AIR GENERATOR

USER MANUAL

214.2.933.002-03UM

PRODUCT P/N: 451-0202

Rev. 02.07.2024

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1 Important notes

This User Manual (UM) intended for studying the device and operation principle of the hydrogen generator (further – the generator), with directions for its proper operation and maintenance.

The list of manufactured generators is specified in Passport 214.4.464.014PS.

Before using the equipment accurately read the present User Manual.

Instructions marked by this box are necessary for carrying out in order to avoid injuries sustaining at working with IUTD and to avoid IUTD damage.

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.

2 Description and operation

2.1 Purpose

Air generator P/N 451-0202 (hereinafter the Air generator) is designed for air feeding of gas chromatographs flame detectors.

Operation of the compressor is carried out in closed laboratory premises if combustible gases and highly inflammable liquids may be present in volume insufficient for creation of explosive– or fire-hazardous mix. Environmental conditions:

- air temperature from 10 to 35 °C;
- relative humidity not more than 80 %;
- Atmospheric pressure from 84 to 107 kPa (from 630 to 800 mm Hg);
- Impurity content in premises air shall be normal, regulated by GOST 12.1.005.

As for climate performance, the compressor is referred to cold-temperate category 4.2 according to GOST 15150-69.

Allowable content of organic contaminants calculated at methane in ambient air of compressor operational place is 10 mg/m^3. This value is indicated as reference, it depends on particular pneumatic scheme of chromatographic system and analysis conditions.

Consecutive order of connection compressor and filter of air catalytic purification provides contents of organic components in output air as low as 0,1 mg/m3) and recommended for detectors air feeding when necessary to obtain maximum sensitivity.

Air generator power supply is alternating current with voltage (220^{+22}_{-33}) V, frequency (50$\pm$1) Hz.

The compressor as per electrical safety complies with class 1, type N requirements in accordance with GOST 12.2.025-76.

By level protection from electrical shock compressor should comply with II-nd class equipment of montage category (overvoltage category), II-nd level of pollution according to GOST R 51350, GOST R 52319.

Manometers located on front panel of the compressor are just means of indication and cannot be exposed to verification procedure.

2.2 Technical specifications and delivery set

Technical specifications and delivery set is according to Passport 214.2.933.002-03PS.

2.3 Construction and operation

Items produced by SDO Chromatec may contain updated parts following new developments or may be undergone to non-essential modernization, not specified in this user manual.

Principal pneumatic drawing of compressor is shown in figure 1. The compressor design is shown in figures 2 (left-side view) and 3 (front and back views).

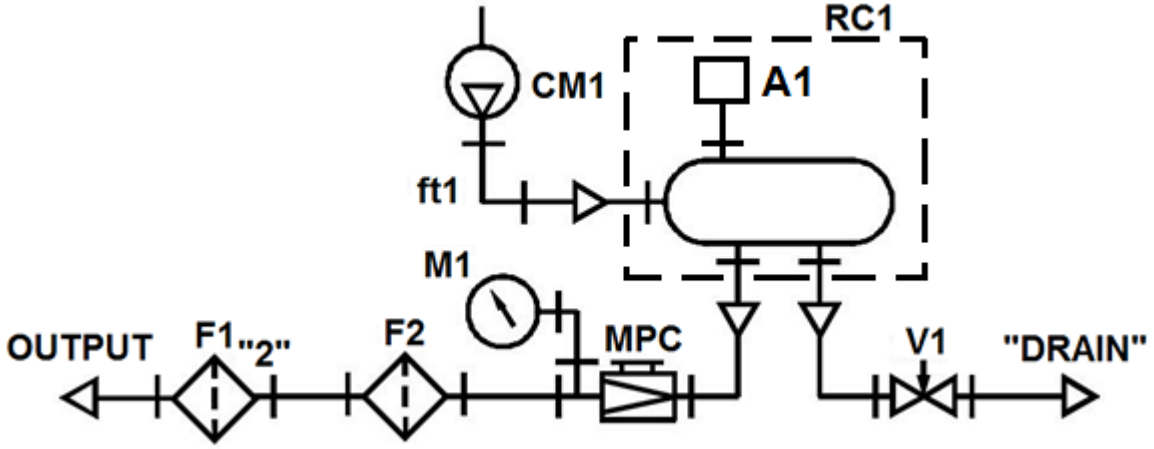
The basic compressor part is the mini compressor containing electric motor, working chamber, pressure relay.

Pumped air goes to receiver reservoir RC. Air pressure in receiver reservoir is controlled by pressure sensor A1. Then air passes from receiver through manual pressure controller MPC and moisture filters F1 and F2 to consuming device. Manometer M serves for visual control of outlet air pressure.

The receiver RC1 is connected to the valve DRAIN. At opening this valve, the drain of steam condensate through drain fitting is carried out.

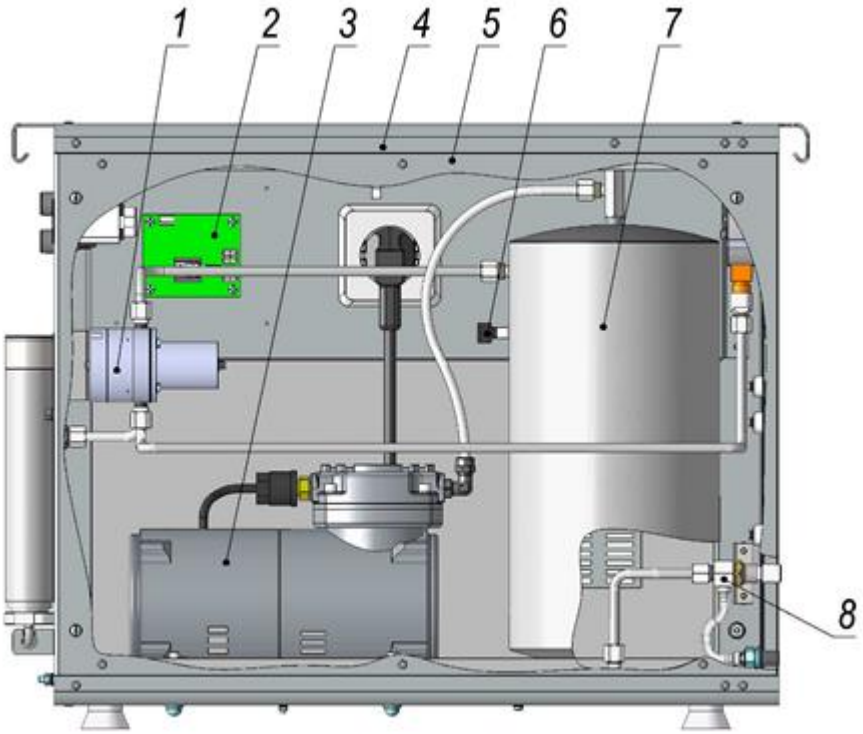
The compressor operating principle is based on cycling suction and pushing out air due to periodic change of working chamber volume due to reciprocating motion of piston actuated by eccentric, which located on drive shaft.

The compressor works in intermittent periodic mode. At maximal consumption the operating time of the compressor engine does not exceed 3 min. After reaching the top pressure value in receiver (at corresponding signal from control board) the electric motor is switching off.



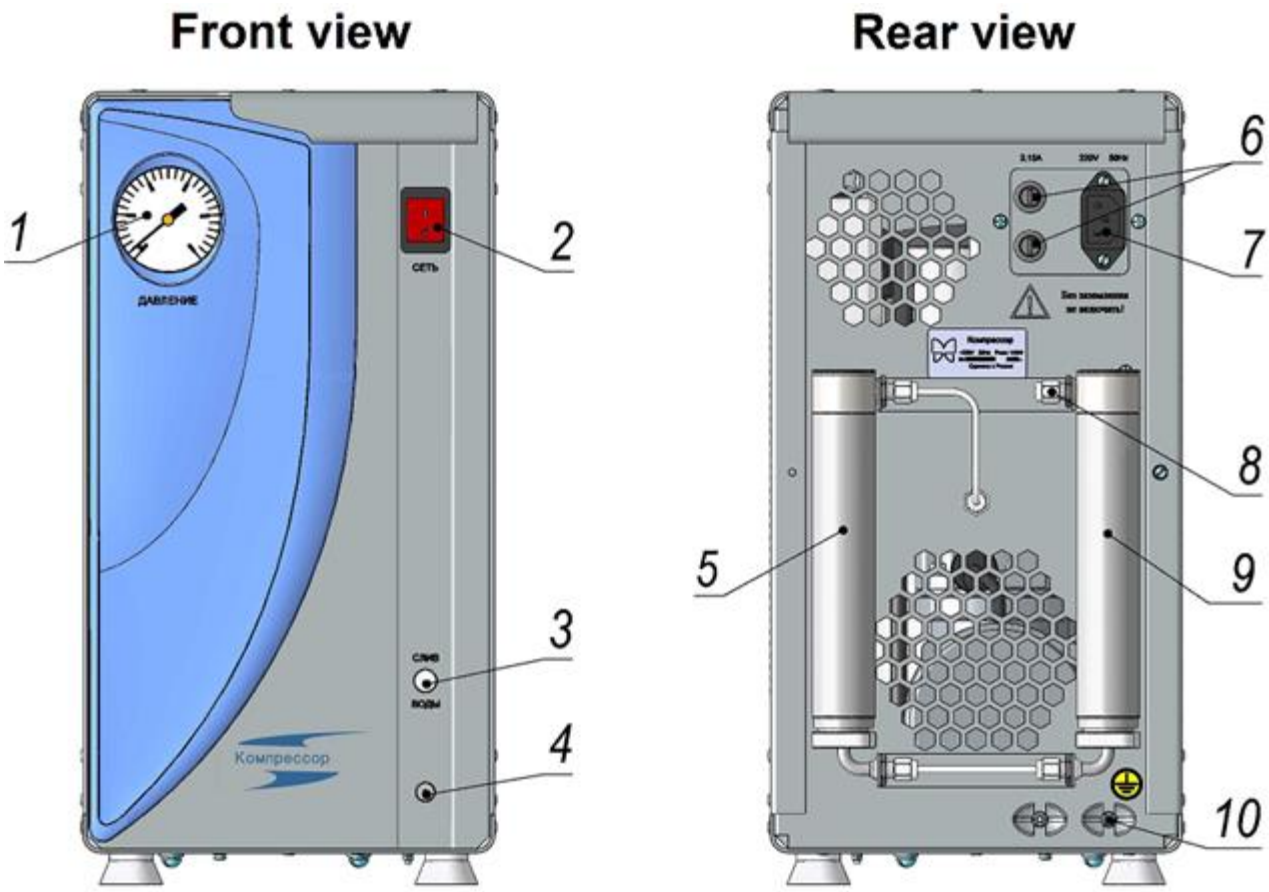
A1 – pressure sensor; V1 – valve 6.451.003; M1 – manometer; CM1 – mini-compressor; MPC – manual pressure controller 5.157.003-01; RC – receiver 5.883.002; F1 – filter 5.884.041; F2 – filter 5.884.041-01; ft1 – fitting 1541 6/4-1/8.

Figure 1 – Pneumatic principal drawing



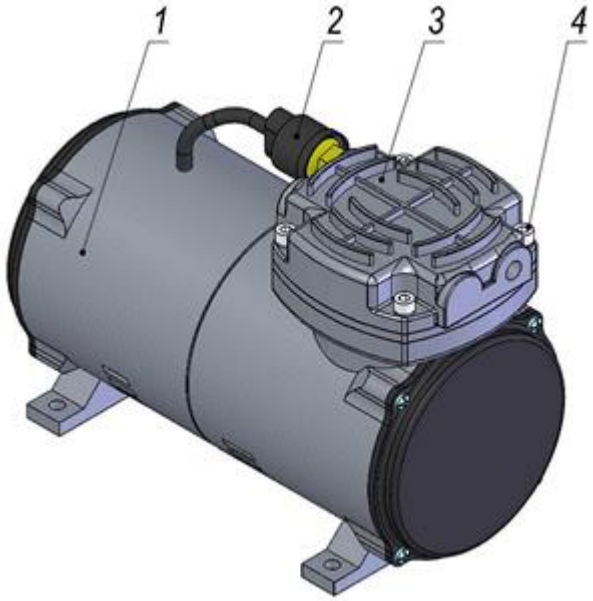
1 – manual pressure controller MPC; 2 – control board; 3 – mini compressor; 4 – carcass; 5 – side covers (2ea); 6 – pressure sensor A1; 7 – receiver reservoir RC1; 8 – drain on/off valve V1.

Figure 2 – Air generator. Left-side view



1 – manometer M1; 2 – toggle POWER; 3 – valve V1 (drain); 4 – drain fitting; 5 – filter F2 (moisture trap); 6 – fuses; 7 – power connector; 8 – fitting "Output" with cap; 9 – filter F1 (moisture trap); 10 – grounding terminal.

Figure 3 – Air generator. Front and back views



1 – drive; 2 – pressure relay; 3 – cap of working chamber; 4 – screw.

Figure 4 – Mini compressor

3 Usage

3.1 Safety measures

Sources of danger in compressor are:

- air, located in receiver under pressure (see figure 2 pos. 5),
- electrical power supply.

For safety operation and preventing injuries when working with compressor, follow directions specified in sections 2.1.2 – 2.1.5 of this User Manual.

Persons who studied this manual and passed workplace operating skills test are allowed to operate the compressor.

The compressor should be grounded. Grounding is carried out with the help of power plug and additionally grounding terminal (position 10 in figure 3). Contact "⊥" of power plug for compressor connection and grounding terminal should be connected to external grounding loop with the help of copper wires with section not less than 1,5 mm2. Grounding terminal is connected to grounding loop with the help of cable 214.6.644.056 from shipping kit.

Do not switch on the compressor without grounding!

Operating with removed covers is FORBIDDEN**!**

Maintenance is allowed to perform only with switched off power cord. The air consumer also should be switched – off.

At operation breaks the compressor should be disconnected from power.

3.2 Preparation and operation procedures

Power electric supply (a single-phase alternating-current mains with voltage 220 V, frequency 50 Hz) should be connected and grounding line (circuit) should be carried out to a compressor installation place.

At drop of power supply below 187 V, compressor may not start operating.

Install the compressor near workplace (it is desirable not far than 6 m) on horizontal surface and connect it to the device-consumer according to the user's manual on chromatograph using tubing Ø3 mm (and ferrules from chromatograph shipping kit).

Connect the compressor to electric system using power cord.

Switch on power toggle on the front compressor panel. Thus the indicator of the toggle should light up. Make sure in absence of foreign noises (steady noise of the engine work is audible only). Check pressure increasing on manometer.

Check compressor for leaks. Set zero air consumption on the device – consumer (or blank-off an output using cap 214.6.432.002 of GC shipping kit). Control pressure increasing by manometer. When the upper allowable pressure value is reached, the engine of the supercharger automatically switches off. Then compressor should be disconnected from electric power. In 30 minutes power supply switched on again. At switching on the engine of the supercharger would not start on.

Set necessary air consumption on chromatograph and check on manometer pressure keeping in set limits.

If long breaks in operation exist, release pressure in the compressor, by opening the valve DRAIN. Close the valve after pressure release.

3.3 Troubleshooting

Except for fuses replacement, user is not recommended to perform any repair operations.

At arising other questions at operating compressor, it's recommended to contact manufacturer or its regional representative.

4 Maintenance

The compressor is long-life product and does not require periodic greasing or any labor-intensive service.

For the compressor two types of maintenance are foreseen:

- Current maintenance. Staff, who studied this user manual and operates the compressor, shall carry out current maintenance.
- Periodic maintenance. Experienced service engineer, trained by manufacturer, shall carry out periodic maintenance.

4.1 Current maintenance

Releasing condensate from receiver reservoir should be carried out approximately once a week at average compressor operation time 8 hours a day.

Drain of condensate is performed, as a rule, at working compressor. It is possible to carry out draining of condensate with compressor switched off, but with working pressure in it.

To drain condensate from receiver reservoir, open the valve DRAIN. Close the valve after termination of moisture coming out from drain fitting;

Tube PVC section from shipping kit can be put on drain fitting for collection of drained moisture convenience.

4.2 Periodical maintenance

Periodic maintenance procedures include **filters regeneration** and **cleaning membranes**.

Filters regeneration. It is recommended to perform regeneration of moisture filters adsorbent at quality loss of supplied in chromatograph air (humidity increase which inadmissibly increases flame detectors noises). Filling of filters – molecular sieve CaA (F1) and active charcoal (F2).

For regeneration of adsorbent, it is necessary perform procedure as follows:

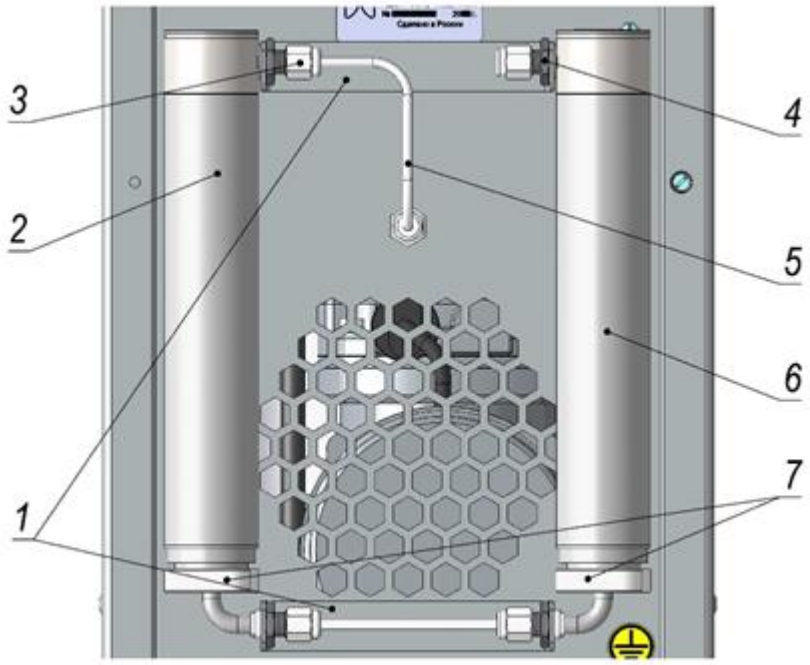
- switch compressor off (figure 3) with switching toggle pos.2 and disconnect power plug from supply;
- Unscrewing valve on the front panel (figure 3), drain air from the air line in compressor;
- on the rear panel unscrew the nut 3 from the filter 2 and remove tube 5 from the filters fitting (figure 5);
- loose nuts 1 on brackets 4 remove assembly of filters 2 and 6 (figure 5);
- locate filters 2 and 6 so that filters nut 7 become upward (figure 5);
- unscrew nuts 7 from the filters 2 and 6, take out sorbents of filter F1 (mol.sieve) 6 and filter F2 (active charcoal) 2 into different containers for regeneration;
- carry out regeneration of sorbents according to recommended temperature ant time (see below);
- place sorbents into filters. Each kind of sorbent should be placed in exactly the same filter. From which it was eliminated;

- assemble and connect filters in reverse sequence.

After mounting filters in compressor check it for leaks according to section 2.2.5.

Regeneration temperatures for sorbent of filters:

- Active charcoal: (140–165) °C for 3hours (it's crucial not to exceed upper temperature of the range);
- Molecular sieve CaA: (250–400) °C for 6 hours (for a deeper cleaning of the sorbent it's recommended to keep temperature close to maximum value).



1 – bracket; 1 – filter F2; 3 – nut 8.930.167; 4 – nut; 5 – tube; 6 – filter F2; 7 – filters nut.

Figure 5 – Regeneration of adsorbent in filters

5 Transportation and storage

Transportation of the compressor in package can be carried out on any distance by any kind of transport, except for not hermetically sealed plane compartments and open decks of water transport. At transportation a transport container should be prevented from exposure to atmospheric precipitations.

Transportation conditions:

- ambient temperature from minus 50 to plus 50 °C;
- relative air humidity up to 98 % at 35°C;
- Presence in air of dust and aggressive admixtures vapors is not allowed.

The way of boxes stacking in transporting means should exclude their moving. During loading and offloading operations boxes should not be exposed to hits and atmospheric precipitations impact.

The compressor should be stored in the packed state indoors under conditions 2 in accordance with GOST 15150-69:

- Temperature of air from minus 30 to plus 40 °C:
- Relative air humidity no more than 98 % at 25 °C.

Presence of dust, acids vapors, alkalis and other aggressive admixtures in air is not allowed.

Stocking – no more than three tiers.

At negative outside temperatures after taking out from packing the compressor should be kept in normal conditions not less than 4 h.

Packing should be stored until the warranty period expiry.

6 Claims

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

- draw up a technically reasoned act of defects concerning its incompliance with technical requirements, specified in Passport;
- make abstracts from section "Acceptance certificate";
- specify 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.

424000 г. Йошкар-Ола, ул. Строителей 94, СКБ "Хроматэк" или 424000, г.Йошкар-Ола, Главпочтамп, а/я 84.

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