

# EMERALD®

## OPERATING MANUAL

# EMERALD STEL 50 DEVICE

FOR PRODUCING ANOLYTE ANK SUPER DISINFECTANT



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**IMPORTANT!** Before using the EMERALD STEL 50 Device (hereinafter referred to as «EMERALD Device» or «Device»), please read this operating manual carefully. With careful use and compliance with the requirements specified in this operating manual, EMERALD Device will serve you for many years.

## 1. INTRODUCTION

EMERALD STEL 50 Device is professional equipment for obtaining a universal environmentally friendly disinfectant Anolyte ANK SUPER from a saline solution of sodium chloride using electrochemical activation (ECA) technology.

EMERALD STEL 50 Device has been developed jointly with the Vitold Bakhir Institute of Electrochemical Systems and represents a new generation of compact STEL devices that have successfully proven themselves both in Russia and abroad. Many years of experience and modern discoveries of our scientists, as well as the direct participation of V.M. Bakhir, Doctor of Technical Sciences, Professor, have made it possible to combine the most advanced technologies of electrochemical activation in EMERALD STEL 50 Device to produce Anolyte ANK SUPER.

The Device efficiency for Anolyte ANK SUPER is 50 liters per hour.

EMERALD STEL 50 Device is designed for use in a variety of areas of life. EMERALD STEL Devices are used to produce Anolyte ANK SUPER in medicine, agriculture, the defense industry and the Ministry of Emergency Situations, in the field of private and industrial water treatment and sanitation, in household and communal services and transport (land, sea and air), in the food industry. EMERALD STEL Devices are also used in dentist offices, spa centers and various medical institutions. For research and educational purposes, EMERALD STEL Devices are used in private and public laboratories, research institutes, schools and universities.

EMERALD STEL Devices are certified both in Russia and abroad, including the European CE certificate of conformity, the European declaration of ROHS (environmental certificate), ISO 9001 quality management system certificate, hygiene certificate (expert opinion) of Rospotrebnadzor, EAC declaration of conformity.

## 2. INFORMATION ON ANOLYTE ANK SUPER

### Main features

**Electrochemically activated anolyte** is predominantly fresh or slightly mineralized water, in which, as a result of the electrochemical unipolar treatment (in the double electric layer at the anode of the electrochemical module), metastable products of anodic electrochemical reactions are formed and stored, the so-called oxidizing agents, predominantly represented by hydroperoxide compounds and oxygen compounds of chlorine.

An electrochemically activated anolyte exhibits electron-acceptor ability, that is, it is a strong oxidizing agent and/or oxidation catalyst in various physicochemical, including biochemical, reactions. Nowadays, the best type of anolyte is known as Anolyte ANK SUPER.

Anolyte ANK SUPER is a broad-spectrum disinfectant with a wide range of action (against bacteria, mycobacteria, viruses, fungi and spores of any species and forms), to which microflora is not able to develop resistance (unable to adapt). Long-term (more than 25 years) use of various types of Anolyte in medical institutions without replacement for other disinfectants has demonstrated complete absence of habituation of microorganisms to Anolyte, due to the metastable structure of its active agents.

The active agents in Anolyte ANK SUPER are a metastable mixture of chlorine-oxygen and hydroperoxide oxidants, equivalent in composition to the mixture being formed in the organisms of living beings during phagocytosis (destruction of foreign substances by phagocytes). The main active agents of Anolyte ANK SUPER are hypochlorous acid, hydrogen peroxide, ozone and singlet oxygen.

Anolyte ANK SUPER is a nature-like and environmentally friendly aqueous solution which is harmless to humans and animals and can be used in any form of application (irrigation, immersion, wiping, soaking, aerosol, foam, ice).

Anolyte ANK SUPER has mineralization corresponding to fresh drinking water (TDS doesn't exceed 1000 mg/l) and the pH indicator of 5.0–6.5 units. That is why Anolyte ANK SUPER does not leave residue on smooth surfaces when dried, does not initiate corrosion of metals and is practically odorless. After use, Anolyte ANK SUPER turns into ordinary fresh water and evaporates without a trace, which eliminates the need for its neutralization or disposal.

Anolyte is the only disinfectant solution in the world that is officially approved in some developed countries (i.e. Japan), not only for high-level disinfection, but also for oral administration as a therapeutic drug. This fact confirms the complete safety of this disinfecting agent. Anolyte ANK SUPER also has appropriate permits for its use in medicine, food industry, veterinary medicine, agriculture and other areas in Russia and a number of foreign countries (USA, Germany, Italy, Bulgaria, UAE, Vietnam), where Anolyte is known under other trademarks.

## Synthesis technology

The unique technology of Anolyte ANK SUPER electrochemical synthesis enables to achieve the long-term preservation of antagonist substances in the solution: hypochlorous acid with accompanying chlorine-oxygen compounds and hydrogen peroxide with accompanying hydroperoxide compounds. It is this mixture of oxidants that is produced by phagocytes in living nature, but existing for only a few milliseconds, while in Anolyte ANK SUPER these compounds do not «see» each other under long-term storage due to powerful ion-hydrate shells surrounding active charged molecular structures. These active substances start to act together only when Anolyte ANK SUPER comes into contact with the processed objects of animate and inanimate nature. It is not possible to obtain a similar mixture of oxidants in solution just by chemical means.

In EMERALD STEL devices, this technology of Anolyte ANK SUPER synthesis is implemented through the use of new MB-11 type electrochemical modules.

It is important to note that the cost of obtaining 1000 liters of Anolyte ANK SUPER in EMERALD STEL devices is only 2.8 USD, which is at least 5 times lower than the average cost of 1000 liters of other disinfectants. At the same time, the above cost price takes into account all the main costs for Anolyte ANK SUPER production: electricity, water, salt, depreciation costs, and the Device operator wages.

## Applications of Anolyte ANK SUPER

Electrochemically activated Anolyte has been successfully used in many industries for more than 30 years in various application forms: irrigation, immersion, wiping, soaking, aerosol, foam, ice.

### *WATER TREATMENT AND DISPOSAL*

- ◆ Disinfection of water at drinking water supply stations;
- ◆ Disinfection of domestic, industrial and agricultural wastewater;
- ◆ Disinfection of wastewater from medical institutions;
- ◆ Disinfection of drinking water and reservoirs in emergency situations;
- ◆ Disinfection of pipes, tanks and other containers of any volume for water supply and storage;
- ◆ Destruction of biofilms on the inner surface of pipelines and water supply and storage tanks.

### *DEFENSE INDUSTRY AND EMERGENCIES*

- ◆ Producing and using of Anolyte ANK SUPER in military field conditions in any places and quantities;
- ◆ Installation of EMERALD STEL devices for producing Anolyte ANK SUPER in ambulances and special military vehicles;
- ◆ Rapid creation of the disinfectant provision in the required quantity without the need for transportation;
- ◆ Disinfection of the skin and clothing of military personnel;
- ◆ Disinfection of drinking water and reservoirs in emergency situations.

### *AGRICULTURE*

- ◆ Disinfection of livestock buildings and other agricultural facilities in the presence of people and animals;
- ◆ Plants treatment (including greenhouse plants) to combat viral and bacterial diseases;
- ◆ Disinfection of seeds and seedlings before sowing and planting;
- ◆ Processing of finished agricultural products to increase their shelf life;
- ◆ Irrigation water treatment and conditioning;
- ◆ Application of anolyte in beekeeping (treatment and prevention of diseases of bees, increase of immunity and productivity of bees).

### *MEDICAL CARE*

- ◆ Producing environmentally friendly disinfectant Anolyte ANK SUPER in any places and quantities without the need for transportation or storage;
- ◆ Disinfection and sterilization of medical devices, as well as surfaces, cleaning equipment and utensils;
- ◆ Disinfection of premises in the presence of patients;
- ◆ Air disinfection by spraying (the smell of chlorine is completely absent, extraneous odors disappear almost instantly, the air feels fresh, like after rain);
- ◆ Disinfection of medical waste;
- ◆ Antiseptic, for example, for treating the hands of a surgeon;
- ◆ Anolyte as a drug for local and external use for the treatment of damaged and intact skin and mucous membranes in various diseases in surgery, therapy, physiotherapy, dermatology, gynecology, urology, otolaryngology (treatment of burn lesions, purulent wounds, trophic ulcers in diabetes, infections of various etiologies, moisturizing and impregnation of absorbents for wound dressings).

### *FOOD PRODUCTION*

- ◆ Improving the quality and increasing the lifetime of food products on the shelves and in warehouses;
- ◆ Treatment of raw materials at food processing, for example, beet processing plants, in order to disinfect and increase shelf life;
- ◆ Disinfection of vegetable raw materials - salads, herbs, vegetables, fruits and increasing their shelf life;
- ◆ Disinfection of fruit and berry raw materials and increasing their shelf life;
- ◆ Disinfection of livestock and poultry carcasses in slaughterhouses and meat processing plants;
- ◆ Disinfection of fish and seafood (Anolyte ANK SUPER is effective against all pathogenic microorganisms, including listeria);
- ◆ The use of Anolyte on fishing vessels to increase the shelf life of fish and seafood;
- ◆ CIP cleaning in all beverage production factories with fulfilment of strict sanitary standards.

### *SWIMMING POOLS*

- ◆ Disinfection of water in indoor and outdoor swimming pools by integrating the Anolyte ANK SUPER producing and dosing equipment into the existing water circulation system. EMERALD devices are connected to active chlorine level sensors installed in swimming pools and operate in automatic mode, enabling to maintain the necessary oxidants level in the water;
- ◆ Ensuring complete microbiological safety of swimming pool water;
- ◆ Destruction of biofilms (colonies of microorganisms) from all surfaces in contact with water including pipelines and basins;
- ◆ Absence of any chlorine smell from the water (only the smell of fresh water) and a pleasant feeling of cleanliness and safety;
- ◆ Ensuring complete transparency of the swimming pool water.

### *TRANSPORT*

- ◆ Disinfection of vehicles (surfaces, walls, seats, floors, toilets, etc.);
- ◆ Disinfection of bed linen and towels;
- ◆ Disinfection of air conditioning systems;
- ◆ Disinfection of water supply systems in trains and ships;
- ◆ Washing and disinfection of supply and storage tanks, including those in contact with drinking water;
- ◆ Disinfection of water in tankers: isolated ballast, clean ballast in tanks;
- ◆ Disinfection of wastewater;
- ◆ Disinfection of drinking water on ships, including yachts.

### *HOUSING AND PUBLIC UTILITIES*

- ◆ Disinfection and washing of surfaces and floors of premises in the presence of people;
- ◆ Disinfection of toilets, sanitary and cleaning equipment;
- ◆ Air disinfection (by spraying) in rooms of any size;
- ◆ Disinfection of air conditioners and ventilation ducts;
- ◆ Disinfection of garbage, garbage chutes, containers for collecting garbage, garbage trucks;
- ◆ Sanitation of entrances and flights of stairs in residential buildings;
- ◆ Disinfection of playgrounds;
- ◆ Elimination of black mold on the walls of buildings.

Important!

The information on the properties, methods and scope of Anolyte ANK SUPER presented in this section is for reference only and does not apply to legally significant statements or recommendations. The manufacturer is not responsible for the correctness of the chosen Anolyte ANK SUPER application method.

### 3. INFORMATION ON CATHOLYTE

#### Main features

A by-product synthesized by the EMERALD STEL 50 Device in the production process of Anolyte ANK SUPER is electrochemically activated catholyte.

**Electrochemically activated catholyte** is predominantly fresh or slightly mineralized water in which metastable products of cathodic electrochemical reactions, in particular molecular ions  $\text{HO}_2^-$ ,  $\text{O}_2^-$ ,  $\text{OH}^-$ , are formed and stored as a result of electrochemical unipolar treatment (at the cathode of the electrochemical module).

The electrochemically activated catholyte exhibits electron donor ability, i.e., it is a strong reducing agent and reduction catalyst in various physicochemical, including biochemical, reactions.

### 4. ELECTROCHEMICAL MODULES

The main elements of the EMERALD Device are 6 (six) MB-11 type electrochemical modules (diaphragm flow-through electrochemical Bakhir modular elements), in which oxidation reactions take place at the anode and reduction reactions at the cathode (Fig. 1).

The safety of water treatment is ensured by the complete absence of any chemicals in EMERALD Devices. The MB-11 type electrochemical modules, in which electrochemical treatment of initial sodium chloride solution (hereinafter "working solution") takes place, exchange only electrons with working solution, taking them from the solution in the anode chamber, where oxidative reactions occur, and introducing the electrons into the solution in the cathode chamber, where reduction reactions take place.

It is important to note that all electrochemical modules and auxiliary hydraulic elements in the EMERALD Device have a long service life and do not require periodic replacement, provided that the maintenance rules described in this operation manual are observed.



Fig. 1. New generation MB-11 type electrochemical module, appearance.

## 5. PRECAUTIONARY MEASURES

- ◆ For normal operation of the EMERALD Device, it is necessary to follow the requirements for its operation and maintenance specified in this Operation Manual.
- ◆ Please read this manual carefully before using the Device. If you have any questions regarding the connection or operation of the EMERALD Device, please consult our authorized dealers or call our customer service.
- ◆ In the case of using cold tap water for preparing the initial salt solution of sodium chloride (working solution) or for carrying out the FLUSHING mode, you need to make sure that the water used complies with SanPiN 2.1.4.1074-01! Note that the total hardness of water should be no more than 2.0 mg-eq/l (° W).
- ◆ If the tap water does not meet the requirements of SanPiN 2.1.4.1074-01, as well as if there are visible suspensions, turbidity and rust flakes in the tap water, it is necessary to use a preliminary water treatment system, which you can purchase directly with the Device (see Table 5), or order separately.
- ◆ Do not use hot tap water to prepare the working solution or run the FLUSHING mode, as this may damage the Device.
- ◆ The Device is not intended for use by children, people with physical and mental disabilities, lacking the necessary experience and knowledge, except in cases of direct instruction by a person responsible for their safety.
- ◆ When using the electrical system, basic safety precautions should always be followed to reduce the risk of fire, electric shock and/or personal injury.
- ◆ Before operating the Device, make sure that all hydraulic and electrical connections are secure. Do not leave the running Device unattended;
- ◆ Materials a plumber uses for sealing the joints must not enter the Device. Avoid adding vegetable oil, petroleum jelly, or other lubricants, solvents, ammonia, alcohols, or strong cleaning solutions to the system. They can seriously damage the Device.
- ◆ Regular maintenance of the EMERALD Device should be carried out to wash the filter elements and electrochemical modules (see Section "DEVICE MAINTENANCE").

### **Electrical safety measures:**

- ◆ The assemblage of the electrical outlet to connect the Device to the electric network must be carried out by qualified electricians in accordance with the laws in force in your country of residence.
- ◆ To prevent the risk of electric shock, do not place the Device near water or other liquid substances. The socket should not be located directly above the sink or in any other place where water can enter it. Before connecting to the power supply, make sure that the Device and all its elements are dry. During operation, all elements of the EMERALD Device must be dry and not leaking.
- ◆ For the proper functioning of the EMERALD Device, your outlet must be uninterrupted, have a working ground contact and be connected through a residual current device (RCD) or a differential circuit breaker with a rated leakage current of 30 mA!
- ◆ Be sure to disconnect the Device from the power supply during long breaks in operation. Do not use any other power supply or adapter in place of the supplied power cord. Check the power cord, power plug, and the Device itself for damage. If any damage is found, please contact the nearest service center for examination or repair of the Device.
- ◆ Incorrect connection to the electric network supply can lead to the risk of electric shock.
- ◆ In order to avoid accidents, it is strictly forbidden to carry out any repair/maintenance work without disconnecting the Device from the electric network!

### **Additional Security Measures:**

- ◆ Use only spare parts approved by the manufacturer.
- ◆ Do not use the Device for purposes other than those intended. Do not use the Device outdoors. Do not use the Device for water desalination.
- ◆ Do not disassemble or repair the Device yourself. Contact an authorized service center. In order to reduce the risk of fire or electric shock, it is strongly recommended not to disassemble the electronic components of the system.
- ◆ Avoid rough handling of the Device, do not drop or hit it. Do not store or transport the Device with residual water at an ambient temperature below 0°C. Use Device only in vertical position.

## 6. DEVICE FEATURES

**Table 1. Specifications**

Performance in Anolyte ANK SUPER, liters per hour	50±5
Power consumption, no more than, W	1 032
Specific electricity consumption, no more than W* h/l	20.6
Supply voltage - standard socket with grounding (for adapter), V.	110-220
Power supply frequency, Hz	50-60
The number of electrochemical modules of MB-11 type, pieces	6
Overall dimensions (excluding inlet and protruding parts), WxHxD, mm	400x600x200
Net weight, kg	17.0
Gross weight, kg	21.0

**Table 2. Quality indicators of Anolyte ANK SUPER**

Appearance (color, smell)	Colorless transparent solution with a slight smell of chlorine-oxygen oxidants
Total concentration of oxidants in terms of active chlorine, % (mg/l), no less	0.05±0.005, (500 ± 50)
Concentration index of hydrogen ions pH, units	5.0-6.5
Mass total concentration of dissolved substances (Total Dissolved Solids), ppm, no more	1 000

**Table 3. Device operating conditions**

Maximum allowable pressure of pressure water line, bar*	4.0
Ambient temperature, °C	+15...+25
Relative humidity (at 25 °C), %	Up to 80
Air exchange	Mandatory supply and exhaust ventilation with at least one air change in the room per hour
Sewerage	Availability of sewerage
Permissible deviations of the electrical network supply voltage	± 10%
Operation mode	Mandatory 15-minute technological breaks after 2 hours of continuous operation, necessary to cool down the internal hydraulic and electrical components of the Device.

\* Maximum allowable pressure of the water pressure line when the Device is connected directly to the water supply line.

## 7. CONTENTS OF DELIVERY

**Table 4. Contents of delivery**

No.	Name	Number, pc.	Appearance
1.	EMERALD STEL 50 Device.	1	
2.	Network cable with IEC320 C14 plug for connecting the Device to the electrical network.	1	
3.	DC ammeter with clamps and digital display (for determining the actual current strength on electrochemical modules).	1	
4.	EMERALD STEL flushing tank with connection fittings.	1	
5.	T-bend with a ball valve for connection to the water supply line with connections: M G1/2" – F G1/2" (female thread) - M G3/4"; connecting fitting F G3/4" – tube 3/8".	1	
6.	Slim Line 10" flask for water treatment filters, a bracket, a wrench and a set of fittings for connection. The kit also includes: 2 pcs. fitting M G1/2" - 3/8" tube for connecting the flask with water supply line and with the Device; 1 pc. mechanical polypropylene filter, 5 microns, replaceable.	1	
7.	A set of fittings for connecting the Device to the circulation tank with the working solution: Fittings with a jumper for connecting tubes to the circulation tank: 1 pc. 3/8", 2 pc. 1/4". Elbow fittings rod - tube: 2 pc. 3/8", 3 pc. 1/4".	1	
8.	1 pc. Catholyte flow regulator with a nominal value of 1000 assembled with an elbow fitting tube 1/4" - rod 1/4" type.  1 pc. Drainage flow regulator with a nominal value of 800 assembled with an elbow fitting tube 1/4" - rod 1/4" type.	1	

9.	Shutoff ball valves (for additional adjustment of the outgoing flows of Anolyte, Catholyte and Drainage): 3 pc. 1/4".	1	
10.	Drainage clamp, for 1/4" tube.	1	
11.	Set of connecting tubes: Tube 3/8", 4 meters; Tube 1/4", 10 meters.	1	
12.	Set for work with tubes and fittings: 1 pc. wrench for fittings and tubes; 1 pc. wrench for the Device casing cover; set of spare clips and plugs: Clips 3/8" – 5 pc., plugs 3/8" – 3 pc; Clips 1/4" – 10 pc., plugs 1/4" – 5 pc.	1	
13.	Fasteners for hanging the Device on the wall: 2 pcs. screw 6x60 galv. with a 10x60 dowel.	1	
14.	Operation Manual.	1	

\* M (male) – male thread, F (female)–female thread, G1/2" – cylindrical pipe thread 1/2".

**Table. 5. Auxiliary items purchased separately**

№	Name	Number, pcs.	Appearance
Add. 1	Diverter with M22 connection and 3/8" tube nipples for connecting the Device above the sink, with a set of nozzles: M G1/2" x M22, F G1/2" x M22, M22 x M24, clamp adapter	1	
Add. 2	Circulation tank connection kit (for filling and draining the tank): 1 pc. tank connection fitting with M G1/2" thread; 1 pc. shutoff valve with F G1/2" - F G1/2" connections; 1 pc. elbow fitting with M G1/2" thread - 3/8" tube.	1	
Add. 3	Mechanical polypropylene filter, 5 microns, replaceable, for Slim Line 10" flask	1	
Add. 4	Filter with ion-exchange resin for water softening (removal of hardness salts), replaceable, for Slim Line 10" flask	1	
Add. 5	Water iron removal filter, replaceable, for Slim Line 10" flask	1	

## 8. PREPARATION OF WORKING SOLUTION

### Characteristics of the main components

**Table 6. Characteristics of the water used**

Water quality (options)*	1) Distilled water according to GOST 6709-72; 2) Water pretreated in a reverse osmosis system according to GOST 25661-83; 3) Cold tap drinking water according to SanPiN 2.1.4.1074-01. Total hardness is not more than 2.0 mg-eq / l (° W ).
Water temperature	4 to 20 °C

\* The Table gives options for the quality of the water used, with 1 and 2 being the most preferred options, and 3 the least preferred one.

**Table 7. Characteristics of the salt used**

Salt quality (options)**	1) Chemically pure sodium chloride in accordance with GOST 4233-77; 2) Tableted salt for regeneration of cation-exchange materials TU 9192-001-55898695-01; 3) Evaporated table salt (extra) in accordance with GOST R 51574;  It is not allowed to use rock salt and/or iodized salt for preparation of the working solution due to the high content of impurities (“hardness salts”) and organic compounds in them, negatively affecting the operation of electrochemical modules.
Salt component characteristics	Mass fraction of NaCl, no less than > 99.5% Mass fraction of water-insoluble substances < 0.03% Mass fraction of sulfate ions < 0.2% Mass fraction of iron oxide < 0.005% Mass fraction of magnesium ions < 0.01% Mass fraction of calcium ions < 0.02%

\*\* The Table gives options for the quality of the salt used, with 1 and 2 being the most preferred options, and 3 the least preferred one.

**Table 8. Characteristics of the hydrochloric acid used**

Hydrochloric acid quality	Hydrochloric acid 30-38%, analytical grade, not inhibited according to GOST 3118-77
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### Working solution preparation procedure

The working solution (aqueous salt solution of electrolytes) is prepared using water and salt (see Table 6,7). Optionally, it is possible to add hydrochloric acid to the working solution (Table 8) if it is necessary to reduce the concentration of hydrogen ions (pH) in Anolyte ANK SUPER. Permissible characteristics for the water, salt and hydrochloric acid used are indicated in Tables 6, 7, 8.

The recommended volume of the working solution for 60 minutes of Device operation is **60 liters** (on average, during an hour of operation, 20 liters are drained, and 100 liters remain in the container in the form of the final Anolyte ANK SUPER solution).

It is recommended to use an opaque plastic container with a volume of **at least 100 liters** with a wide flat screw cap as a container for preparing the initial working solution and subsequent synthesis of Anolyte ANK SUPER. The most suitable types of plastic for containers are as follows: ABS, HDPE, PVC, PS. The presence of a wide flat cover will allow for installation of the cut-in fittings from the delivery set (7, Table 4) into it and securely connecting the Device to the tank for ease of further use. In addition, for the convenience of filling and draining the tank, it is possible to install a cut-in valve at the bottom of the tank (Add. 2, Table 5).

Table 9 describes a reference option of the working solution preparation using distilled or reverse osmosis water and chemically pure sodium chloride. Table 10 shows the reference characteristics of the final working solution, based on which the user will be able to properly prepare the working solution not only on distilled or reverse osmotic water, but also on tap water.

**Table 9. Basic proportions for preparing the working solution**

No.	Name	For 1 liter of working solution	For 60 liters of working solution
1.	Distilled water according to GOST 6709-72 <i>or</i> Water treated in a reverse osmosis system according to GOST 25661-83;	1 liter	60 liters
2.	Chemically pure sodium chloride in accordance with GOST 4233-77; <i>or</i> Tableted salt for regeneration of cation-exchange materials TU 9192-001-55898695-01;	1.0 – 1.1 gr.	60 – 66 gr.
3.	Hydrochloric acid 38%, analytical grade, not inhibited according to GOST 3118-77	0.0 – 0.12 ml	0 – 7.2 ml

**Table 10. Characteristics of the final working solution**

Indicator of concentration of hydrogen ions pH, units	4.0-5.5
Mass total concentration of dissolved substances ( total dissolved solids ), mg/l, no more	1 000 – 1 100
Working solution temperature, °C	4-20

**Important!** To control the final parameters of the working solution and the resulting Anolyte ANK SUPER, use a certified and calibrated pH meter, TDS meter, as well as special equipment for determining the concentration of active chlorine in the Anolyte ANK SUPER solution (for details, see Appendix 1 DETERMINATION OF ACTIVE CHLORINE CONCENTRATION). To accurately determine the volume of added water and salt, use appropriate measuring instruments (flow meters, laboratory or kitchen scales).

In the case of preparing a working solution with tap water, you need to make sure that the characteristics of the resulting solution correspond to the characteristics indicated in Table 10. The volume of added salt in this case must be reduced according to the water mineralization level. For example, if the total mineralization of tap water is 200 mg/l, then it means that not 1 gram of salt should be added to 1 liter of the working solution, but 0.8 grams. Thus, for 60 liters of tap water with a salinity of 200 mg/l, you need to add 48.0 grams of salt, in order to comply with the parameters indicated in Table 10.

If you need to reduce the pH of Anolyte ANK SUPER, add hydrochloric acid to the initial working solution (Table 9). 1 milliliter of hydrochloric acid (38%) lowers the pH of a 60-liter working solution (using distilled or reverse osmosis water) by about 0.4 pH unit.

Note that adding the same amount of hydrochloric acid to a working solution with distilled or reverse osmosis water and a solution prepared with tap water will give different pH reductions.

**Important!** All work related to the preparation of the working solution should be carried out using personal protective equipment for the skin, eyes and respiratory organs! Special care should be taken when working with hydrochloric acid, as it smokes in air and can cause burns to the skin and mucous membranes!



## 9. DEVICE CONNECTION

### Description of basic elements on EMERALD Device casing

Fig. 2 shows the basic elements of EMERALD STEL 50 Device located on the left, central and right parts of the casing. For the user convenience, the numbering of elements in Fig. 2 and on subsequent Device connection diagrams in OPERATION and FLUSHING modes is the same.

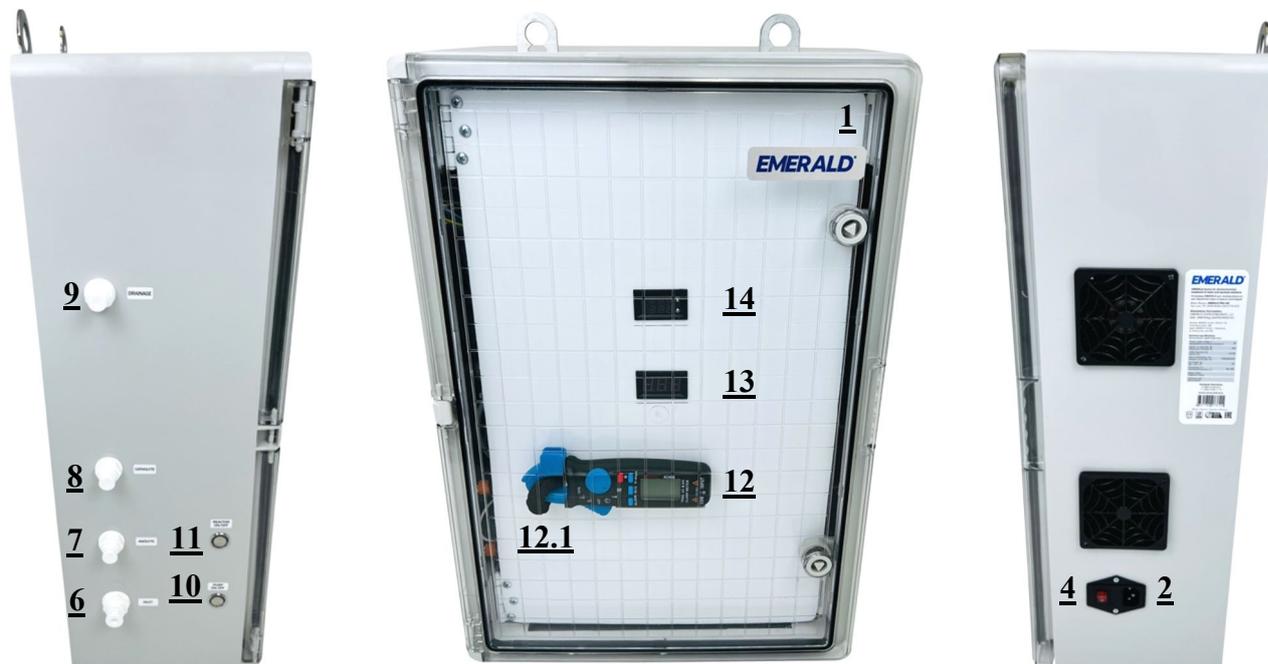


Fig. 2. Basic elements on the EMERALD STEL 50 Device casing.

1. EMERALD STEL 50 Device;
2. Plug to connect the network cable to the Device;
4. General power supply button;
6. INLET fitting for supplying the working solution to the Device;
7. ANOLYTE fitting for the outlet of electrochemically activated Anolyte;
8. CATHOLYTE fitting for the outlet of electrochemically activated Catholyte;
9. DRAINAGE fitting for liquid outlet to the drain;
10. PUMP ON/OFF button to turn on/off the pumps;
11. REACTOR ON/OFF button to turn on/off the electrochemical modules;
12. DC ammeter with clamps and digital display (to determine the actual current strength on the electrochemical modules);
- 12.1. Power electrical cables going to the anodes of the electrochemical modules (to determine the actual current strength on the electrochemical modules using the DC ammeter with clamps);
13. Thermometer (to determine the working solution temperature);
14. Ammeter and voltmeter (showing the current and voltage supplied by the main Device power supply);

### General Rules for Handling John Guest® type quick-release fittings

The connection of the tubes to the fittings is done manually. John Guest® type quick-release fittings allow you to repeat the procedures for connecting/disconnecting the tubes and fittings if necessary. When properly connected, the tube enters the fitting hole by 15-18 mm. Correctness and reliability of the connection is checked by the return movement of the tube, after connecting to the fitting. With a force of 8 to 10 kgf, the tube should not be pulled out of the fitting.

Important! Do not apply force when performing these procedures! Proper connection/disconnection of John Guest® tubes and fittings does not require excessive force!

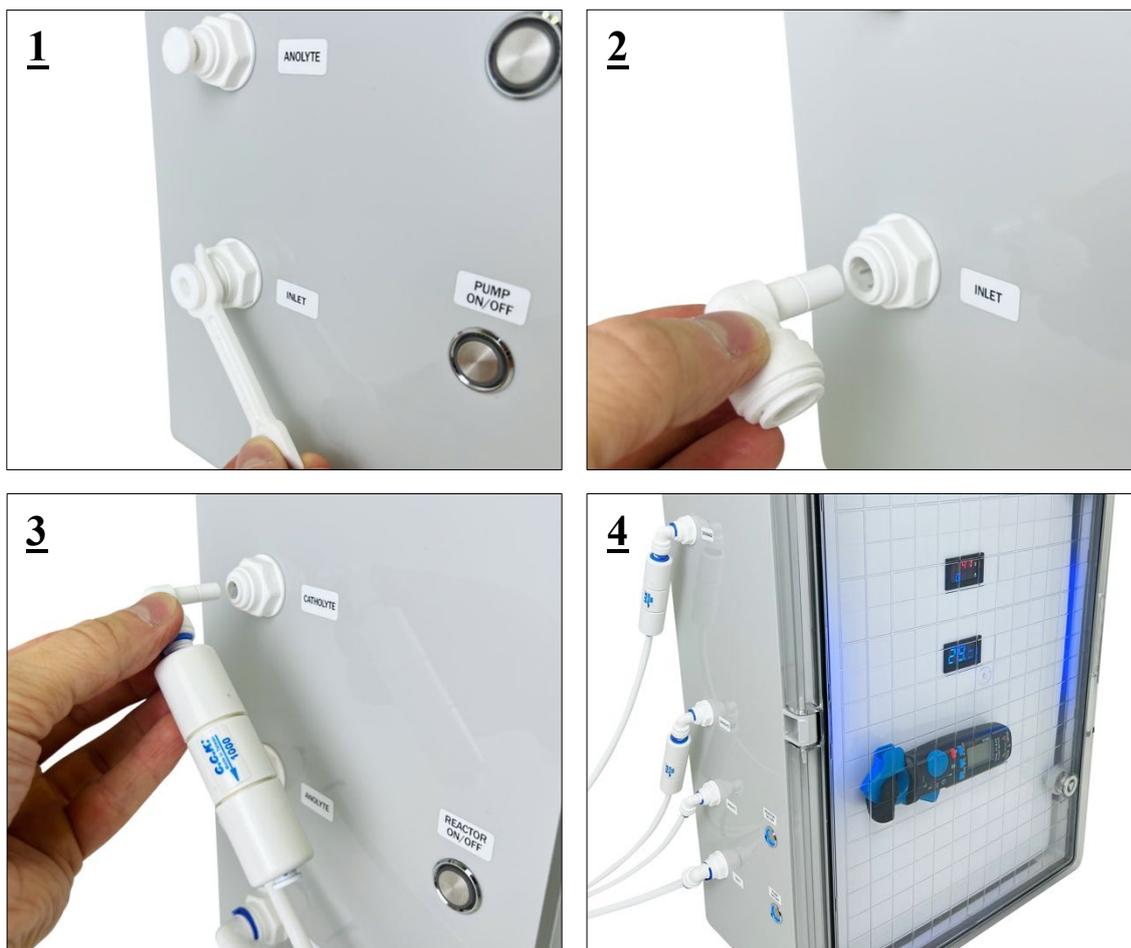


Fig. 3. General view of connecting tubes to quick-release fittings.

## CONNECTING TUBES AND CLOSING PLUGS TO QUICK-RELEASE FITTINGS.

Connecting tubes or plugs to fittings is to be performed in accordance with Fig. 4:

- ◆ Insert the tube by hand into the fitting hole (1) as far as it will go. When properly connected, the tube enters the fitting hole by 15-18 mm;
- ◆ Insert a fixing clip-lock (2,3) into the gap between the sliding collet ring and the base of the fitting;
- ◆ Check that the connection is secure by moving the tube back. With a force of 8 to 10 kgf, the tube should not be pulled out of the fitting.

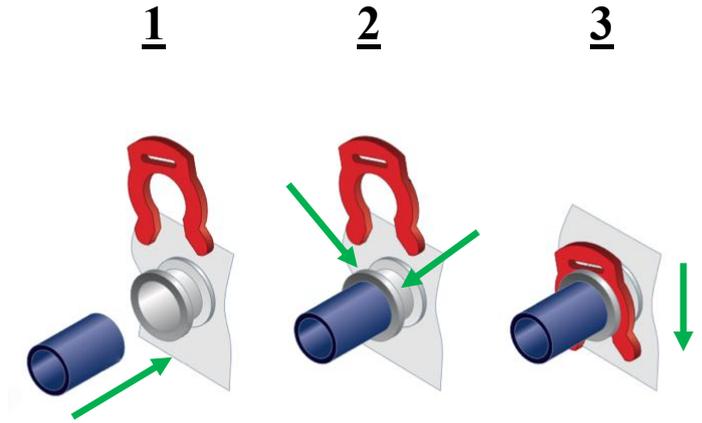


Fig. 4. Connecting tubes and closing plugs to quick-release fittings on the Device casing.

## DISCONNECTING TUBES AND CLOSING PLUGS FROM QUICK-RELEASE FITTINGS.

Disconnecting tubes or plugs from fittings is to be performed in accordance with Fig. 5:

- ◆ Remove the fixing clip-lock from the fitting (2);
- ◆ Using a hand or a special wrench (9, Tab. 5), press the collet ring of the fitting to its base (3);
- ◆ While holding the collet ring of the fitting in the pressed position (3), pull the tube or plug out of the fitting by hand (4).

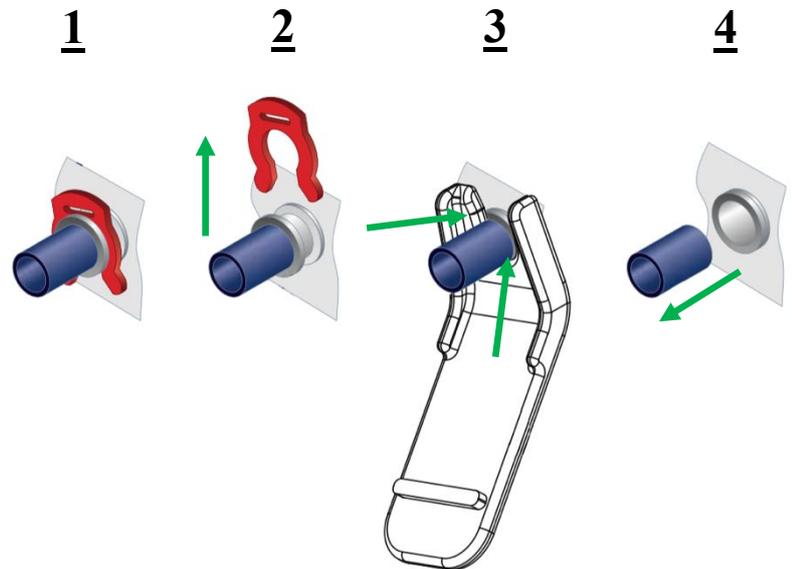


Fig. 5. Disconnecting tubes and closing plugs from quick-release fittings on the Device casing.

## EMERALD Device connecting diagram in OPERATION mode

This section describes the basic way to connect the EMERALD Device, recommended by the manufacturer. If you use an alternative connection method for the EMERALD Device, you must make sure that the method you choose does not contradict the other conditions of this Operation Manual. In case of violation of the conditions of installation and operation of the EMERALD Device, warranty claims may be rejected.

The main part of the Device is the RPE-6 electrochemical reactor, consisting of six new generation type MB-11 diaphragm electrochemical modules.

The main OPERATION mode consists in the circulation of the working solution. Using the built-in self-priming pumps, the working solution is supplied from the circulation tank to the Device, where it undergoes electrochemical activation in the anode and cathode chambers of the MB-11 electrochemical modules. Anolyte fully goes back into the circulation tank with the working solution. Catholyte partially goes to the circulation tank with the working solution to correct the pH and partially is discharged into the drain.

As a container for preparation of the initial working solution and subsequent synthesis of Anolyte ANK SUPER, it is recommended to use an opaque plastic container with a volume of at least 100 liters with a wide flat screw cap. The most suitable types of plastic for containers: ABS, HDPE, PVC, PS. The presence of a wide flat cover will allow you to install the cut-in fittings from the delivery set (7, Table 4) into it and securely connect the Device to the tank for ease of further use. Also, for the convenience of filling and draining the tank, it is possible to install a cut in valve at the bottom of the tank (Add. 2, Table. 5).

The Device is placed on a stable, flat, horizontal surface (floor or desktop). For fastening to a wall, there are special eyelets in the upper part of the Device casing. The connecting tubes are cut into the required lengths at the installation site. You can cut the tube with a regular kitchen or stationery knife using a cutting board.

Fixed connection of EMERALD Device requires certain skills in working with plumbing equipment. Do not install the Device in a place where its maintenance would be difficult. Do not install the Device in a place where the Device casing will be exposed to water or direct sunlight. After the Device is fully connected, make sure that all connections are tight. During installation, make sure the inlet and outlet tubes pass freely along the radii, excluding kinks.

Important! Pay attention to the position of the tubes inside the circulation tank in the OPERATION mode! This is important for the correct circulation of the working solution during the production of Anolyte ANK SUPER. The following location is recommended (Fig. 6):

- ◆ The working solution intake tube «6» is lowered into the middle of the tank;
- ◆ The Anolyte outlet tube «7» is lowered to the very bottom, on one side of the tank (opposite to the Catholyte outlet tube);
- ◆ The Catholyte outlet tube «8» is lowered to the very bottom, on the other side of the tank (opposite to the Anolyte outlet tube).



## Connection to cold water supply via t-bend

For the convenience of quick flushing of the Device with cold tap water after the OPERATION mode (to remove residual acid and alkaline solutions of Anolyte and Catholyte) or after the FLUSHING mode (to remove dissolved impurities and residues of citric acid flushing solution) a t-bend with a ball valve (with connections M G1/2" - F G1/2" - M G3/4") is installed in the pressure water supply line (Fig. 7). To connect the t-bend with water filter or with the Device a fitting type F G3/4" - 3/8" tube is used.



Fig. 7. T-bend with a ball valve for connection to the water supply line.

The main connections on the t-bend and fitting (Fig. 7):

1. Female thread G1/2";
2. Male thread G1/2";
3. Male thread G3/4";
4. Female thread G3/4";
5. Quick-release fitting for tube 3/8";

To connect to the water line:

- ◆ Shut off the water supply line at the inlet, and then open the shutoff valve of this line at the outlet to relieve pressure in the pipe;
- ◆ When using a flexible hose, unscrew the union nut of the flexible hose, through which water is supplied to the outlet. Insert a t-bend with a ball valve into the gap between the main line and the flexible hose (Fig. 8).
- ◆ Next, on the threaded connection on the t-bend type M G3/4" (3, Fig. 7), screw the fitting for connecting the water supply tube (4, Fig. 7) to the stop);
- ◆ Connect a 3/8" tube to the mating part of the fitting (5, Fig. 7) for supplying water to the filter (6, Table 4) or to the Device (6, Fig. 6);
- ◆ Fix the quick-release fittings with clip-locks;
- ◆ Tighten all screw connections with a wrench or adjustable wrench. Check the reliability of all connections.

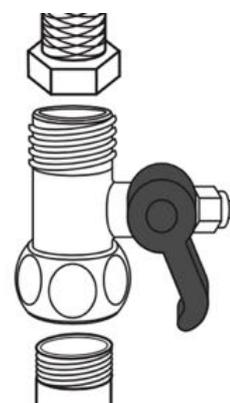


Fig. 8. An example of mounting a t-bend with a ball valve into a gap in the water supply line.

**Important!** When connecting these elements, do not overtighten the connections! This can lead to a damage of the t-bend or fitting, including a hidden one (with long-term consequences). Threaded connections without sealing gasket must be sealed (e.g. with Tangit uni-lock® plumbing thread). The amount of sanitary sealing material used must not be excessive! In case of any mechanical damage to the connection unit due to improper installation and use, warranty claims may be rejected.

## Connecting the drain clamp

The drain clamp allows you to connect the 1/4" outlet drain tube from the DRAINAGE fitting (9, Fig. 6) to the sewer tube. The drain clamp fits most sewer tubes with a diameter of about 40 mm.

The connection is made in accordance with the diagram in Fig. 9:

- ◆ Remove the protective film (2) from the self-sticking gasket (1). Glue the sealing gasket (1) to the inner side of the clamp (3), so that the hole in the gasket coincides with that in the clamp nipple (4);
- ◆ Install the clamp on the sewer drain tube and then tighten the bolts (5). The bolts should be tightened evenly so that both parts of the clamp (3 and 6) are parallel;
- ◆ Drill a hole in the drain tube with a diameter of 7 mm through the clamp nipple (4).
- ◆ Slide the plastic black union nut (7) from the clamp nipple through the 1/4" tube;
- ◆ Insert the tube into the drain clamp and into the drilled hole in the drain tube.
- ◆ Screw the union nut up to the stop on the clamp nipple to fix the tube;
- ◆ Check the strength and tightness of the connection.

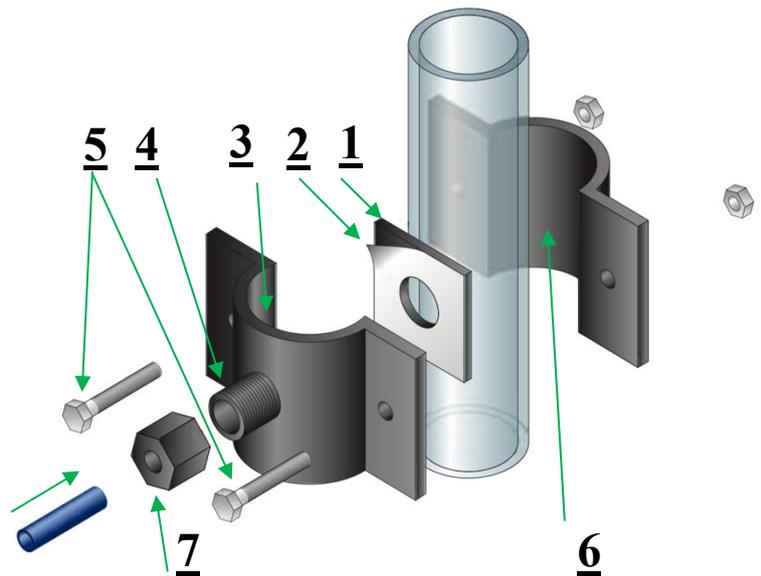


Fig. 9. Connecting diagram of the drain clamp to the sewer pipe.

Important! When connecting these elements, do not overtighten the connections! This can lead to a damage of the drain clamp, including a hidden one (with long-term consequences). In the event of any mechanical damage to the connection node due to improper installation and use, warranty claims may be rejected.



Fig. 10. General view of the assembled drain clamp.

## Connecting the water pre-treatment system

A Slim Line 10" flask with a 5 micron polypropylene mechanical filter from the delivery set is used for pre-treatment of water used for the working solution or flushing the Device with cold tap water. The manufacturer recommends always using a pre-filter before feeding water into the Device or before drawing cold tap water into the circulating tank for preparing the working solution.

Important! In case of non-compliance of the source tap water with the requirements of SanPiN 2.1.4.1074-01, it is possible to install an additional preliminary water treatment system (purchased separately, see Table 5)

Connection diagram of Slim Line 10" flask with mechanical filter (Fig. 11):

- ◆ The flask is attached to the wall using a fixing plate (6) and screws;
- ◆ In the unscrewed part of the flask body (3) the polypropylene mechanical cartridge is installed, then the upper and lower parts of the flask are tightly screwed to each other;
- ◆ In the threaded fittings of the flask (1,2) with F 1/2" threads the corresponding threaded parts of the connection fittings (4,5) are screwed. The threaded connections are sealed;
- ◆ In accordance with the arrow of water flow direction on the body of the flask the tap water supply tube 3/8" from a t-bend with a ball valve (Fig. 7) is connected to the quick-release fitting (4);
- ◆ The working solution supply tube (6, Fig. 6) is connected to the outlet quick-release fitting (5);
- ◆ Fixing blue clips are installed in all quick-release connections.



Fig. 11. Slim Line 10" flask with connection fittings and mechanical polypropylene filter.

## Connecting the EMERALD Device to the electrical network

Connecting the EMERALD Device to the electrical network is carried out in several stages in accordance with the connection diagram in Fig. 6. To do so:

- 1) The network cable with the IEC320 C14 plug is connected to the corresponding plug on the side of the Device casing (2, Fig. 6), and the other part of the network cable is connected into the socket (3, Fig. 6);
- 2) To supply power to the Device, turn the button located next to the cable plug (4, Fig. 6) to the ON position («I»);

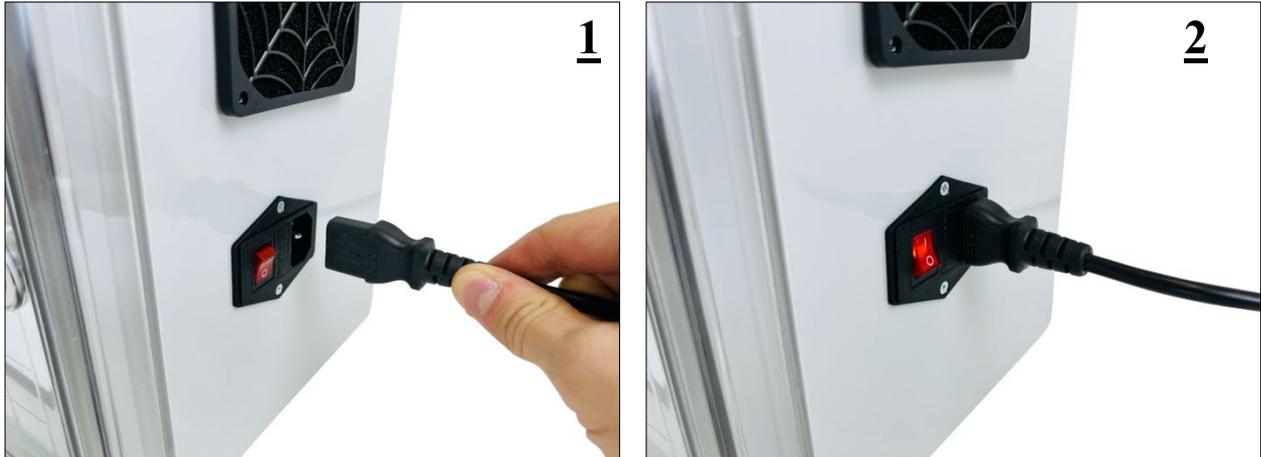


Fig. 12. Connecting diagram of EMERALD Device to the electric network using the network cable.

### **Important!**

Make sure that the Device is connected in a safe and secure manner to an electrical network with suitable characteristics (see Sections *PRECAUTIONARY MEASURES* and *DEVICE FEATURES*).

Turning off the power supply button, as well as disconnecting the network cable from the plug on the casing or from the electrical socket is only allowed when the Device is turned off (when the Device is in *STANDBY* mode). Do not turn off the power button or disconnect the network cable while the Device is in *OPERATION* mode.

To comply with electrical safety measures, the electrical outlet to which the EMERALD Device is connected must work uninterruptedly, have a working ground contact, and also be connected through a residual current device (RCD) or a differential circuit breaker (differential breaker) with a rated leakage current of 30 mA!

## 10. DEVICE OPERATION

### Basic operation modes

#### STANDBY mode.

In the STANDBY mode, the Device is connected according to the OPERATION mode scheme (Fig. 6), the general power supply button on the side of the case is in the OFF position «0». The cooling fan is off. Pump and electrochemical modules ON/OFF buttons (10, 11, Fig. 6) are switched off.

#### OPERATION mode.

To **turn on** the Device in the OPERATION mode, in accordance with the OPERATION mode diagram (Fig. 6):

- ◆ Switch the general power supply button (4) on the side of the casing to the ON «I» position to supply network power to the built-in power supply inside the Device casing. After pressing this button, the cooling fan on the right side of the casing starts working, the displays of the thermometer (13) and ammeter (14) turn on;
- ◆ Making sure that all hydraulic connections are connected correctly, press the pump on/off button (10) once to turn on the circulation pumps located inside the Device casing;
- ◆ When the flow of the working solution shows (after about 15 seconds) from the Anolyte (7) and Catholyte (8) outlet tubes, press the electrochemical modules on/off button (11) once to supply power to the electrochemical modules. After pressing the button, the main process of electrochemical activation of the working solution begins, the current on the ammeter (14) increases, the built-in LEDs light up in blue.
- ◆ Then the Device works in automatic mode for 60 minutes. After 60 minutes, Anolyte ANK SUPER solution will be ready.

To **turn off** the OPERATION mode, in accordance with the diagram in Fig. 6:

- ◆ Press the electrochemical modules on/off button (11) once to turn off the power supply to the electrochemical modules. The current on the ammeter (14) drops to zero (0), the built-in blue LEDs go out;
- ◆ Press the pumps on/off button (10) once to turn off the pump;
- ◆ Switch the general power supply button (4) on the side of the casing to the off position «O» to stop the network power supply to the built-in power supply inside the Device casing. After that, the Device switches to STANDBY mode again: the cooling fan on the right side of the casing turns off, the thermometer (13) and ammeter (14) displays turn off.

**Important!** After turning off the Device from the OPERATION mode, it is necessary to carry out a short-term WASHING-OUT procedure (see the DEVICE MAINTENANCE section) to wash out the residues of Anolyte and Catholyte acid and alkaline solutions from the Device with ordinary cold tap water in order to prevent corrosive wear of hydraulic elements during the Device downtime. To do this, you need to connect the Device according to any of the two schemes of the WASHING-OUT stage (Fig. 16 – washing-out from the tank or Fig. 17 – washing-out from the main) to flush the entire hydraulic system with cold tap water.

The duration of the WASHING-OUT stage in this case should be **at least 5 minutes**. The WASHING-OUT stage after the OPERATION mode must be carried out every time the planned downtime of the Device is **more than 30 minutes**.

## Device operation indication

### Ammeter and voltmeter (14, Fig. 6)

The electronic display with ammeter and voltmeter on the front of the Device casing allows the user to evaluate the parameters at which the Device power supply operates.

In EMERALD Device, the voltage at the output of the power supply is stable and is 24V.

The ammeter shows in amps (A) the current strength that the power supply produces. The display current should not exceed 40 A.

By multiplying the voltage by the current, you can get the power parameter at which the power supply operates. The total power of the power supply should not exceed 960 watts (24V x 40A).

Important! A decrease in the current strength on this display does not indicate an actual decrease in the current on the electrochemical modules, but only reflects a change in the parameters of the current stabilizers. The actual current must be measured with a clamp-on DC ammeter.



Fig. 13. EMERALD Device in OPERATION mode.

### Electronic thermometer (13, Fig. 6)

The electronic thermometer allows you to control the temperature of the working solution flowing in the electrochemical modules. The temperature of the working solution in the OPERATION mode **must not exceed 50 °C**.

### Outlet Analyte and Catholyte flows

An important indicator of the correct operation of the Device is the stable Anolyte, Catholyte and Drainage flows that go out in the OPERATION mode from the corresponding tubes (7,8,9 Fig. 6). The optimal flow rates in the OPERATION mode are given below:

- ◆ Anolyte tube output (7, Fig. 6): **675 – 830 ml/min;**
- ◆ Catholyte tube output (8, Fig. 6): **150 – 200 ml/min;**
- ◆ Drainage tube output (9, Fig. 6): **120 – 160 ml/min;**

For stable operation of the Device, make sure that in OPERATION mode the output of the working solution from all outlet tubes is always preserved and the flow rate corresponds to the specified optimum flow rates! A deviation of the flow rate on any of the outlet tubes **by more than 2 times** from the optimum values indicates either a wrong connection of the Device or that the electrochemical modules and auxiliary hydraulic elements are dirty and the Device should be flushed (see the DEVICE MAINTENANCE section).

**Important!** When the flow rate of any of the outgoing tubes deviates by more than 2 times from the optimal values or when there is no output of the working solution, the correct course of electrochemical reactions in the modules is violated, the current value on the ammeter may become unstable! Do not use the Device under these conditions!

## DC ammeter with clamps and digital display (12, Fig. 6)

DC ammeter with clamps and digital display serves to determine the actual current strength on the electrochemical modules. Due to the fact that the power supply of the electrochemical modules does not come directly from the power supply, but is carried out through special current stabilizers, the current strength indicator on this ammeter will reflect the real current flowing in the electrochemical modules, and may differ from the current strength indicator on the built-in digital display of the ammeter/voltmeter (14, Fig. 6).



Fig. 14. DC ammeter with clamps and digital display.

The principle of operation of this ammeter is based on the Hall effect and allows using measuring clamps for non-contact determination of the value of direct current flowing through electric cables going to the anodes of electrochemical modules (12.1, Fig. 6).

To measure current with this ammeter, you need:

- ◆ Press the ammeter power button once;
- ◆ Switch the ammeter to DC current measurement mode  $\text{---}$  ;
- ◆ Reset the ammeter readings on the digital display (ZERO button);
- ◆ Open the front cover of the Device casing using the wrench (12, Tab. 4);
- ◆ Grasp the braid with power electrical wires with measuring clamps (the measuring clamps must be completely closed and fit snugly together);
- ◆ Close the cover of the Device casing;
- ◆ Put the Device into OPERATION mode.

Immediately after pressing the on/off button of the electrochemical modules (11, Fig. 6), the ammeter display will show the current strength. For the first 10 seconds, the current will increase, after which the current value on the display will stabilize and remain in approximately the same range during all the 60 minutes of the Device functioning in OPERATION mode.

The current strength on this ammeter should be in the range of **28.0-40.0 amperes**. This is the most important indicator of the correct operation of the Device, when we can say with confidence that the user has correctly prepared the working solution and, accordingly, will obtain the necessary parameters of the Anolyte after 60 minutes of the Device functioning in the OPERATION mode. A stable high current in the range of 28.0-40.0 amperes throughout the entire OPERATION mode means that the Device is working properly.

A decrease in the current strength on this ammeter in the OPERATION mode **by more than 2 times** relative to the initial values (provided that the Device is operating on the same working solution) indicates that it is necessary to flush the Device (see the DEVICE MAINTENANCE section).

**Important!** We kindly ask you to read the enclosed instruction manual before using this ammeter.

## 11. DEVICE MAINTENANCE

To maintain the efficient operation of the EMERALD STEL 50, it is necessary to flush the Device periodically with a solution of citric acid. With timely and simple maintenance, your Device will function properly for many years without the need to replace the electrochemical modules.

Maintenance of the EMERALD Device consists of flushing the entire hydraulic system and the external auxiliary hydraulic components (including flow regulators and shutoff valves) with a citric acid solution to remove accumulated contaminants. The frequency of the EMERALD Device maintenance procedure depends on the quality of the water and salt used to prepare the working solution, as well as on the mode of operation.

**FLUSHING** mode consists of two main stages:

1) **CIRCULATION** of the flushing solution inside the Device. At this stage, the built-in pump is turned on and the process of pumping and circulating the solution through all hydraulic elements of the Device begins.

2) **WASHING-OUT** with plain cold tap water. At this stage, the Device is connected according to one of the two schemes of the WASHING-OUT stage (Fig. 16 or Fig. 17) to wash out dissolved contaminants and residues of citric acid flushing solution from the Device with water.

To more accurately determine the degree of contamination of the Device and the need to flush it, one should focus on the following factors:

- ◆ Reduction of the current strength on the DC ammeter with clamps (12, Fig. 6) in the OPERATION mode **by more than 2 times** relative to the initial values (provided that the Device is operating on the same working solution);
- ◆ Reduction of the flow rate from the outlet tubes of Anolyte, Catholyte or Drainage (7,8, 9, Fig. 6) **by more than 2 times** relative to the initial values;
- ◆ The working solution temperature indicator (13, Fig. 6) in the OPERATION mode rises rapidly and exceeds **50 °C**;
- ◆ Deterioration of parameters of the ready Anolyte ANK SUPER solution relative to the required values (see Table 2).

If the user notices at least one of the above items, then the Device needs to be serviced.

## Preparing EMERALD Device for FLUSHING mode

For a more efficient FLUSHING mode, it is necessary to first remove the remaining working solution or water from the Device so that the citric acid flushing solution does not mix with the remaining cold water liquid inside the hydraulic elements. To do this, in accordance with the connection diagram in Fig. 6:

- ◆ Switch the general power supply button (4) on the side of the casing to the on position «I» to supply network power;
- ◆ Disconnect the inlet tube (6) from the tank with the working solution;
- ◆ Press the pump on/off button (10) once to turn on the circulation pump and remove the residual working solution/water from the hydraulic elements of the Device (the electrochemical modules will NOT turn on in this mode);
- ◆ Switch off the pump after 1 minute by pressing the pump on/off button (10).

Important! Do not attempt to remove residual liquid from the Device completely, as small amounts of liquid will still continue to flow out of the Device when the pump is on. The main task is to remove the bulk of the liquid from the Device, so it is not recommended to use the switched on pump in this mode for more than 1 minute!

## Preparing the citric acid flushing solution

To carry out the EMERALD Device flushing procedure, it is necessary to prepare one and a half liters of citric acid flushing solution in the EMERALD STEL flushing tank (4, Table. 4). The citric acid flushing solution is prepared at the rate of 150 grams of citric acid per one and a half liters of water. It is recommended to dilute citric acid crystals in hot water, and flush with a solution with a temperature of 70 ° C (not higher!).



Important! It is not allowed to flush the EMERALD Device with a citric acid solution with a temperature of more than 70°C. This can damage the hydraulic elements of the system! In this case, warranty claims will be rejected. Use temperature gauges to accurately determine the temperature of the flushing solution.

All work related to the preparation of the flushing solution, as well as the entire flushing process of the Device, should be carried out using personal protective equipment for the skin and eyes!

## EMERALD Device connection diagram at the CIRCULATION stage

The connection of the EMERALD Device in the FLUSHING mode at the CIRCULATION stage is made in accordance with the diagram in fig. 15.

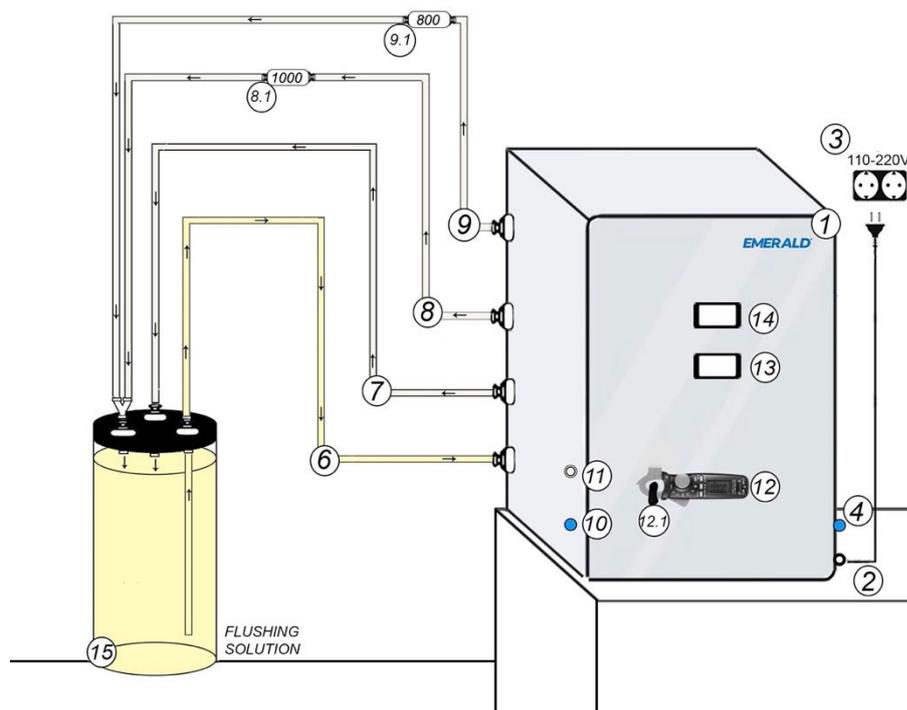


Fig. 15. EMERALD Device connection diagram at the CIRCULATION stage.

1. EMERALD STEL 50 Device;
2. Plug for connecting the network cable to the Device;
3. Network cable with a plug for connection to the electrical network;
4. General power supply button;
6. INLET tube and fittings for supplying flushing solution to the Device;
7. ANOLYTE tube and fittings for the outlet of the flushing solution from the anode chambers;
8. CATHOLYTE tube and fittings for flushing solution outlet from the cathode chambers;
- 8.1. Catholyte flow regulator with a nominal value of 1000;
9. DRAINAGE tube and fittings for flushing solution outlet from the drain line (the drain outlet tube is disconnected from the drain clamp at the CIRCULATION stage and connected to the flushing tank);
- 9.1. Drain flow regulator with a nominal value of 800;
10. PUMP ON/OFF button - used to circulate the flushing solution;
11. REACTOR ON/OFF button - must be OFF throughout the entire FLUSHING mode;
12. DC ammeter with clamps and digital display (not used);
- 12.1. Power electric cables going to the anodes of electrochemical modules (not used);
13. Thermometer (to determine the flushing solution temperature);
14. Ammeter and voltmeter (not used);
15. EMERALD STEL flushing tank (included in the delivery set - 4, Table 4).

## CIRCULATION Stage

To start the CIRCULATION stage, the EMERALD Device must be connected according to the diagram in fig. 15. All hydraulic and electrical connections must be securely fixed. The flushing device must be placed on a level and stable surface (e.g. on a worktop next to a sink, on the floor or on the bottom shelf of the sink cabinet).

To carry out the CIRCULATION stage, you need (Fig. 15):

- ◆ Move the general power supply button (4) to the on position «I»;
- ◆ Press the pumps on/off button (10) once to start the first circulation of the flushing solution;
- ◆ Flush the Device in this mode **for 10 minutes**;
- ◆ Press the pumps on/off button (10) once to turn off the first flushing solution circulation cycle;
- ◆ Unscrew the top cover of the flushing tank (15) and discharge the rest of the cooled flushing solution into the drain. Pour a new flushing solution into the flushing container in a volume of 1.5 liters. Screw in the top cap of the flushing tank until it stops (alternatively, in order to save flushing solution, it is allowed to simply heat the existing solution to 70 ° C and reuse it for the second circulation cycle);
- ◆ Press the pumps on/off button (10) once to start the second flushing solution circulation cycle;
- ◆ Flush the Device in this mode **for 10 minutes**;
- ◆ Press the pumps on/off button (10) once to turn off the second flushing solution circulation cycle;
- ◆ Unscrew the top cover of the flushing tank (15) and discharge the rest of the flushing solution into the drain;
- ◆ Disconnect the tubes from the flushing tank.

### Some features of the CIRCULATION stage

- ◆ If any failure occurs during the FLUSHING mode, you need to repeat this procedure from beginning to end before using the Device in OPERATION mode;
- ◆ To increase the useful life of the EMERALD STEL flushing tank and connecting tubes, after the FLUSHING mode, we recommend thoroughly washing them with warm tap water, drying and removing these elements before the next flushing;
- ◆ Please note that when connecting/disconnecting the Device in FLUSHING modes, a small amount of water or flushing solution may leak from the tubes and fittings.

**Important!** After completion of the CIRCULATION stage, it is necessary to carry out the WASHING-OUT stage to wash out the dissolved contaminants and residues of the flushing citric acid solution from the Device with cold water. The WASHING-OUT stage can be carried out according to any of the two schemes shown in Fig. 16 and 17.

## Connection diagram for EMERALD Device on WASHING-OUT stage from the tank

In this connection diagram, the washing out of contaminants and residual flushing solution from the Device is carried out with cold water collected in a container. For this stage, any plastic container with a volume of 50 liters or more can be used, including the same tank which is used in the OPERATION mode to prepare Anolyte ANK SUPER.

The connection of the EMERALD Device in the FLUSHING mode at the WASHING-OUT stage from the tank is made in accordance with the diagram in Fig. 16.

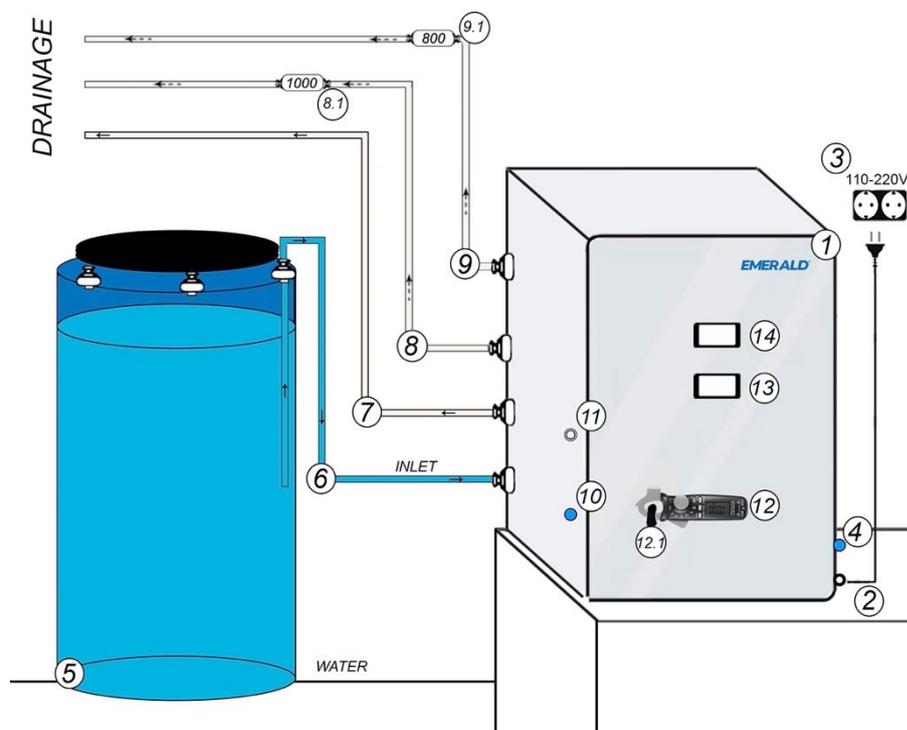


Fig. 16. EMERALD Device connection diagram on WASHING-OUT from the tank stage.

1. EMERALD STEL 50 Device;
2. Plug for connecting the network cable to the Device;
3. Network cable with a plug for connection to the electrical network;
4. General power supply button;
5. Circulation tank filled with cold water (at least 25 liters);
6. INLET tube and fittings for supplying water to the Device;
7. ANOLYTE tube and fittings for water outlet from the anode chambers;
8. CATHOLYTE tube and fittings for water outlet from the cathode chambers;
- 8.1. Catholyte flow regulator with a nominal value of 1000;
9. DRAINAGE tube and fittings for water outlet to the drain;
- 9.1. Drain flow regulator with a nominal value of 800;
10. PUMP ON/OFF button – used for pumping the water and washing out of the flushing solution from the Device;
11. REACTOR ON/OFF button – must be turned OFF during the entire FLUSHING mode;
12. DC ammeter with clamps and digital display (not used);
- 12.1. Power electrical cables going to the anodes of electrochemical modules (not used);
13. Thermometer (to determine the temperature of flowing water);
14. Ammeter and voltmeter (not used).

### Connection diagram for EMERALD Device on WASHING-OUT stage from the main

In this connection diagram, the washing out of contaminants and residues of the flushing solution from the Device is carried out with cold tap water supplied from the main. To do this, the Device is connected to the pressure line of the cold water supply using a t-bend with a ball valve included in the delivery set (5, Tab. 4).

The connection of the EMERALD Device in the FLUSHING mode at the WASHING-OUT stage from the main is made in accordance with the diagram in Fig. 17.

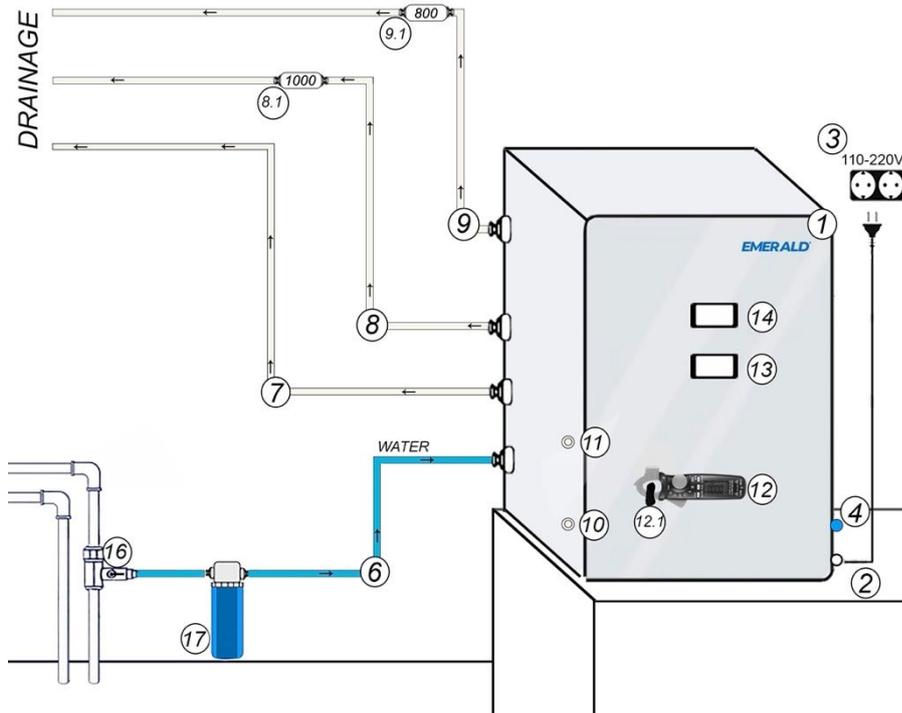


Fig. 17. EMERALD Device connection diagram at the WASHING-OUT stage from the main.

1. EMERALD STEL 50 Device;
2. Plug for connecting the network cable to the Device;
3. Network cable with a plug for connection to the electrical network;
4. General power supply button;
6. INLET tube and fittings for supplying water to the Device;
7. ANOLYTE tube and fittings for water outlet from the anode chambers;
8. CATHOLYTE tube and fittings for water outlet from the cathode chambers;
- 8.1. Catholyte flow regulator with a nominal value of 1000;
9. DRAINAGE tube and fittings for water outlet to the drain;
- 9.1. Drain flow regulator with a nominal value of 800;
10. PUMP ON/OFF button (not used);
11. REACTOR ON/OFF button – must be turned OFF during the entire FLUSHING mode;
12. DC ammeter with clamps and digital display (not used);
- 12.1. Power electrical cables going to the anodes of electrochemical modules (not used);
13. Thermometer (to determine the temperature of flowing water);
14. Ammeter and voltmeter (not used);
16. T-bend with a ball valve for supplying cold water to the Device (5, Table 4);
17. Mechanical water pre-treatment filter (6, Table 4).

## WASHING-OUT Stage

After completion of the CIRCULATION stage, it is mandatory to carry out the WASHING-OUT stage in order to wash out the dissolved contaminants and residual citric acid wash solution from the Device with cold water. The WASHING-OUT stage can be carried out according to any of the two schemes shown in Fig. 16 and 17.

### WASHING-OUT from the tank stage

In order to flush the Device with cold water from the tank, it is necessary, in accordance with the diagram in Fig. 16:

- ◆ Draw at least 25 liters of cold water into the tank;
- ◆ Turn the general power supply button (4) to the on position «I»;
- ◆ Press the pumps on/off button (10) once to start pumping water and wash out the flushing solution from the Device;
- ◆ Wash out the Device in this mode **for 10 minutes**;
- ◆ Press the pumps on/off button (10) once to turn off the pump.

This completes the entire FLUSHING mode! The Device is ready for use again in the normal OPERATION mode!

### WASHING-OUT stage from the main

To flush the Device with cold tap water, follow the diagram in Fig. 17:

- ◆ Open the ball valve on the t-bend (16) so that water starts flowing into the Device;
- ◆ Wash the Device out in this mode **for 10 minutes**;
- ◆ Close the ball valve on the t-bend (16) to complete this stage.

This completes the entire FLUSHING mode! The Device is ready for use again in the normal OPERATION mode!

### Some features of the WASHING-OUT stage

- ◆ Cold water used for the WASHING-OUT stage must comply with SanPiN 2.1.4.1074-01! Note that the total hardness of water should be no more than 2.0 mg-eq/l (° W).
- ◆ If the tap water does not meet the requirements of SanPiN 2.1.4.1074-01, as well as if there are visible suspensions, turbidity and rust flakes in the tap water, it is necessary to use a preliminary water treatment system, which you can purchase directly with the Device (see. Table 5), or order separately.
- ◆ Do not use hot tap water for the WASHING-OUT stage as this may damage the Device.

## Maintenance of prefilter and flow regulators

During the maintenance of the Device, it is also necessary to inspect and, if necessary, change the mechanical prefilter in the Slim Line 10" flask and flush Anolyte, Catholyte and Drainage flow regulators.

### Filter replacement (Fig. 18.1)

To replace the filter in the flask it is necessary to (Fig. 11):

- ◆ After making sure that there is no pressure in the cold water supply line, unscrew the upper part of the flask with a wrench (7);
- ◆ Extract the cartridge from the flask (3) and dispose of it in accordance with the laws of the country
- ◆ of residence;
- ◆ Insert a new filter into the flask;
- ◆ Using a wrench (7), screw both parts of the flask tightly together;
- ◆ Make sure that there are no leaks when supplying water.



Fig. 18.1. Slim Line 10" flask with connection fittings and mechanical polypropylene filter.

### Flushing of the flow regulators (Fig. 18.2)

Anolyte, Catholyte and Drainage flow regulators, as well as ball valves (if used), also require regular inspection and maintenance, since their inlets and outlets can become clogged over time (mainly with hardness salts) and completely block the outlets from the Device and Anolyte, Catholyte and/or Drainage flows, which, in turn, will lead to problems in the normal operating conditions of the Device and, with the pump turned on, will create excessive pressure in the hydraulic system, which may lead to the failure of the Device. In this case, warranty claims will be rejected.



Fig. 18.2. Flow regulator (left) and ball valve (right), general view.

To flush flow regulators and ball valves:

- ◆ Soak them **for 20 minutes** in a citric acid flushing solution. The flushing solution in this case is prepared from a proportion of 50 grams of citric acid per 500 ml of water. It is recommended to dilute citric acid crystals in hot water, and carry out the soaking in a solution with a temperature of 60-70 ° C (not higher!);
- ◆ After soaking, wash them thoroughly under running water for 2 minutes to remove dissolved mud and residual flushing solution;

## 12. TROUBLESHOOTING GUIDE

**Table 11. Troubleshooting guide**

Problem	Probable Cause	Remedy
<p>I. The Device does not turn on.</p> <p>LED and electronic display do not light up.</p>	<p>1. Hydraulic and electrical connections of the Device are connected incorrectly.</p> <p>2. No electrical contact/network power supply</p>	<p>1. Connect the hydraulic and electrical connections according to the DEVICE CONNECTING section.</p> <p>2. Check the presence of electrical contact / power supply in the network.</p>
<p>II. Failure to increase flow rate.</p> <p>The water flow rate in the Device is below normal.</p>	<p>1. Hardness deposits have formed in the Device hydraulic system.</p> <p>2. The filter element of the mud filter is clogged;</p> <p>3. The outgoing Anolyte / Catholyte / Drainage flow regulators are clogged</p>	<p>1. Flush the Device with citric acid solution (see DEVICE MAINTENANCE section).</p> <p>2. Flush the mud filter (see Maintenance of the mud filter and flow regulators)</p> <p>3. Flush the flow regulators (see Maintenance of the mud filter and flow regulators).</p>
<p>III. The pumps do not pump working or flushing solutions into the Device.</p>	<p>1. Hydraulic connections are connected incorrectly.</p> <p>2. Air pockets have formed in the hydraulic elements of the Device, preventing the pump from pumping liquid.</p>	<p>1. Make sure that the connecting tubes run freely along the radii without any kinks.</p> <p>2. Flush the Device with cold tap water using a t-bend with a ball valve to eliminate air pockets (see Fig. 17).</p>
<p>IV. In OPERATION</p> <p>In mode, the current value on the ammeter becomes unstable or drops to zero.</p> <p>In OPERATION mode, outlet from the Catholyte or Catholyte tubes is interrupted</p>	<p>1. During the Device operation, there is an abundant release of gases in the electrochemical modules: hydrogen at the cathodes and oxygen at the anodes. With manual adjustment of the outlet flows, when the outlet shutoff valves of Anolyte and/or Catholyte are tightly closed, there is not enough time for the resulting gases to fully exit the tubes, which leads to excessive gas filling of the chambers of electrochemical modules and, accordingly, to current flows blocking. Therefore, the ammeter readings become either very unstable or drop to 0.</p> <p>Most often, this situation occurs when the Catholyte outlet shutoff valves are tightly closed, since more hydrogen is formed in the cathode chambers than oxygen in the anode chambers.</p>	<p>1. If the Catholyte shutoff valves are closed and/or there is no flow of the working solution through the Catholyte outlet tubes, it is necessary to fully open the Catholyte outlet shutoff valves for about 10-30 seconds in order for the excess amount of hydrogen to come out of the tubes. This process is accompanied by characteristic short pops.</p> <p>After the release of accumulated hydrogen from the cathode tubes, the current on the ammeter should stabilize and return to normal. After that, you can tighten the Catholyte shutoff valves again, but to a lesser extent.</p> <p>If the situation repeats, then you need:</p> <p>1.1. Close Catholyte shutoff valves at the outlet weaker to allow hydrogen to escape from the hydraulic system of the Device;</p> <p>1.2. Reduce the overall mineralization of the working solution in order to reduce the total current strength in electrochemical modules, since the intensity of gas production at the cathode and anode directly depends on the flowing current strength.</p> <p>If the Anolyte or Drainage valves are closed and/or there is no flow of the working solution through the Anolyte or Drainage outlet tubes, you need to repeat the same steps with the Anolyte or Drainage valves.</p>

### 13. WARRANTY

The manufacturer guarantees that the Device complies with the requirements of the technical specifications, subject to observing the conditions of operation, transportation, storage and installation specified in this Operating Manual. The period of free warranty service for EMERALD Device is 2 (two) years from the date of its sale, but not more than 3 (three) years from the date of manufacture. In the absence of the date of sale and the stamp of the trading organization, the period of free warranty service is calculated from the date of production.

The manufacturer warrants that the EMERALD Device (excluding accessory and replacement filters/cartridges) will be free from defects (as defined below) under correct use for a period of 2 years from the date of purchase. A product is considered to be defective if the defect is due to defective material or workmanship, or if such a defect interferes with or impairs the end customer's use of the EMERALD Device.

Warranty obligations are valid only in the presence of correctly completed payment documents and this Operating Manual.

The warranty does not cover:

- ◆ EMERALD Device, which has been used for other purposes or in a way that is contrary to the instructions in this Operating Manual;
- ◆ Any EMERALD Device that has been used incorrectly, crashed, physically damaged, improperly installed or misused, altered, mishandled, or exposed to adverse external factors (including but not limited to, lightning, flood or fire);
- ◆ Any EMERALD Device that has been damaged due to improper repair, modification, alteration or service by anyone other than an authorized warranty and service representative of the manufacturer or an authorized sales partner;
- ◆ Any EMERALD Device found to be defective or degraded due to the use of any non-original spare parts or accessories (including non-original water pre-treatment filters) not intended for use with the EMERALD Device;
- ◆ Any EMERALD Device not installed using the original kit supplied with the pack.

The manufacturer is also released from liability in the following cases: EMERALD Device or its parts have external mechanical damage; EMERALD Device has not been serviced in a timely manner (in accordance with the instructions of this Operating Manual); the filter elements (if they are included in the delivery and the specific Device model) have exhausted their resource, but have not been replaced or serviced in a timely manner; this Operating Manual with the dates of production and/or sale are lost and there are no other ways to determine the service life of the product; when the consumer uses spare parts from other manufacturers that are different from the original components included in the kit; when installing and operating the Device in excess of the limits established by the technical requirements for the operating conditions of the product; under the influence of force majeure circumstances; in other cases provided for by law.

## **Legal disclaimers**

The design of EMERALD Devices is constantly being improved, so the product you have purchased may differ slightly from that described in this Operating Manual while maintaining all the declared performance properties. The manufacturer reserves the right to make changes and improvements to the Device design that do not impair the Device operational properties and the quality of the resulting product;

Although all necessary measures have been taken to verify the text of this Operating Manual, the manufacturer does not guarantee its completeness or the absence of errors.

## **Claims**

EMERALD ECOTECHNOLOGIES LLC is the authorized company to receive all complaints and requests, including warranty claims for the EMERALD Device.

To make claims under this warranty, you can leave a claim on our official website [www.emerald.eco](http://www.emerald.eco), as well as call the company's service department at the unitary number: 8 (495) 928-77-71 or write to [info@emerald.eco](mailto:info@emerald.eco). You are kindly requested to contact us at the above contacts before you decide to send the Device for diagnostics.

In order to make a claim under this warranty, the buyer must notify EMERALD ECOTECHNOLOGIES LLC in writing of the defect found within two (2) months after the defect was discovered, but no later than two (2) months after the end of the relevant warranty period.

Important! The manufacturer and official trading partners are not responsible in case of problems caused by the condition of the water pipes and sanitary fittings of the buyer. The unsatisfactory condition of the supply water pipes, plumbing fittings and the buyer's failure to comply with the conditions necessary for connecting the Device and the conditions set forth in this Operating Manual are grounds for refusing to install the Device, as well as warranty service. In the case of independent connection and service maintenance of Device, the manufacturer and official trading partners are not responsible and do not accept claims in case of problems caused by violation of the rules for connection and maintenance of Device stated in this Operating Manual. The manufacturer and official trading partners are not responsible and do not accept claims if the EMERALD Device was used for other purposes or in a way that contradicts the instructions in this Operating Manual.

## **14. TRANSPORT AND STORAGE**

EMERALD STEL 50 Device does not contain harmful, toxic, flammable or explosive substances. Transportation of the Device can be carried out by any type of land or air transport (except for unheated compartments during the cold season). The product is stored in a packed form, avoiding drying, freezing, direct sunlight, at a distance of at least 1 meter from heating Devices, at an ambient temperature of at least 5 °C and not above 40 °C, away from substances with a strong odor.

EMERALD Device has a warranty period of 3 (three) years from the date of manufacture.

## 15. ACCEPTANCE AND SALE CERTIFICATE

EMERALD STEL 50 Device (shortened name EMERALD) complies with Tech. cond. № 28.99.39-006-19313776-2022 and is recognized as serviceable.

**Factory number** \_\_\_\_\_  
**Release date** \_\_\_\_\_  
**Quality control tes** \_\_\_\_\_

### MANUFACTURER:

EMERALD ECOTECHNOLOGIES Limited Liability Company (abbreviated name EMERALD ECOTECHNOLOGIES LLC)

600035, Russia, Vladimir city, Kuibysheva street, 26A



EMERALD STEL 50 Device (shortened name EMERALD) is manufactured by EMERALD ECOTECHNOLOGIES LLC. The company EMERALD ECOTECHNOLOGIES LLC has the exclusive rights to manufacture EMERALD Devices, as well as to carry out their service and warranty maintenance. The company EMERALD ECOTECHNOLOGIES LLC has the exclusive right to transfer to its official trading partners all the necessary powers for the sale of EMERALD Devices, as well as for their service and warranty maintenance.

### For service and warranty issues, please contact:

EMERALD ECOTECHNOLOGIES Limited Liability Company

600035, Russia, Vladimir city, Kuibysheva street, 26A

Tel.: 8 (495) 928-77-71; E-mail: info@emerald.eco;

Website: www.emerald.eco

### WARRANTY CARD

Date of sale \_\_\_\_\_

Shop stamp \_\_\_\_\_

L.S.

Electronic version of this document is available by the link below:



## APPENDIX №. 1. ACTIVE CHLORINE CONCENTRATION MEASUREMENT

The methods of determination the content of active chlorine compounds in Anolyte ANK SUPER are as follows:

### 1. Express method using test strips

The express method consists in determining the mass fraction of active chlorine compounds using indicator strips. The test strip is immersed in a container with the measured Anolyte solution for about 5 seconds and immediately removed. Then, jerking hand, shake off the remnants of the solution from the test strip and hold it horizontally for about 60 seconds with the indicator pad up, then compare the color of the test strip with the color indicator scale on the package.

For detailed instructions turn to the manufacturer.

#### Sample test strips:

- ◆ VINAR DESIKONT NEUTRAL ANOLYTE test strips for active chlorine concentration measurement in the range from 0 to 800 mg/l (left, Fig. 19);
- ◆ HACH AquaChek test strips for active chlorine concentration measurement in the range from 0 to 600 mg/l (right, Fig. 19).



Fig. 19. EMERALD Device connection diagram at the WASHING-OUT stage from the main.

## 2. Titration method

Example 1: Titration according to GOST 18190-72 “Drinking water. Methods for determination of residual active chlorine»

Example 2: Hach Titrimetric Method for the Determination of Total Chlorine in Solutions

### Reagents:

Sodium Thiosulfate standard solutions 0.113 N cat. 22673-01 (sodium thiosulfate, standard solution);

Potassium iodide reagent cat. 1077-99 (potassium iodide);

Dissolved oxygen 3 powder pillows cat. 987-99 (buffer pH=4);

Starch indicator solution cat. 349-32 (starch solution as indicator);

Distilled water.

### Equipment:

Titration;

Conical flask, 250 cm<sup>3</sup>;

Graduated cylinder, 25 cm<sup>3</sup>;

Glass pipette, 10 cm<sup>3</sup>.

To determine the content of total chlorine in Anolyte ANK SUPER solution, you can use the direct titration method. Depending on the expected concentration of chlorine in the sample, select the sample volume:

25 cm<sup>3</sup> (20-80 mg/l), 10 cm<sup>3</sup> (50-200 mg/l), 5 cm<sup>3</sup> (100-400 mg/l) and 2 cm<sup>3</sup> (250-1000 mg/l).

Add the measured volume of the test solution to the flask and bring the volume to 50 ml with distilled water.

Add buffer (solution pH 4 or lower) and iodine indicator to the flask, mix thoroughly. Titrate with sodium thiosulfate solution. When the solution becomes pale yellow, add one pipette of the starch solution (the solution will turn dark blue). Continue titration until the color disappears.

Multiply the value of the volume of sodium thiosulfate used by the “correction factor” corresponding to the volume of the sample.

Titration conditions depending on the total chlorine content

Total chlorine content, mg/l	Sample volume, ml	Sodium thiosulfate concentration	Correction factor
20-80	25	0.113 N	0.2
50-200	10	0.113 N	0.5
100-400	5	0.113 N	1
250-1000	2	0.113 N	2.5

See manufacturer's detailed instructions.

### 3. Colorimeter HI 96771 for quantitative analysis of free chlorine in solutions, 0-500 mg/l

For low free chlorine range use HI93701-01 reagents and for high chlorine range use HI95771-01 reagents. The HI96771 is packed with many advanced features, including the exclusive CAL Check™ feature used for health checks and instrument calibration.

The HI96771 portable photometer is designed to measure chlorine over a very wide range. Most chlorine photometers are limited to very low measurable chlorine concentrations. To measure chlorine concentrations that exceed the measurement range, dilution of the samples is necessary.

The HI96771 has unique chemistries designed to measure samples up to 500 mg/L (ppm) chlorine without the need for sample dilution. This portable photometer is equipped with a modern optical system; The combination of a special tungsten lamp, a narrow bandpass filter and a silicon photodetector ensures consistent photometric measurement accuracy.

The Hanna-exclusive CAL Check™ feature uses NIST-traceable out-of-the-box standards for instrument validation and calibration. A special cuvette locking system ensures that the cuvette is inserted into the measuring cell in the same position every time, ensuring the same path length of the light beam.

See manufacturer's detailed instructions.



Fig. 20. Colorimeter HI 96771 for quantitative analysis of free chlorine in solutions, 0-500 mg/l.

## APPENDIX № 2. CERTIFICATES

### 1. CE CERTIFICATE OF CONFORMITY OF THE EUROPEAN UNION

شهادة – 증명서 – 證明書 – Сертификат – Certificat – 証明書

Form QAT\_10-MOS, version 00, effective since March 25th, 2020



## Certificate of Compliance

No. 0D201203.EEW054

**Certificate's Holder:** EMERALD ECOTECHNOLOGIES, LLC.  
600026, Russia, Vladimir city, Kuibysheva street, 26A

**Certification ECM Mark:** 

**Product:** Devices for Purification and Electrochemical Treatment of Water and Aqueous Solutions

**Brand:** EMERALD

**Model(s):** PRO, HOME, OFFICE, COTTAGE, SPA, STEL, VENDING, ECO, BIO, AQUA

**Verification to:** Standard: EN 60335-1:2012/A13:2017, EN 55014-1:2017, EN 55014-2:2015, EN 61000-3-2:2014, EN 61000-3-3:2013

related to CE Directive(s):  
2014/35/EU (Low Voltage)  
2014/30/EU (Electromagnetic Compatibility)

**Remark:** This document has been issued on a voluntary basis and upon request of the manufacturer. It is our opinion that the technical documentation received from the manufacturer is satisfactory for the requirements of the ECM Certification Mark. The conformity mark above can be affixed on the products accordingly to the ECM regulation about its release and its use.

**Additional information need clarification about the Marking:**  
The manufacturer is responsible for the CE Marking process, and if necessary, must refer to a Notified Body. This document has been issued on the basis of the regulation on ECM Voluntary Mark for the certification all products. RG01\_ECM rev.3 available at: [www.entecerma.it](http://www.entecerma.it)

**Issuance date:** 03 December 2020  
**Expiry date:** 02 December 2025

Reviewer  
Technical expert  
Amanda Payne



Approver  
ECM Service Director  
Luca Badonni



**Ente Certificazione Macchine Srl**  
Via Col' Bella, 243 – Loc. Castello di Semovalle – 40053 Valsamoggia (BO) – ITALY  
☎ +39 051 6705141 ☎ +39 051 6705156 ✉ info@entecerma.it 🌐 www.entecerma.it

### 2. RoHS EUROPEAN UNION DECLARATION OF CONFORMITY



## EC Declaration of Conformity

No: DoC.047.2020 Dated «03» December 2020

**RoHS Directive (2011/65/EU)**

of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (recast).

**Manufacturer:** EMERALD ECOTECHNOLOGIES LLC

**Legal address:** 600026, Russia, Vladimir city, Kuibysheva street, 26A

**Product:** Devices for purification and electrochemical treatment of water and aqueous solutions

**Brand:** EMERALD

**Type/Model:** PRO, HOME, OFFICE, COTTAGE, SPA, STEL, VENDING, ECO, BIO, AQUA

Pb, Hg, Cd, Cr (VI), PBBs and PBDEs could not be detected over the limited by the European Directive 2011/65/EU (recast).

This is to certify that, on the basis of the tests, the above described object of the declaration corresponds to the "Directive" 2011/65 / EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (recast). It is possible to use RoHS marking demonstrate the compliance with protecting environment.

Signed for and on behalf of the manufacturer by

**Authorized representative:** Business Mission GmbH

**Address:** Loccumer Straße 55, 30519 Hannover, Germany

**Name and function:** Director Julia Tsybulevska

Signature / Stamp:



**BUSINESS MISSION**

Business Mission GmbH

Loccumer Str. 55, 30519 Hannover

Ammonstr. 27b, 30671 Hannover

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☎ +49 51 87467399

RoHS

### 3. EAC DECLARATION OF CONFORMITY OF THE EAEU CUSTOMS UNION



ЕВРАЗИЙСКИЙ ЭКОНОМИЧЕСКИЙ СОЮЗ  
ДЕКЛАРАЦИЯ О СООТВЕТСТВИИ



Заявитель ОБЩЕСТВО С ОГРАНИЧЕННОЙ ОТВЕТСТВЕННОСТЬЮ "ЭМЕРАЛЬД  
ЭКОТЕХНОЛОГИИ"

Место нахождения (адрес юридического лица) и адрес места осуществления деятельности: 600035,  
Россия, область Владимирская, город Владимир, улица Куйбышева, Дом 26а, Этаж 3, Пом. 327

Основной государственный регистрационный номер 1177746905709.  
Телефон: 8 (495) 928-77-71 Адрес электронной почты: info@emerald.eco

в лице Генерального директора Гнатюка Петра Васильевича

заявляет, что **ОБОРУДОВАНИЕ ХИМИЧЕСКОЕ: УСТАНОВКИ СЕИИ EMERALD PRO ДЛЯ  
ПОЛУЧЕНИЯ ДЕЗИНФИЦИРУЮЩЕГО СРЕДСТВА АНОЛИТ АНК СУПЕР** модель: EMERALD PRO  
05, EMERALD PRO 10, EMERALD PRO 20, EMERALD PRO 40, EMERALD PRO 50, EMERALD PRO  
60, EMERALD PRO 80, EMERALD PRO 100, EMERALD PRO 120, EMERALD PRO 150, EMERALD  
PRO 250, EMERALD PRO 500, торговая марка: EMERALD / ЭМЕРАЛЬД.  
Изготовитель ОБЩЕСТВО С ОГРАНИЧЕННОЙ ОТВЕТСТВЕННОСТЬЮ "ЭМЕРАЛЬД  
ЭКОТЕХНОЛОГИИ"

Место нахождения (адрес юридического лица): 600035, Россия, область Владимирская, город

Владимир, улица Куйбышева, Дом 26а, Этаж 3, Пом. 327

Адрес места осуществления деятельности по изготовлению продукции: 600035, Россия, Владимирская

область, город Владимир, улица Куйбышева, дом 26А, Этаж 3, помещение 327

Код (коды) ТН ВЭД ЕАЭС: 8543300000

Серийный выпуск

соответствует требованиям

Технического регламента Таможенного союза "О безопасности низковольтного оборудования" (ТР ТС  
004/2011)

Технического регламента Таможенного союза "О безопасности машины и оборудования" (ТР ТС  
010/2011)

Технического регламента Таможенного союза "Электромагнитная совместимость технических средств"  
(ТР ТС 020/2011)

Декларация о соответствии принята на основании

Протокола испытаний № 069-03/03-22 от 03.03.2022 года, выданного Испытательной лабораторией

Общества с ограниченной ответственностью "МосСтандарт" (регистрационный номер аттестата

аккредитации РОСС RU.31112.21ПР58)

Схема декларирования соответствия: 1д

Дополнительная информация

ГОСТ 12.2.003-91 "Система стандартов безопасности труда. Оборудование производственное. Общие

требования безопасности", ГОСТ МЭК 60204-1-2007 (ИЕС 60204-1:1997) "Безопасность машин.

Электрооборудование машин и механизмов. Часть 1. Общие требования", ГОСТ 30804.6.2-2013

"Совместимость технических средств электромагнитная. Устойчивость к электромагнитным помехам

технических средств, применяемых в промышленных зонах. Требования и методы испытаний", ГОСТ

30804.6.4-2013 "Совместимость технических средств электромагнитная. Электромагнитные помехи от

технических средств, применяемых в промышленных зонах. Нормы и методы испытаний", Условия

хранения продукции в соответствии с ГОСТ 15150-69 "Машины, приборы и другие технические

изделия. Исполнения для различных климатических районов. Категории, условия эксплуатации,

хранения и транспортирования в части воздействия климатических факторов внешней среды", Условия

хранения конкретного изделия, срок хранения (службы) указываются в прилагаемой к продукции

товаросопроводительной и/или эксплуатационной документации.

Декларация о соответствии действительна с даты регистрации по 03.03.2027 включительно.

Гнатюк Петр Васильевич  
(Ф.И.О. заявителя)

Регистрационный номер декларации о соответствии: ЕАЭС N RU Д-РУ.РА02.В.25426/22

Дата регистрации декларации о соответствии: 05.03.2022



#### 4. HYGIENIC CERTIFICATE, EXPERTS' REPORT FROM RUSSIAN GOVERNMENT OFFICIALS (ROSPOTREBNADZOR)

  
 Федеральная служба  
 по надзору в сфере защиты прав  
 потребителей и безопасности товаров  
 (Роспотребнадзор)  
 Федеральное бюджетное  
 учреждение здравоохранения  
 «Центр гигиены и эпидемиологии  
 в Владимирской области»  
 Толькина ул., д.5, г. Владимир, 600003  
 Тел. факс: (4922) 53-88-28  
 E-mail: vlad@fbs.gov.ru  
 ОГРН 7501834, ОГРНИП 1025301282453,  
 ИНН/КПП 3327819089/332601001  
 Адрес в Едином государственном реестре юридических лиц 76-05/000

**УТВЕРЖДАЮ**  
 Главный врач  
 ФБУЗ «Центр гигиены и эпидемиологии  
 в Владимирской области»,  
 руководитель программы инспекции  
  
 М.В. Бузалов

№ 5712 от 22.11.2018 г.

**ЭКСПЕРТНОЕ ЗАКЛЮЧЕНИЕ № 907**

**1. Наименование продукции:** Оборудование для очистки и электрообработки пресной воды, торговая марка «EMERALD», модели EMERALD HOME, EMERALD OFFICE, EMERALD PRO, EMERALD BUSINESS.

**2. Организация-изготовитель:** Общество с ограниченной ответственностью «ЭМЕРАЛД ЭКОТЕХНОЛОГИИ», 123423, г. Москва, ул. Народного Ополчения, дом 34, этаж 2, помещение 22А.

**3. Палауатель заключения:** Общество с ограниченной ответственностью «ЭМЕРАЛД ЭКОТЕХНОЛОГИИ», 123423, г. Москва, ул. Народного Ополчения, дом 34, этаж 2, помещение 22А.

**4. Представленные материалы:**

- ТУ 28.29.12-001-19313776-2018;
- Сертификат соответствия № ТС RU С-RL-ВЛЗ.В.02970 от 25.09.2018;
- Декларация о соответствии ЕАЭС № RU.Д-ВЛ.00011.0.00712/18 от 26.10.2018;
- Протокол лабораторных исследований Исламкановского лабораторного центра «Центр государственного санитарно-эпидемиологического надзора» Управления администрации Президента Российской Федерации (ФГУБУ «Центр государственного санитарно-эпидемиологического надзора» ФБУЗ «Центр гигиены и эпидемиологии в Владимирской области»), АТТЕСТАТ № РОСС RU.0001.310440 Федеральной службы по аккредитации (Средствами с 26 октября 2013 г. по 26 декабря 2018 г.) № ИОП-П800С-11-18 от 13 ноября 2018 г.;
- Протокол лабораторных исследований Исламкановского лабораторного центра «Независимый институт анализа и сертификации (группа аккредитации № РОСС RU.0001.21115, срок действия до 24.02.2019 г.) № 124 С - 127 С от 02.04.2018 г.

**5. Область применения продукции:** доочистка пресной воды от органических примесей, микроорганизмы и в том числе металлов, снижение окислительно-восстановительного потенциала пресной воды.

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**6. Цель экспертизы:** установление соответствия (несоответствия) продукции требованиям раздела 3 «Требования к материалам, деталям, оборудованию, используемому для водочистки и водоподготовки», раздела 7 «Требования к продукции машиностроения, приборостроения и электротехники» главы II Единых санитарно-эпидемиологических и гигиенических требований к товарам, подлежащим санитарно-эпидемиологическому надзору (контролю), утвержденных решением Комиссии Таможенного союза от 28.05.2010 г. № 299.

**7. Основание проведения санитарно-эпидемиологической экспертизы:** заявление-ходатайство № 1249 от 21.11.2018 г.

**8. Проведение санитарно-эпидемиологической экспертизы поручено:** эксперту, врачу по общей гигиене ОКГ и ГТ ФБУЗ «Центр гигиены и эпидемиологии в Владимирской области» Брылевскому А.А.

**9. Порядок проведения работ:** Санитарно-эпидемиологическая экспертиза проводится на соответствие требованиям раздела 3 «Требования к материалам, деталям, оборудованию, используемому для водочистки и водоподготовки» раздела 7 «Требования к продукции машиностроения, приборостроения и электротехники» главы II Единых санитарно-эпидемиологических и гигиенических требований к товарам, подлежащим санитарно-эпидемиологическому надзору (контролю), утвержденных решением Комиссии Таможенного союза от 28.05.2010 г. № 299 на основании представленных результатов лабораторных исследований продукции, данных декларативно-технической документации изготовителя продукции.

**10. Результаты лабораторных и (или) инструментальных исследований:**

Исследования по 7 разделу:

- Напряженность электрического поля – не более 18 кВ/м;
- Напряженность электрического поля частотой 50 Гц – не более 0,5 кВ/м;
- Надвигая магнитного поля частотой 50 Гц, мГс, не более – 5;
- Эквивалентные уровни шума, дБА – не более 45;
- Выборки общие:
  - Корректированный уровень вибростойкости, дБА – не более 62;
  - Корректированный уровень виброускорения, дБА – не более 20.

Исследования по 3 разделу:

Корпус (ПВХ):

- Исследование водной вытяжки (дистиллированная вода, температура 25°С, время экспозиции 3 суток): Запах, запах – не более 2; Мутность, ЕМФ – не более 2,6; Пеннообразование – отсутствие; стабильной крупнопузырчатой пены, высота мелкопузырчатой пены у стенок цилиндра – не выше 1 мм; Привкус – отсутствие; Цветность, градусы – 20; Наличие осадка – отсутствие; Волнообразный помутнения (рН) в пределах 6 – 9; Величина перманганатной окисляемости, мг/л – не более 5;
- Миграция химических веществ в модельную среду (дистиллированная вода, температура 25°С, время экспозиции 3 суток), мг/л, не более:
  - Формальдегид – 0,05; Спирт метиловый – 3; Спирт этиловый – 0,1; Спирт изобутиловый – 0,15; Ацетальдегид – 0,2; Этанолсигнал – 0,2; Ацетин – 2,2.

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Распределитель (полиэтилен):

- Исследование водной вытяжки (дистиллированная вода, температура 25°С, время экспозиции 3 суток): Запах, запах – не более 2; Мутность, ЕМФ – не более 2,6; Пеннообразование – отсутствие; стабильной крупнопузырчатой пены, высота мелкопузырчатой пены у стенок цилиндра – не выше 1 мм; Привкус – отсутствие; Цветность, градусы – 20; Наличие осадка – отсутствие; Волнообразный помутнения (рН) в пределах 6 – 9; Величина перманганатной окисляемости, мг/л – не более 5;
- Миграция химических веществ в модельную среду (дистиллированная вода, температура 25°С, время экспозиции 3 суток), мг/л, не более:
  - Формальдегид – 0,05; Спирт метиловый – 3; Спирт этиловый – 0,1; Спирт изобутиловый – 0,15; Ацетальдегид – 0,2; Этанолсигнал – 0,2; Ацетин – 2,2.

Противосифон (резина):

- Исследование водной вытяжки (дистиллированная вода, температура 25°С, время экспозиции 3 суток): Запах, запах – не более 2; Мутность, ЕМФ – не более 2,6; Пеннообразование – отсутствие; стабильной крупнопузырчатой пены, высота мелкопузырчатой пены у стенок цилиндра – не выше 1 мм; Привкус – отсутствие; Цветность, градусы – 20; Наличие осадка – отсутствие; Волнообразный помутнения (рН) в пределах 6 – 9; Величина перманганатной окисляемости, мг/л – не более 5;
- Миграция химических веществ в модельную среду (дистиллированная вода, температура 25°С, время экспозиции 3 суток), мг/л, не более:
  - Формальдегид – 0,05; Спирт метиловый – 3; Спирт этиловый – 0,1; Спирт изобутиловый – 0,15; Ацетальдегид – 0,2; Этанолсигнал – 0,2; Ацетин – 2,2.

Мембрана (полиэтилен):

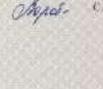
- Исследование водной вытяжки (дистиллированная вода, температура 25°С, время экспозиции 3 суток): Запах, запах – не более 2; Мутность, ЕМФ – не более 2,6; Пеннообразование – отсутствие; стабильной крупнопузырчатой пены, высота мелкопузырчатой пены у стенок цилиндра – не выше 1 мм; Привкус – отсутствие; Цветность, градусы – 20; Наличие осадка – отсутствие; Волнообразный помутнения (рН) в пределах 6 – 9; Величина перманганатной окисляемости, мг/л – не более 5;
- Миграция химических веществ в модельную среду (дистиллированная вода, температура 25°С, время экспозиции 3 суток), мг/л, не более:
  - Формальдегид – 0,05; Спирт метиловый – 3; Спирт этиловый – 0,1; Спирт изобутиловый – 0,15; Ацетальдегид – 0,2; Этанолсигнал – 0,2; Ацетин – 2,2.

**ВЫВОДЫ ЭКСПЕРТА:**

По результатам проведенных испытаний типового представителем образца, экспертами представленной документации, модельная продукция «Оборудование для очистки и электрообработки пресной воды торговой марки «EMERALD», модели EMERALD HOME, EMERALD OFFICE, EMERALD PRO, EMERALD VENDING», соответствует требованиям главы II Единых санитарно-эпидемиологических и гигиенических требований к товарам, подлежащим санитарно-эпидемиологическому надзору (контролю), утвержденным решением Комиссии Таможенного союза от 28.05.2010 г. № 299 (раздел 3 и 7).

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Эксперт, врач по общей гигиене  
 ФБУЗ «Центр гигиены и эпидемиологии  
 в Владимирской области»  
 Технический директор органа инспекции

 А.А. Брылевский  
 С.Е. Воробьева

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