CRYSTAL ZERO NITROGEN GENERATOR

USER MANUAL

214.4.464.120UM

P/N 451-0310, P/N 451-0311, P/N 451-0316

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1 Description and operation

Instructions marked with this box must be followed to prevent personal injury or damage to the equipment. In the same way, information is highlighted that should be given special attention.

Two marking types of parts are used in this and accompanied documents:

XXX-XXXX – Part number or Cat. Number referred to ordering documents;

214.X.XXX.XXX(-XX) or simplified X.XXX.XXX(-XX) – Cross ID referred to internal manufacturer documents.

Both can be used for ordering parts.

The present User manual (hereinafter – the manual) contains the description of Crystal Zero Nitrogen Generator (hereinafter – the Generator), its operation principles and instructions for its proper use and maintenance.

The list of available generator versions is given in its Passport 214.4.464.120PS.

Products of SDO “Chromatec” may contain non-essentially upgraded parts in accordance with the new developments or may be subject to irrelevant non-essential improvements that do not affect the technical specifications and safety requirements not included in this document.

Only the qualified and medically examined personnel with at least 2nd qualification level as per electrical safety code and familiar with safety precautions when operating the generator are allowed to perform installation, inspection and maintenance of the generator.

The list of documents that are referred to in this manual is given in the Appendix A.

1.1 Application

The generator is used to produce nitrogen as per GOST 9293 in a laboratory environment. This nitrogen is further supplied into gas chromatographs and liquid chromatographs, analyzers of total organic carbon and other analytical equipment.

1.2 Operating conditions

Requirements for the room where nitrogen generator work:

- equipped with supply and exhaust ventilation;
- equipped with fire extinguishing appliances;
- equipped with ground loop.

The generator is operated in closed laboratories and other premises where concentration of combustible gases and highly flammable liquids is insufficient to create the explosion and fire hazardous mixture, under the following conditions:

Parameter	Required conditions	Recommended conditions
Temperature	from 10 to 35 °C	from 20 to 27 °C
Relative humidity	no more 80 %	no more 60 %
Atmospheric pressure	from 84 to 107 kPa (from 630 to 800 mm Hg)	

Ambient air impurity content within sanitary norms stated in GOST 12.1.005.

The requirements of GOST 12.1.005 also valid for the air in the operation area at national economic enterprises. The standard sets the general sanitary requirements to the environment indicators and acceptable content of the hazardous substances in the air at operation area.

The generator refers to NF climatic version category 4.2 as per GOST 15150. Ingress protection rating IP2X as per GOST 14254.

The generator is allowed to be used in type II atmosphere (industrial) as per GOST 15150 (item 3.14).

The generator is designed to operate under following power supply conditions: AC mains with voltage of (220^{+22}_{-22}) V, frequency of (50±1) Hz (for P/N 451-0310, 451-0311) or (60±1) Hz (for P/N 451-0316).

1.3 Specifications and delivery set

The generator complies with the requirements of specification TS 28.99.39-032-12908609-2017 and set of documentation 214.4.464.120.

Specification and contents of delivery is given in Passport 214.4.464.120PS.

1.4 Content of precious metals

The generator contains no precious metals.

2 Reliability index

The generator is a restorable item.

The generator's MTBF should be at least 10,000 hours provided that maintenance recommendations given in the respective sections herein are observed.

The failure criterion is the malfunction and unrecoverable non-compliance of one of the parameters (pressure, capability, nitrogen purity) with the preset requirements.

The average generator service life shall be at least 6 years at an average operation rate of 8 hours per day.

The limit state of the generator – failure state when its restoration is economically impractical.

3 Safety Requirements

You can only operate the generator after having familiarized yourself with the safety requirements provided in this section and the below listed documents.

3.1 The generator should comply with the electric safety requirements provided in GOST 12.2.007.0 and have the 1 class of electric shock hazard protection.

3.2 During the installation, supervision and maintenance observe the applicable Electrical Installations Code (PUE), Regulations for Operation of Consumer Electrical Installations (PTEEP), Occupational Safety Rules for Electrical Installations (POTEU).

3.3 Only the qualified and medically examined personnel with at least 3rd qualification level as per Regulations for Operation of Consumer Electrical Installations and Occupational Safety Rules for Electrical Installations and familiar with generator operation principle, installation procedure as well as safety precautions when operating the generator are allowed to perform installation and inspection of the generator.

3.4 The following can be the source of hazard:

- live parts under voltage;
- hot surfaces;
- gas under pressure.

3.5 The temperature of any generator external surface that can be touched should be maximum 60 ^{o}C.

3.6 The generator complies with the requirements of GOST 30804.3.2 for electromagnetic compatibility.

4 Design and operation

The generator is an electrical, fixed equipment with automatic control. Its operation parameters are displayed continuously on the digital indicator.

4.1 Pneumatic circuit diagrams

The figure 1 shows the pneumatic circuit diagram of the generator 214.4.464.120-00 and -03, model 20.400 UHP with the capacity of 20 L/h with internal pump.

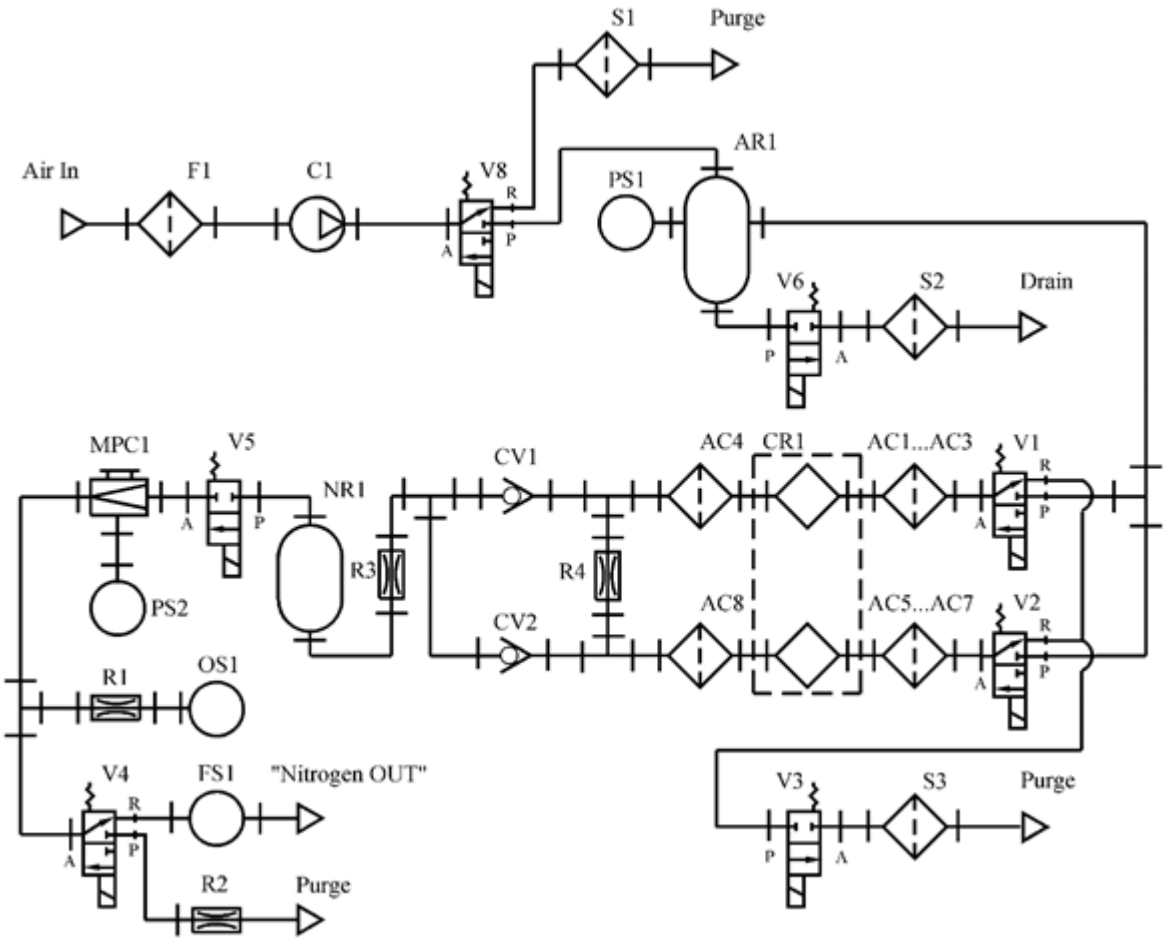


Figure 1 – Crystal Zero Nitrogen Generator, model 20.400 UHP

The figure 2 shows the pneumatic circuit diagram of the generator 214.4.464.120-01, model 30.400E UHP with the capacity of 30 L/h with external pump.

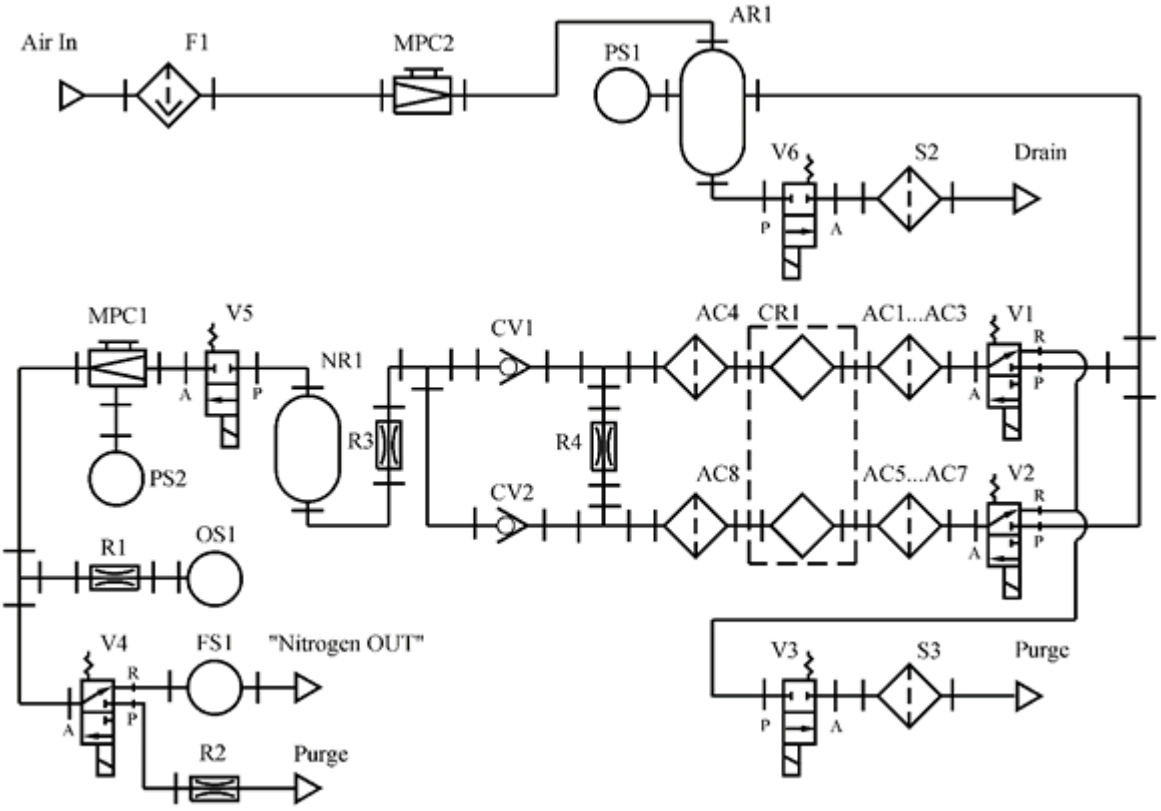


Figure 2 – Crystal Zero Nitrogen Generator, model 30.400E UHP

Designations in figures 2,3:

- AC1-AC8 – adsorption columns;
- AR1 – air receiver;
- CR1 – catalytic reactor;
- CV1, CV2 – non-return valves;
- F1, F2 – mechanical filters;
- FS1 – flow sensor;
- MPC1, MPC2 – pressure regulators;
- NR1 – nitrogen receiver;
- OS1 – oxygen sensor;
- PS1, PS2 – pressure sensors;
- R1-R4 – pneumatic restrictors;
- S1-S3 – silensers;
- V1-V6 – solenoid valves.

4.2 Principle of operation

Generator's principle of operation consists in receiving nitrogen from air by method swing pressure adsorption (further – PSA) on carbon molecular sieves (further – CMS).

Air compresses due to external or internal pump C1 and enters to the air receiver AR1. Further the air enters to the PSA block consisting of eight adsorption columns AC1-AC8, filled with CMS. In the block there is a release of nitrogen from air, to simultaneous purification of nitrogen of oxygen, water and carbon dioxide. Then nitrogen passes through the reactor CR1 for cleaning from methane and carbon monoxide.

Groups of adsorption columns AC1-AC4 and AC5-AC8 work for a generator exit in turn. When the first group works, in the second group there is regeneration of sorbent (removal of oxygen, water and carbon dioxide) by heatless desorption by pressure down and purging by a small part of pure nitrogen. The oxygen, water and carbon dioxide which are collected up in the sorbent are purged in the atmosphere at regeneration.

Electromagnetic valves V1…V6 and non-return valves CV1, CV2 ensure functioning, according to the cyclogram of switching. The compressed pure nitrogen enters to a nitrogen receiver NR1 which volume depends on generator's productivity. From a receiver nitrogen arrives on a generator exit via pressure regulator MPC1.

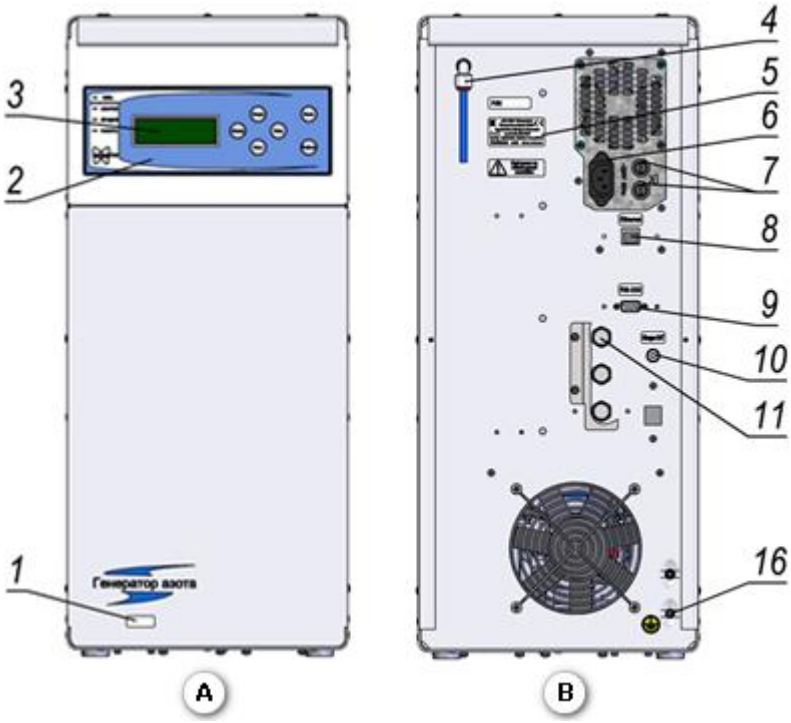
Oxygen sensor OS1 is used for measuring oxygen in nitrogen at the exit of the generator, for measurement flow of nitrogen – flow sensor FS1, for measurement of pressure – pressure sensors PS1 and PS2 are installed.

The OS1 oxygen sensor is an indicator whose task is to display the dynamics of a decrease or increase in the oxygen concentration and approximately estimate its concentration.

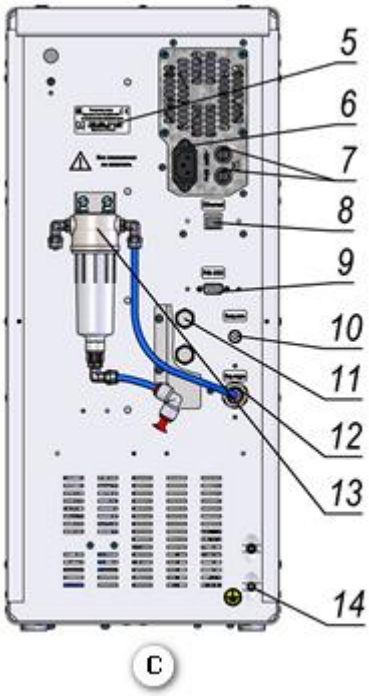
Due to the high error of the OS1 oxygen sensor, it is impossible to evaluate the compliance of the generator with the technical characteristics. Specifications are checked at the factory on special stands and are further provided by the generator operation algorithms.

4.3 Generator overall view

The figures 3, 4 and 5 shows the overall view of the generator.



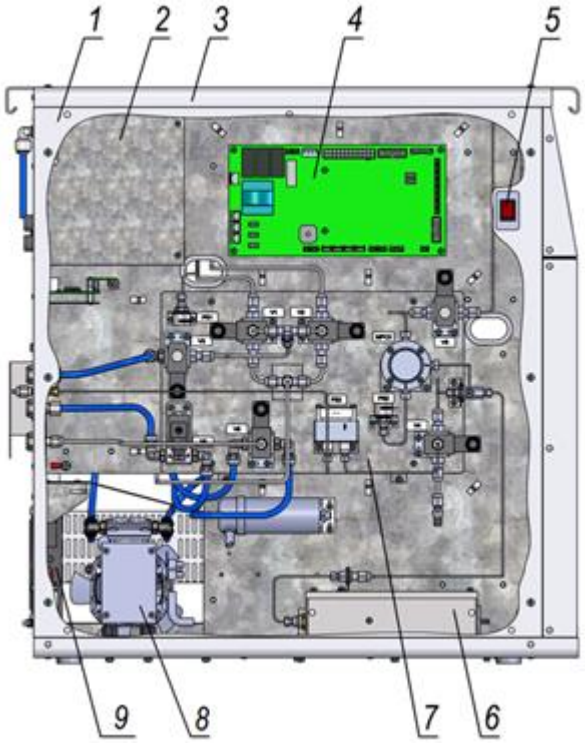
front view (all models), B) rear view, model 20.400 UHP



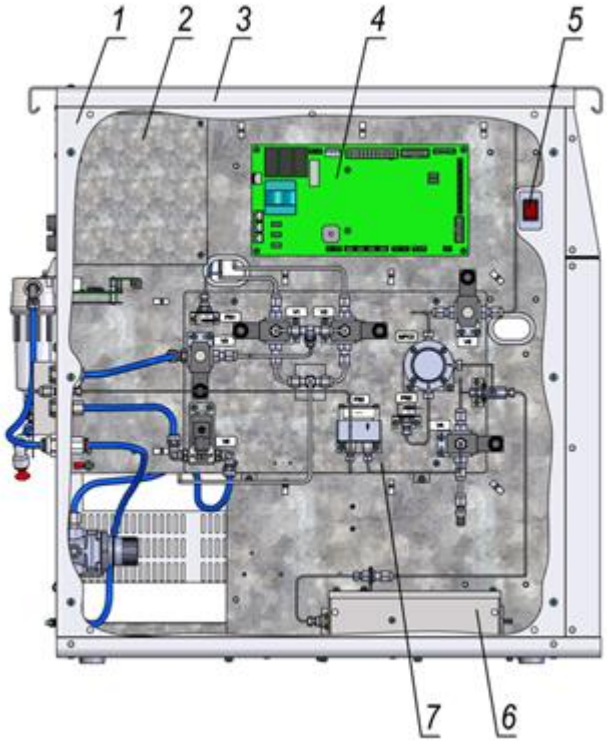
C) rear view, model 30.400E UHP

1 – marking of generator; 2 – keyboard; 3 – digital indicator; 4 – air input; 5 – plate with factory No. of a generator; 6 – power connector; 7 – fuses; 8 – connector Ethernet (optional); 9 – connector RS-232; 10 – nitrogen exit; 11 – silensers; 12 – air input; 13 – coalescence filter; 14 – ground contact.

Figure 3 – Nitrogen generator. Front view and rear view.



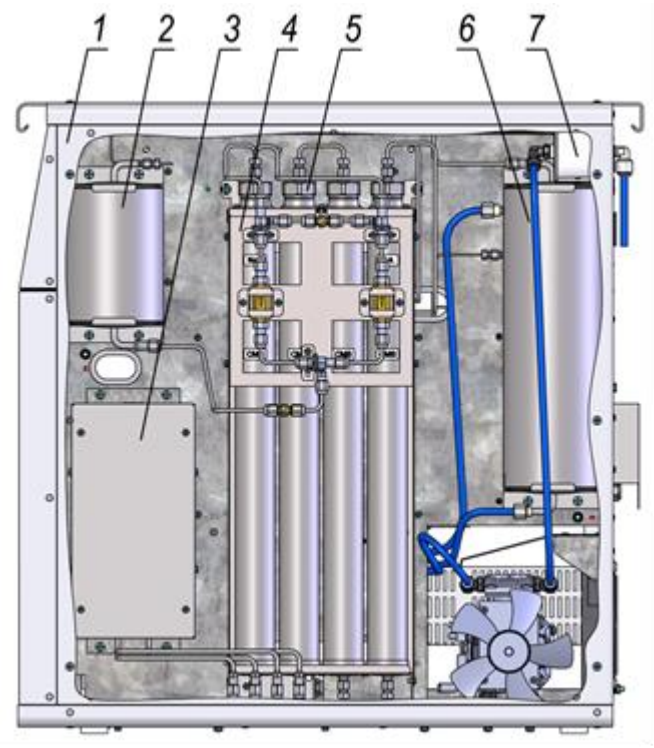
a) model 20.400 UHP



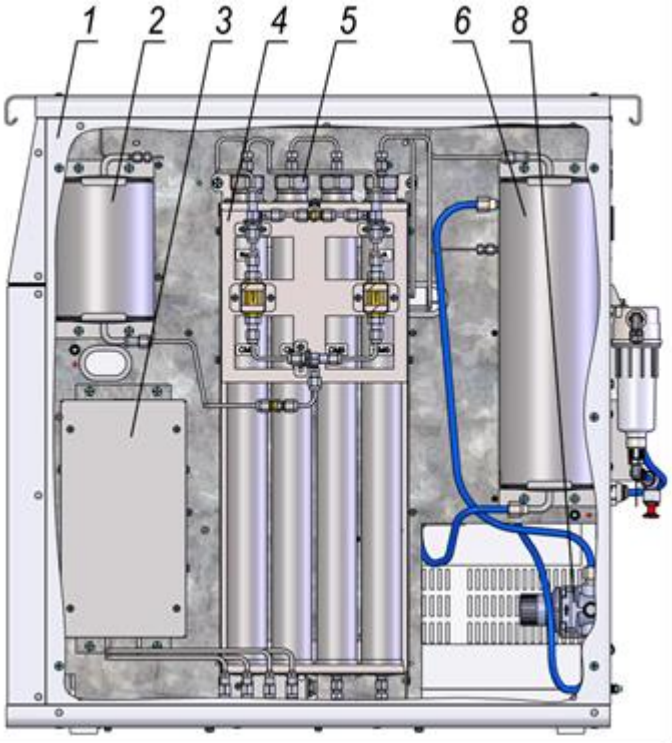
b) model 30.400E UHP

1 – wall; 2 – power supply; 3 – cover; 4 – control board; 5 – power switch; 6 – oxygen sensor; 7 – gas panel; 8 – internal pump; 10 – fan.

Figure 4 – Nitrogen generator. The left-side view with the removed side panel.



a) model 20.400 UHP



b) model 30.400E UHP

1 – wall; 2 – nitrogen receiver; 3 – reactor; 4 – back purge unit; 5 – block of nitrogen adsorption columns; 6 -air receiver; 7 – air filter; 8 – pressure regulator.

Figure 5 – Nitrogen generator. The right-side view with the removed side panel.

4.4 Before starting

Before starting the generator, carefully read this manual.

4.4.1 Generator location

- A free space of minimum 1 m^2 should be prepared for the generator;
- The generator should be mounted in a vertical position on the floor or on the table to allow access to the front and rear walls;
- The minimum distance to the wall should be 50 cm;
- Do not place the generator near heating sources (radiators etc.);
- The distance to the power socket and grounding bus should be maximum 1.5 m.

4.4.2 Requirements to the external pump (30.400E UHP model)

- The external pump should be oil-free;
- Air pressure on an entrance to the generator must be in the range from 600 to 800 kPa;
- Air productivity should exceed 20 L/min.

To make connection of the pump to the generator use the tube 214.6.457.256-04 (a polyurethane tube of 6x1 mm and 2 m long);

Don't forget to drain regularly water from a receiver (frequency is specified in the operation manual of the pump).

4.4.3 Connection to the consumer of nitrogen

- To connect the generator to an input of gas carrier of the chromatograph or other consuming device of nitrogen, use tube 214.8.626.391-06 from the shipping kit.

4.5 Generator operation

4.5.1 Generator TURNING ON

- To connect cables of power supply and additional grounding (214.6.644.056) from a shipping kit of the generator.
- To turn on the generator pressing of the "Power" switch on the left wall.
- The generator will starts working in the "Purge" mode and the level of concentration of oxygen displayed on the screen will go down. Duration of the "Purge" mode depends on duration of previous downtime of the generator in a non-working state and can be from 0.5 to 8 hours.
- At decrease of oxygen concentration to the level 20 ppm the generator will switch in the "Ready" mode. At the same time on the indicator the message "Purge" will change on "Ready" (if the option "Autostart" is switched OFF).
- Press the "Run" button on the keyboard for supply of nitrogen to the consumer.
- If the option "Autostart" is switched ON, then the generator automatically after an exit to the "Run" mode gives nitrogen to the consumer.

The maximum displayed value of concentration of oxygen on the indicator – 999 ppm.

When using a generator as a source of carrier gas for equipment analyzing CO2 at a level of less than 1 ppm, a longer purge is required (5-10 days), especially if downtime lasted for more than 1 month, or a temporary filter installation is necessary to trap CO2 residues.

4.5.2 Generator TURNING OFF

- To pause the generator, for example to re-connect the gas line, press the "Run" button on the keyboard to stop supplying nitrogen to the consuming device. At the same time on the indicator the message "Run" will change on "Ready".
- Before long downtime or storage, it is necessary to drain the water from the receiver through the Service menu – Storage item and turn off the generator by pressing the "Power" switch on its left wall.

4.5.3 Using the menu

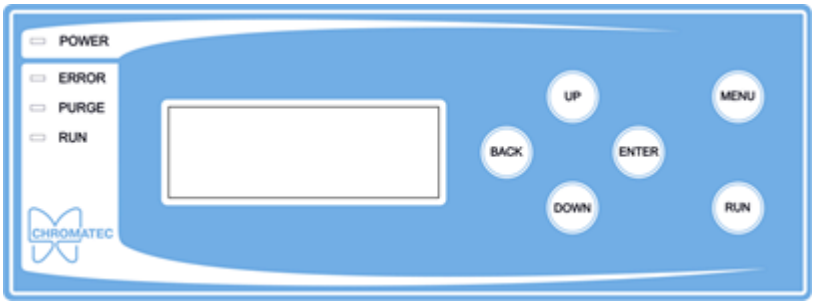


Figure 6 – Front panel. Control buttons and LEDs.



Figure 7 – Indicator. Main screen

The main parameters are displayed on the indicator – nitrogen pressure, nitrogen flow rate, oxygen concentration in nitrogen.

Press the Menu button to open the menu. Press Up and Down buttons to scroll through the menu. Press the Enter button to select the item/parameter. Use Up and Down buttons to edit the item/parameter. Press the Enter button to save the new item/parameter value. Press the Back button to leave the sub-menu or menu. The Run button allows to transfer the generator to the Ready mode.

4.5.4 Menu structure

Menu item	Sub-menu	Parameter	Note
Settings	Units Temp	°C	Switching units of measure of temperature, pressure and flow rate
	Units Press	kPa, bar, psi	
	Units Flow	ml/m	
	Autostart	On/Off	ON and OFF of automatic transition from the Ready mode to the Run mode
	Sound	On/Off	ON an OFF sound
	Master	Yes/No	Collaboration of several generators (optional)
	Slave	1 ... 10	
	Set Date	D:M:Y	Day; Month; Year
	Set Time	H:M	Hour; Minute
	Language	English/Russian	Change Language
Diagnostics	Soft version	xx.xxx.xxx	Firmware version review
	Temp R1	°C	Temperature of CR1 reactor of hydrocarbons removal
	Temp R2	°C	Temperature of CR2 reactor of oxygen removal (optional)
	Temp Pump	°C	Internal pump temperature
	Press Air	kPa	Pressure in the air receiver AR1
	Press N2	kPa	Pressure in the nitrogen receiver NR1

	Flow N2	ml/min	Nitrogen flow rate
	Flow Air	ml/min	Air flow rate (optional)
	Status	Status 0/1	View of status of valves and pump
	Conc O2	ppm	Oxygen concentration
	Sens O2	mV	Oxygen sensor voltage
	U Offset	mV	Oxygen sensor offset voltage
	Date	dd-mm-20yy	Date
	Time	hh-mm	Time
	Coeff Pump	x.xxx	Control of pump
Service	Log	List 1-9	Viewing of the log of internal error messages
	Work Time	h	Time from the date of turning on the generator
	Serv Time	h	Make technical inspection through the specified hours
	Test Mode	On/Off	Test mode for diagnostics*
	Manual Control	Auto/On/Off	Manual control for diagnostics*
	Log Clear	Clear Log?	Cleaning of the log of errors after repair or maintenance
	Clear Serv Time	Service done?	Cleaning of the log of errors after repair or maintenance
	Test	Start Test?	Run autotesting*
	Calibration O2	Calibration O2?	Calibration of the sensor of oxygen
	Storage		Pressure relief before storage

* The items of the “Service” menu: “Test Mode”, “Manual Control” and “Test” are used only for diagnostics of the generator failure and are not intended to be changed by the user.

** The “Service” menu item: “Calibration O2”, is used to set the zero of the oxygen sensors after its replacement and is not intended to be changed by the user.

4.6 Firmware Update

For updating of firmware, you need have cable 214.6.644.431 (not included in the shipping kit, optional).

- Download the archive with the firmware. Unpack the archive.
- Turn off generator.
- Remove left wall of generator.
- Take cable 214.6.644.431 from delivery set.
- Connect one end of cable to USB port of computer, and other end of cable to right down black connector of controller of generator.

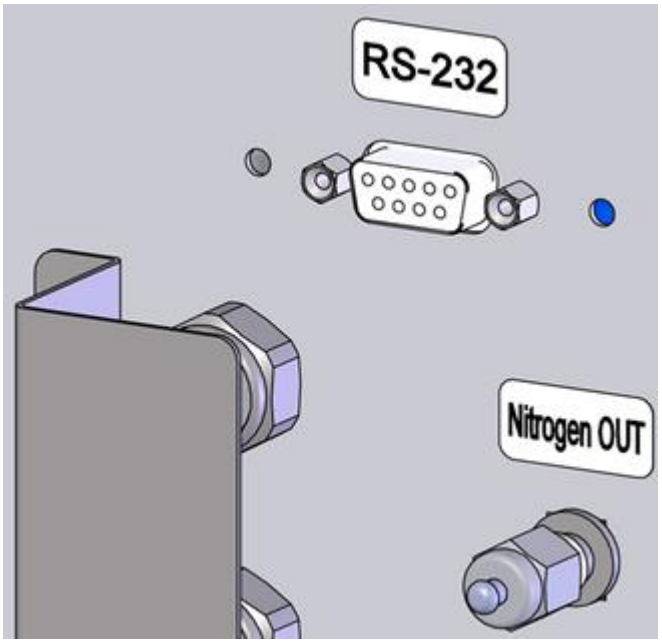


Figure 8 – Connector for programming on the controller

- Install COM port drivers: file **PL2303-Prolific_DriverInstaller_v1200.exe** located in the **loader\eng** folder of the downloaded archive.
- Run **FirmwareLoader** software.

1. Select the COM-port.
2. Open file **Gen_N2.prg** (from **firmware** folder).
3. Press the programming button.

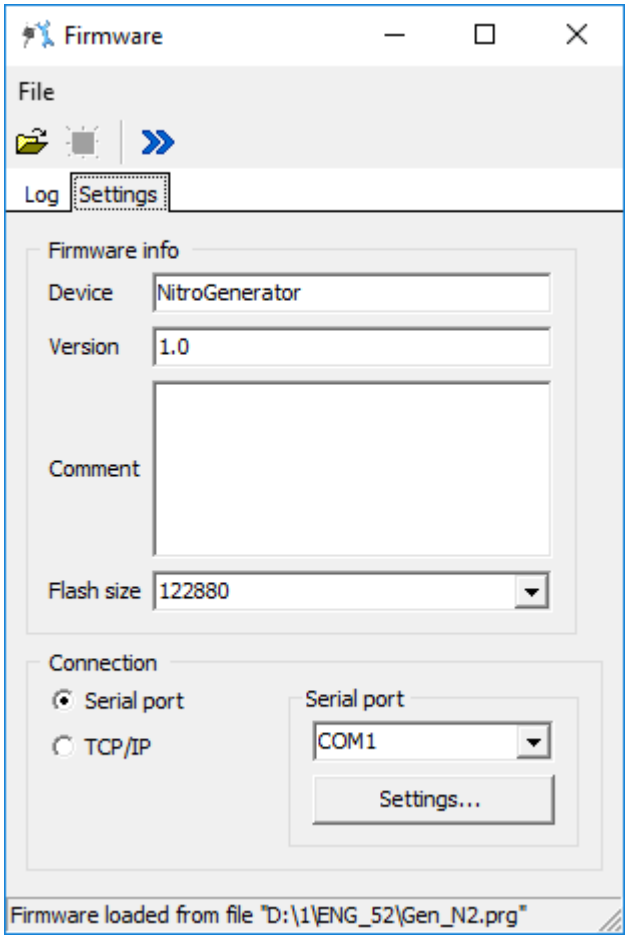


Figure 9 – View of program window

- Turn on generator.
- If COM port selected right, then starting log writing and on generator display flashing yellow LED.
- After programming was end, the generator is starting automatically.
- Turn off generator. Disconnect a cable. Mount left wall.
- It all. Then you should turn on generator. Enter menu you choose a **Diagnostic**, and see new version of firmware.

4.7 Troubleshooting

Possible failures and recommended remedy actions are given in таble below.

Error	Possible cause	Recommended remedy action
The generator does not start after pressing the POWER button	Power cable is not connected	Check the power cable and mains voltage
	No voltage in the power socket	Check the mains voltage
	Fuse failure	Replace the fuses
The generator performance is below the one specified in the Passport	Inlet filter F1 is clogged	Replace the inlet filter
	Leakage in the pump line	Tighten the pipeline seals
	The internal pump requires maintenance	See clause 5.3
Oxygen concentration is below the one specified in the Passport	Low pressure in the pump line	Check the pump pressure
	The temperature in the room is too high.	Lower the temperature in the room.
	Generator leakage – air tightness check is not passed	Contact the manufacturer
Error displayed “Nitrogen flowrate”	Depressurization of the line of the consumer of nitrogen	Tighten the seals of tube 214.8.626.391-06
Error displayed “Air pressure”	Inlet pressure decrease	Leakage in the external pump line or the pump is not connected
Error displayed “Pump”	Internal pump check is not passed.	See clause 5.3 Contact the manufacturer
Error displayed “Nitrogen pressure”	Generator tightness	Contact the manufacturer
	Valve malfunction	Contact the manufacturer
Error displayed “Reactor”	Reactor R1 malfunction	Contact the manufacturer
Error displayed “O2 Sensor”	Oxygen sensor failure	Contact the manufacturer

5 Maintenance

All maintenance activities for the Nitrogen Generator should be performed by suitable personnel using reasonable care and follow the safety measures which specified in this user manual.

Without the need not to disassemble and adjust the blocks and nodes of the generator.

Maintenance is performed in order to keep good performance of the generator and ensure compliance with its specifications during operation.

Basic maintenance operations:

- Replacement of the inlet filter F1 (pos.7, fig. 6) is carried out only when the filter is dirty;
- Periodic discharge of water from the receiver (only for an external pump) at the frequency specified in the pump manual;
- Restoring the efficiency of the internal pump, with a decrease in its pneumatic characteristics (pressure and performance).

Piston seal wear is a common occurrence in oil-free pumps. The operating time before replacement depends on the load on the pump.

Piston seals and, to a lesser extent, valve plates are the only parts of the internal pump that are subject to wear. These parts are easy to change (see point 5.2).

Wear is usually indicated by a sharp decrease in pneumatic and electrical performance:

– The pump must build up pressure (600±10) kPa in the receiver in no more than 3 minutes;

– Pump capacity at pressure (700±10) kPa must be at least 7.2 l/min;

– Current consumption of the pump should be no more than 0.8 A.

5.1 Change inlet filter

- Unscrew 6 screws and to remove the top cover of the generator, using the crosswise screw-driver.
- Unscrew 2 screws of fastening of an arm and to remove the filter 5.884.116, using the crosswise screw-driver.
- Take the new filter 5.884.116 from the shipping kit of the generator.
- Assemble the generator in the reversed order.

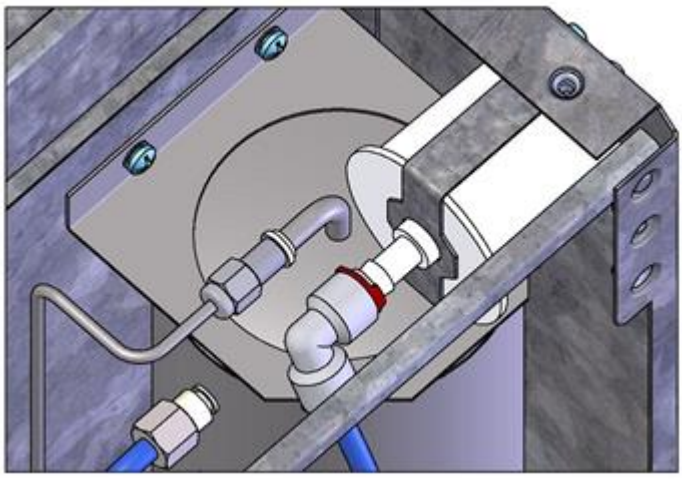


Figure 10 – Inlet filter installed on an arm

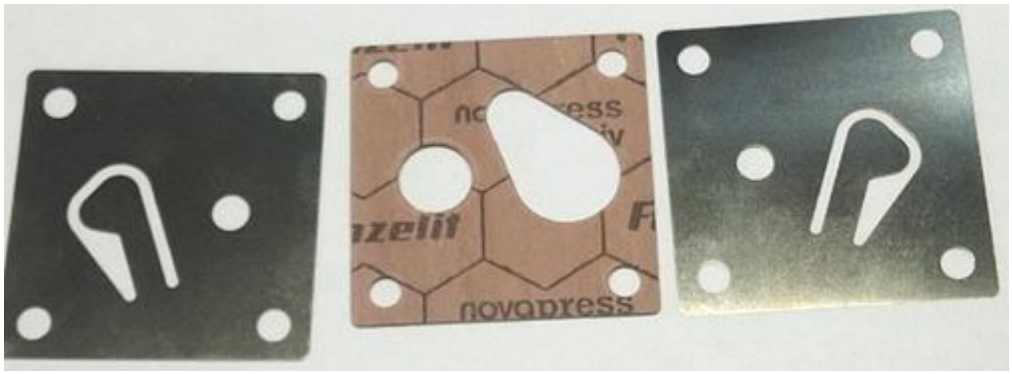
5.2 Pump recovery

5.2.1 Pump service kit

Order number ID 325473. The pump requires two of these kits.

It includes:

- Valve plates (ID 052649) – 2pcs;
- Gasket (ID 304346) – 1 pc;



- Screw (ID 110725) – 1pc;
- O-ring (ID 317559) – 1pc;
- Piston seal (ID 343660) – 1 pc.



5.2.2 Order of disassembly/assembly of the pump head

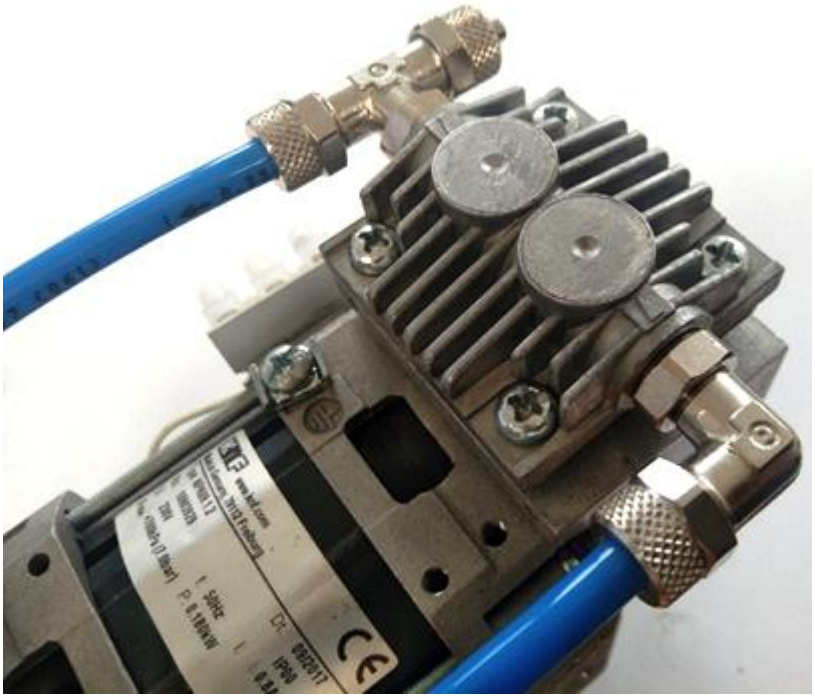
Tool/Materials:

- Phillips's screwdriver PH No. 2;
- Flat screwdriver (blade width 5.5 mm);
- Phillips's screwdriver PH No. 1;
- Marker.

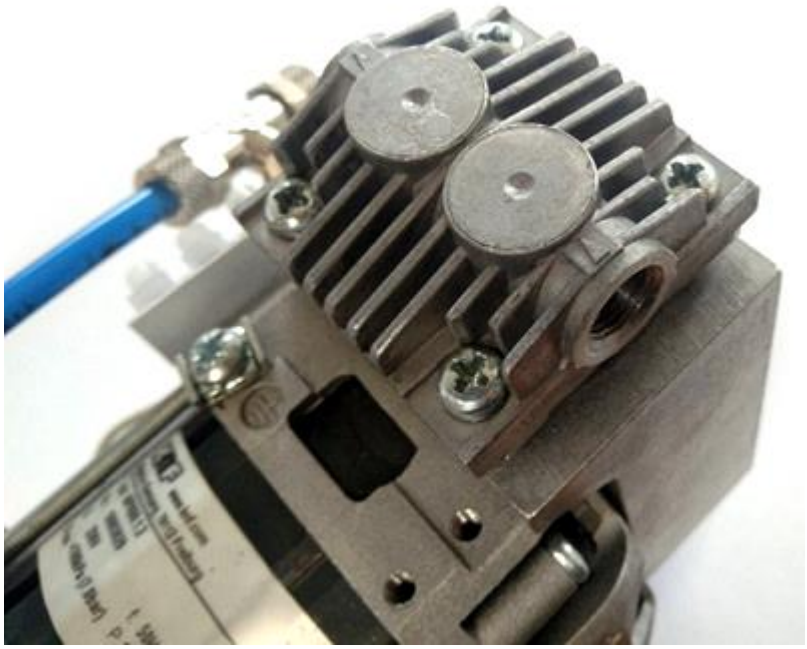
The piston seal and, to a lesser extent, the valve plates are the only parts of the pump that are subject to wear. They are easy to replace. When replacing the piston seal, check the valve plates for damage (bent tongues, corrosion).

Before disassembling the head, mark the location of the parts with a marker.

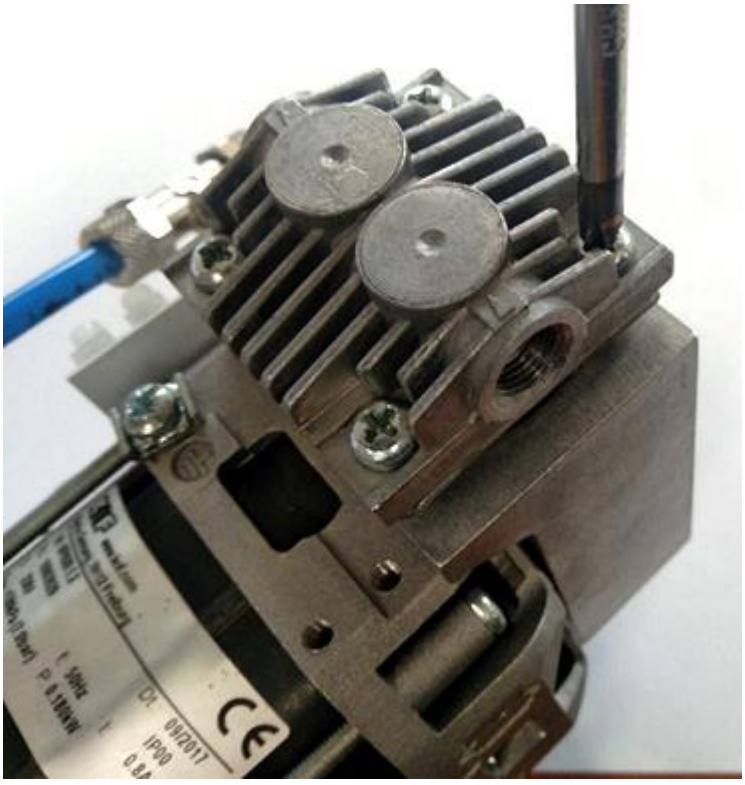
Disconnect the power supply and pneumatic lines from the pump, remove it from the generator housing.



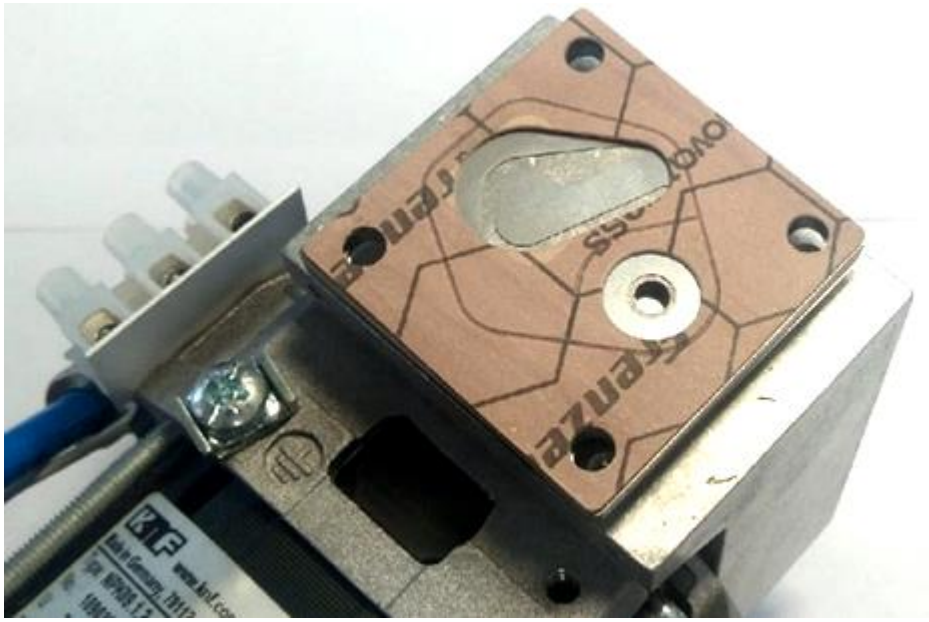
Unscrew the tubes from the ribbed head.



Using a Phillips screwdriver, unscrew the 4 screws securing the pump head to the rest of the pump element and remove the ribbed head.



Remove gasket.



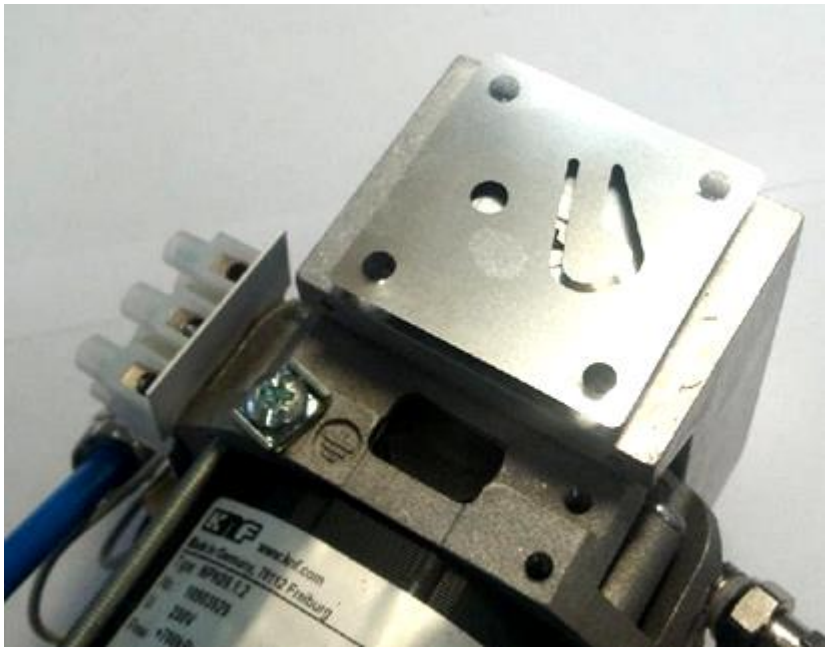
Remove the first valve plate.



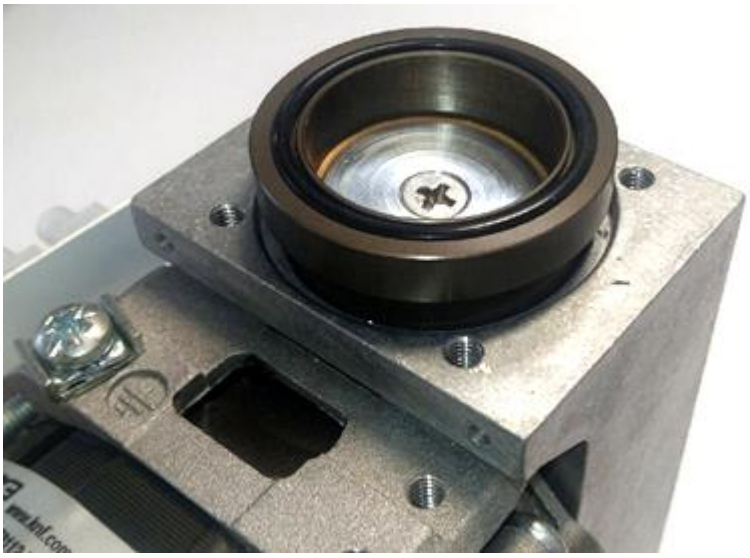
Remove intermediate plate.



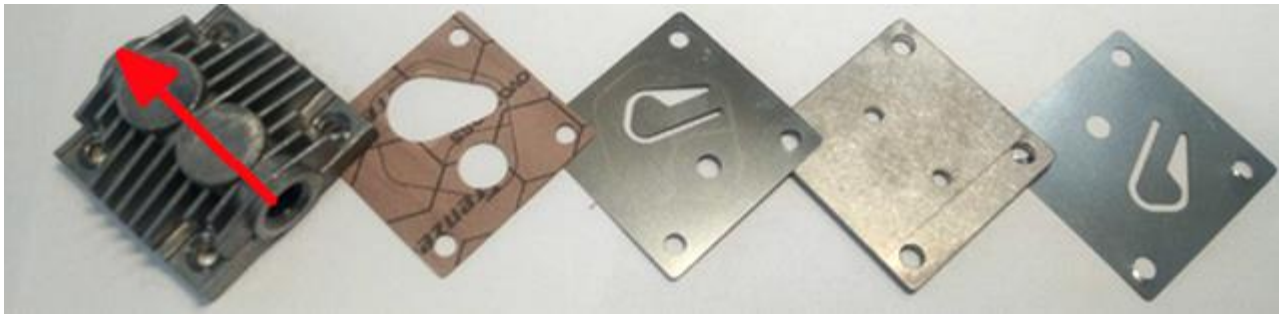
Remove the second valve plate.



View of the pump element without the pump head.



Disassembled pump head. The arrow shows the direction of air movement.



After removing the head, check the parts for dirt and damage. Clean, if necessary, with a dry, lint-free cloth. Stainless steel parts can be wiped with alcohol. If the parts are damaged, replace from the service kit.

Pull the cylinder up to remove it.



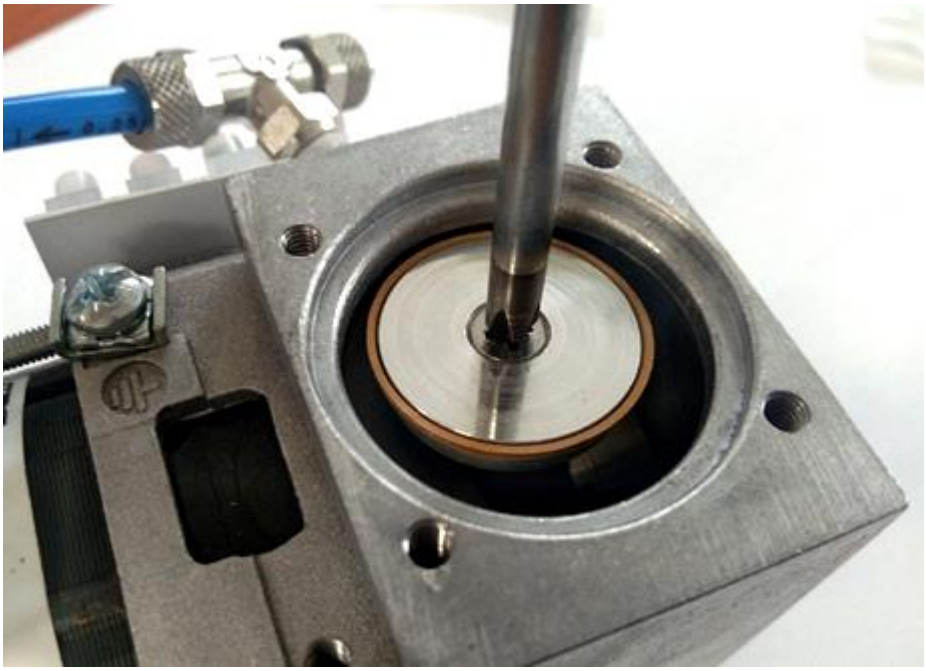
Cylinder with O-ring.



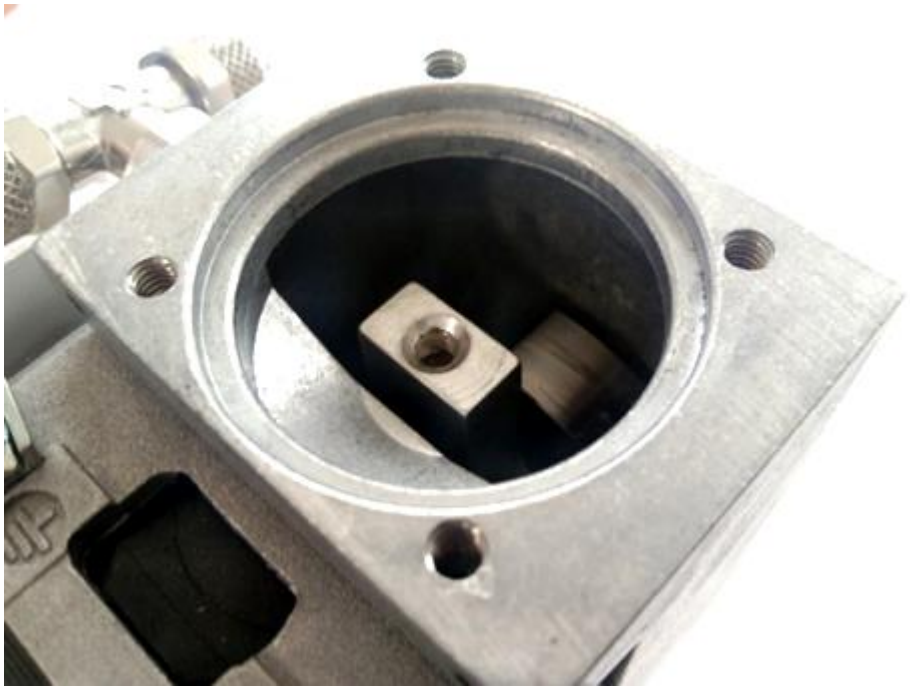
View of the fixed piston. Rotate the pump fan to set the fixing plate to top dead center.



While holding the fan, loosen the fixing plate screw and remove the screw, fixing plate, support and washer(s).



View of the disassembled pump element.



View of the removed piston assembly.



Remove metal washers.



Remove support.



Remove the piston seal.



After inspection, cleaning and replacement of defective parts, assemble the pump.

Keeping the connecting rod vertical, install the cylinder on the pump housing.

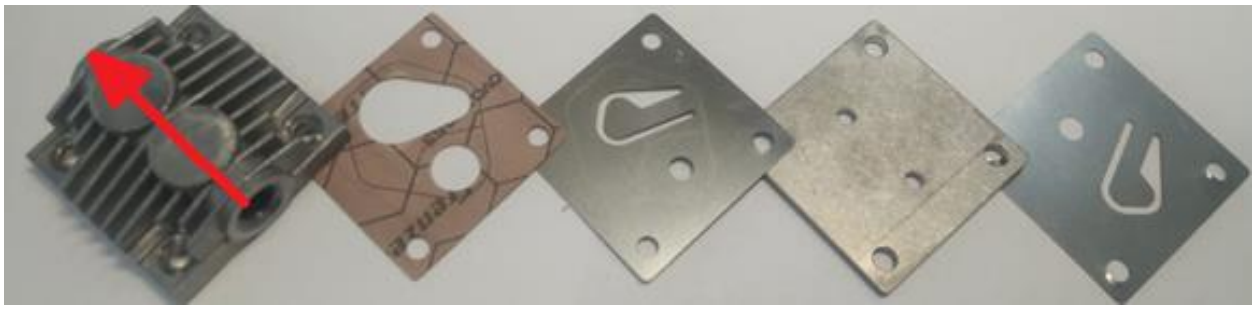
Reassemble the piston assembly:

- Place a new piston seal on the fixing plate with the sealing lip against the free flat surface of the fixing plate;
- Install the support on the fixing plate/piston seal assembly;
- Insert a new pan head screw into the assembly and install the same number of washers as previously used.

Insert the piston assembly (fixing plate, support, piston seal and washer(s) with screw) into the cylinder from above, onto the connecting rod. Secure it by tightening the screw.

The piston seal must not be deformed during assembly. It must be in contact with the cylinder along its entire circumference.

Assemble the pump head: stack the parts of the pump head on top of each other in the order shown in the figure: ribbed head, gasket, first valve plate, intermediate plate and second valve plate.



Place the head assembly on the pump housing.

Tighten the screws. First by hand, then with a screwdriver, diagonally. Maximum tightening torque 1.5 Nm.

Repeat the operations described for the second head and replace the connections between the two heads.

After assembly, turn the fan of pump by hand to check that the shaft rotates freely. This indicates that the pump is assembled correctly.

6 Storage

The generator should be stored, being packed, in closed room at conditions 2 by GOST 15150:

- air temperature – 50 to + 40 °C;
- relative humidity of air is no more 98% at +25 °C.

The existence of dust, acid vapors, alkali and other aggressive contaminants is not allowed.

Unpack the generator in dry heated rooms after 24 hours being kept there if during transportation or storage the temperature was below 5 °C.

7 Transportation

The generator is delivered being packed in transport box.

Transportation of the generator in packed condition may be to any distance, by any transport except unpackaged compartment of aircraft and weather decks observing storage conditions 5 by GOST 15150.

Package should be protected from atmospheric precipitates during transportation. It is not allowed blows caused by violation of railway transportation rules.

Transportation conditions:

- Environment temperature from – 50 to +50 °C;
- Relative air humidity no more 100% at 35 °C;
- The existence of dust and vapors of aggressive contaminants is not allowed.

Packing technique of the boxes into transportation container should exclude their displacement. Stockpiling is not allowed.

During handling the boxes should not be undergone to quick blows and impact of atmospheric precipitates.

8 Disposal considerations

The generators that lost their original application properties pose no threat to the human health and environment and are disposed according to the rules, regulations and methods applicable at the particular region.

The materials of the generator parts (aluminum, stainless steel, copper) can be recycled and can be sold, if customer decides so.

The generator parts that contain fiberglass and insulation materials can be buried.

9 Claims

In case of the generator failure within warranty period it is necessary to:

- draw up a technically reasoned act of defects concerning its incompliance with technical requirements, specified in the Passport;
- make abstracts from section "Acceptance Certificate";
- specify date and the organization that performed putting into operation;
- specify performed maintenance procedures.

It’s allowable sending copies of sections "Acceptance Certificate" and "Maintenance registration" witnessed by head of customer’s organization.

The claim should be sent to the address:

Special Design Office “Chromatec”, 94 Stroiteley Str., Yoshkar-Ola, Russian Federation 424000; or at Correspondence address: Central post office, P.O. box 84, Yoshkar-Ola, Mari-El republic, Russian Federation 424000.

Fax: +7.8362.685916, E-mail: mail@chromatec.ru

Service support department

Tel. +7.8362.685919, +78362.685932, fax. +7.8362.685987,
E-mail: service@chromatec.ru

Sales department

Tel. +7.8362.685968, +78362.685969, fax. +78362.685970,
E-mail: sales@chromatec.ru

10 Appendix A (reference)

The list of documents referred to in the User manual

GOST 9.014-78	Unified system of corrosion and aging protection. Temporary corrosion protection of products. General requirements
GOST 12.1.005-88	Occupational safety standards system. General sanitary requirements for the air in the working area
GOST 12.2.007.0-75	Occupational safety standards system. Electrical equipment. General safety requirements
GOST 9293-74	Gaseous and liquid nitrogen. Specifications.
GOST 14192-96	Cargo marking
GOST 14254-2015	Degrees of protection provided by enclosures
GOST 15150-69	Machines, instruments and other technical products. Versions for different climatic regions. Categories, operating, storage and transportation conditions as to the influence of environment climatic aspects
GOST 26828-86	Machine building and instrument making products. Marking
GOST 30804.3.2-2013 (IEC 61000-3-2:2009)	Electromagnetic compatibility of technical equipment. Harmonic current emissions (equipment input current maximum 16A per phase). Limits and test methods
GOST R 52931-2008	Instruments for process monitoring and control. General specifications
PTEEP	Regulations for Operation of Consumer Electrical Installations
PUE	Electrical Installations Code
POTEU	Occupational Safety Rules for Electrical Installations