CATALYTIC PURIFIER 20.0

USER MANUAL

214.5.884.092UM

PRODUCTS P/N: 451-0511, 451-0512, 451-0513, 451-0514

Edition 23.07.2026

Instructions highlighted in this manner must be followed to avoid injury when working with the product, as well as damage to the equipment.



This symbol warns of the risk of burns.



The instructions marked with this symbol must be followed to avoid electric shock.



Instructions marked with this symbol must be followed to avoid injury.

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.

Table of contents

1 Description and operation 5

1.1 Basic information about Catalytic purifier 20.0 5

1.2 Purpose 5

1.3 Technical specifications and delivery set 6

1.4 Operation conditions 6

1.5 Design and operation 7

1.5.1 Catalytic purifier design 7

1.5.2 Reactor and operation principle 8

2 Usage 9

2.1 Safety precautions 9

2.2 Preparation for operation 10

2.3 Operation 11

3 Maintenance 12

3.1 Check for purification quality 12

3.2 Trap 5.886.001 regeneration 13

3.3 Frequency of regeneration for oxygen removal channel 14

3.4 Regeneration of oxygen removal channel 14

3.5 Reactor replacement 15

3.6 Troubleshooting 15

4 Transportation and storage 16

5 Claims 17

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.

1.1 Basic information about Catalytic purifier 20.0

Manufacturer JSC SDO "Chromatec".

Products of JSC SDO "Chromatec" may contain non-fundamentally modernized parts in new developments or may be subject to minor non-fundamental modifications that do not affect the technical characteristics and safety requirements not reflected in this document.

1.2 Purpose

Catalytic purifier 20.0 (further the Purifier) is intended for purification of gas flows feeding the chromatograph: carrier gas (nitrogen, argon, hydrogen, helium) and air used as carrier gas or as feeding gas for flame detectors.

Climatic version of the purifier is cold temperature climate zone version (TC), category 4.2 as per GOST 15150-69.

The Purifier is designed to operate under following power supply conditions: AC mains with voltage of (220±10%) V, frequency of 50/60 ± 1 Hz.

The purifier is manufactured in 3 modifications:

- Cat.N 451-0511, Cross ID 214.5.884.092-01 (further the Purifier 20.0-01) for purification of air flow from organic impurities;
- Cat.N 451-0512, Cross ID 214.5.884.092-02 (further the Purifier 20.0-02) for purification of inert gases from oxygen traces;
- Cat.N 451-0513, Cross ID 214.5.884.092-03 (further the Purifier 20.0-03) for purification of air flow from organic impurities and inert gases from oxygen traces.
- Cat.N 451-0514, Cross ID 214.5.884.092-04 (further the Purifier 20.0-04) for purification of helium from impurities

The Purifier 20.0 does not have a built-in oxygen indicator at the outlet of the carrier gas oxygen purification channel. If the oxygen purification reactor is saturated (the required carrier gas purification level is not achieved), using filters 20.0-02 and 20.0-03 may damage the chromatography column. To prevent this, it is crucial to regenerate the catalyst in the reactor timely.

Recommendations for the frequency of oxygen purification channel regeneration and the regeneration procedure are described in Section 3.

1.3 Technical specifications and delivery set

Technical specifications and delivery set as per Passport of the Purifier.

1.4 Operation conditions

Operation of the generator 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 in the following conditions:

- ambient 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);
- the content of impurities in the ambient air within the limits of sanitary standards regulated by GOST 12.1.005-88 "System of occupational safety standards. General sanitary and hygienic requirements for the air in the working area."

The requirements of GOST 12.1.005-88 apply to the air in workplaces. The standard establishes general sanitary and hygienic requirements for microclimate parameters and permissible levels of harmful substances in the air of workplaces.

The standard specifies maximum permissible concentrations of harmful substances in the air of workplaces for human exposure, which apply to workplaces regardless of their location (in production facilities, mines, open areas, vehicles, etc.).

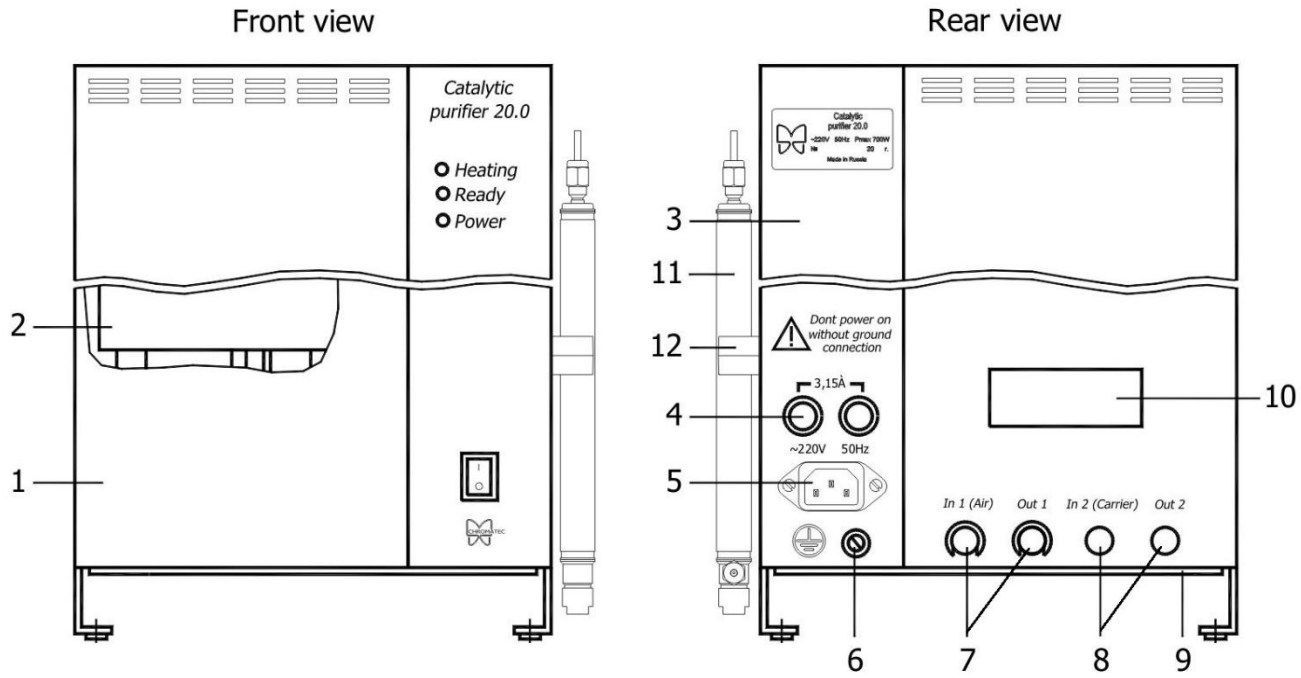
If the ambient air contains large amounts of halogen, nitrogen, sulfur, and organophosphorus compounds, catalytic purifiers 20.0-01(-03) may fail due to irreversible interaction of these compounds with the reactor's sorbent, reducing its catalytic activity.

It is recommended to install the air compressor in an area that excludes the presence of substances in the ambient air that could poison the reactor's catalyst.

1.5 Design and operation

1.5.1 Catalytic purifier design

The purifier overview is given below, Figure 1.



1 – cover; 2 – reactors thermostat; 3 – cover; 4 – fuse (2 ea.); 5 – power socket; 6 – grounding terminal; 7 – fittings air inlet/outlet (for 20.0-01, 20.0-03); 8 – fittings, carrier gas inlet/outlet (for 20.0-02, 20.0-03, 20.0-04); 9 – cover; 10 – tag; 11 – trap, 12 – holder.

Figure 1 – Catalytic purifier. Overview

The purifier is designed in metal casing with functional units located inside. Basic units are the oven with reactor placed into (closed by cover 1) and temperature controller (closed by cover 3). The different Purifiers models vary in reactors (see p. 1.5.21.5.2).

The reactor is heated to a temperature of 400°C (change of temperature rate is not considered). The purifier is turned on using a switch located on the front panel of the purifier housing. The Purifier is connected to a 220V power supply using the power cord included in the shipping kit.

Status LEDs located on the front panel of the purifier: yellow – HEATING, red – POWER (lights up upon connection to power supply, goes out upon disconnection from power supply), and green – READY.

The status LEDs reflect the following operation modes.

Mode “Not ready”.

The feature of this mode is that the temperature of reactor thermostat does not reach operation temperature. In these conditions the green LED (READY) is not lit, whereas the red one (HEATING) is lit while heating, and is not lit while cooling.

Mode “Ready”.

In this mode the reactor thermostat reached the preset temperature. In this case the indicator LED READY is lit, and indicator LED HEATING lights on and off maintaining temperature within range.

Mode “Error”.

In this mode the LED HEATING is not lit, and the LED READY blinks, once per second.

The Purifier is connected to gas lines via fittings located in the lower part of rear cover (Figure 1) using tubing and parts from shipping kit.

1.5.2 Reactor and operation principle

Design of Purifier modifications is the same except reactor (see Table 1). If necessary, the reactor can be replaced to change purpose of the Purifier.

Table 1 – Purifiers and corresponding reactors

Purifier	Reactor	Description
20.0-01	5.886.022	Air purification channel: removing organic impurities
20.0-02	5.886.022-01	Carrier gas purification channel: removing oxygen
20.0-03	5.884.093	2 independent channels: Air purification channel: removing organic impurities Carrier gas purification channel: removing oxygen
20.0-04	5.884.142	2 sequential channels: Moisture, oxygen, nitrogen, carbon monoxide, carbon dioxide, and organic impurities removal channel Hydrogen removal channel

Reactor 5.884.022(-01) in the Purifiers 20.0-01 and 20.0-02 has single channel with input and output fittings. The reactor 5.884.093 в Фильтре 20.0-03 has 2 independent channels, 2 input and 2 output fittings.

Operation principle of Air purification channel. Organic impurities are removed at catalytic oxidizing in air flow:

$$C_xH_y + O_2 => CO_2 + H_2O$$

Carbon dioxide (CO_2) and water (H_2O) resulted at oxidizing, are collected in Molecular sieve trap 5.886.001 at the outlet of the purifier.

Operation principle of Carrier gas purification channel. Heated Metal oxidized by traces of Oxygen:

$$Me + O= = MeO_x\ (Me_2O_y)$$

Eventually, carrier gas purification channel will be saturated, when the metal sorbent completely oxidized. Then regeneration of this channel in hydrogen flow should be applied:

$$MeO_x\ (Me_2O_y) + H_2 = Me + H_2O$$

The helium purifier (20.0-04) uses a getter alloy to remove trace amounts of water, oxygen, nitrogen, carbon monoxide, carbon dioxide, organic impurities, and hydrogen. The impurities are irreversibly captured on the getter surface through chemisorption.

2 Usage

2.1 Safety precautions

In terms of safety, the Purifier complies with the requirements of GOST 12.2.003-91 "Occupational safety standards system. Industrial equipment. General safety requirements", section 2, GOST R IEC 60204-1-2007 "Safety of machinery. Electrical equipment of machines and mechanisms. Part 1. General requirements"; in terms of protection against electric shock, the filter belongs to class I.

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

To prevent Purifier overheating, it shall be installed in the places, where formation of convective air flows within the area of housing walls of the Purifier is provided. It is not permitted to install foreign objects that cover ventilation openings on top part of the Purifier.



To avoid burns, do not touch heated reactor components. Replace the reactor after turning off the filter, at least 1 hour later.



The purifiers housing must be grounded using an additional grounding wire.



Do not turn on without grounding.

Grounding of the Purifier is performed using power plug and bonding point (Figure 1). The contact "⊥" of power socket for the Purifier connection and the bonding point shall be connected to grounding loop by means of copper wires with section of 1.5 mm^2 minimum. Grounding cable 6.644.056 is included into shipping kit.

Before starting maintenance make sure that power cord is disconnected from mains, and gas line is shut-off.

At working with combustible, harmful and aggressive gases it is required to observe the fire safety measures as per GOST 12.1.004-91, as well as the measures provided in special instructions developed by customer (in accordance with specific features of the applicable substances) on the basis of GOST 12.1.007-76.

At long breaks in operation the Purifier shall be disconnected from electrical mains, and gas line shall be shut off.

In terms of electromagnetic compatibility, the filter meets the requirements of GOST 30804.6.2-2013 (IEC 61000-6-2:2005) “Electromagnetic compatibility of technical equipment. Immunity to electromagnetic interference of technical equipment used in industrial areas. Requirements and test methods”, section 8, GOST IEC 61000-6-4–2016 “Electromagnetic compatibility (EMC). Part 6-4. General standards. Electromagnetic emission standard for industrial environments”, section 7.

2.2 Preparation for operation

Before connecting gas lines, assure that gas fittings of the Purifier had been properly sealed upon delivery.

The Purifier for purification from oxygen traps oxygen insignificantly even at ambient temperature, thus at any doubt at proper sealing, regeneration of the reactor is recommended.

Install the Purifier on horizontal place.

Connection to gas lines to channels of the reactor is carried out via fittings located in bottom rear part of Purifier cover (Figure 1) using tubes, nuts, ferrules and washers from shipping kit.

Connect gas lines from the sources of gases and to the chromatograph with input / output fittings of the Purifier. Example of connection flow diagram of the Purifier 20.0-03 is shown below. Use only connection channel of air for the Purifier 20.0-01 (inlet 1, outlet 1). Use only connection channel of inert gas for the Purifier 20.0-02 (inlet 2, outlet 2).

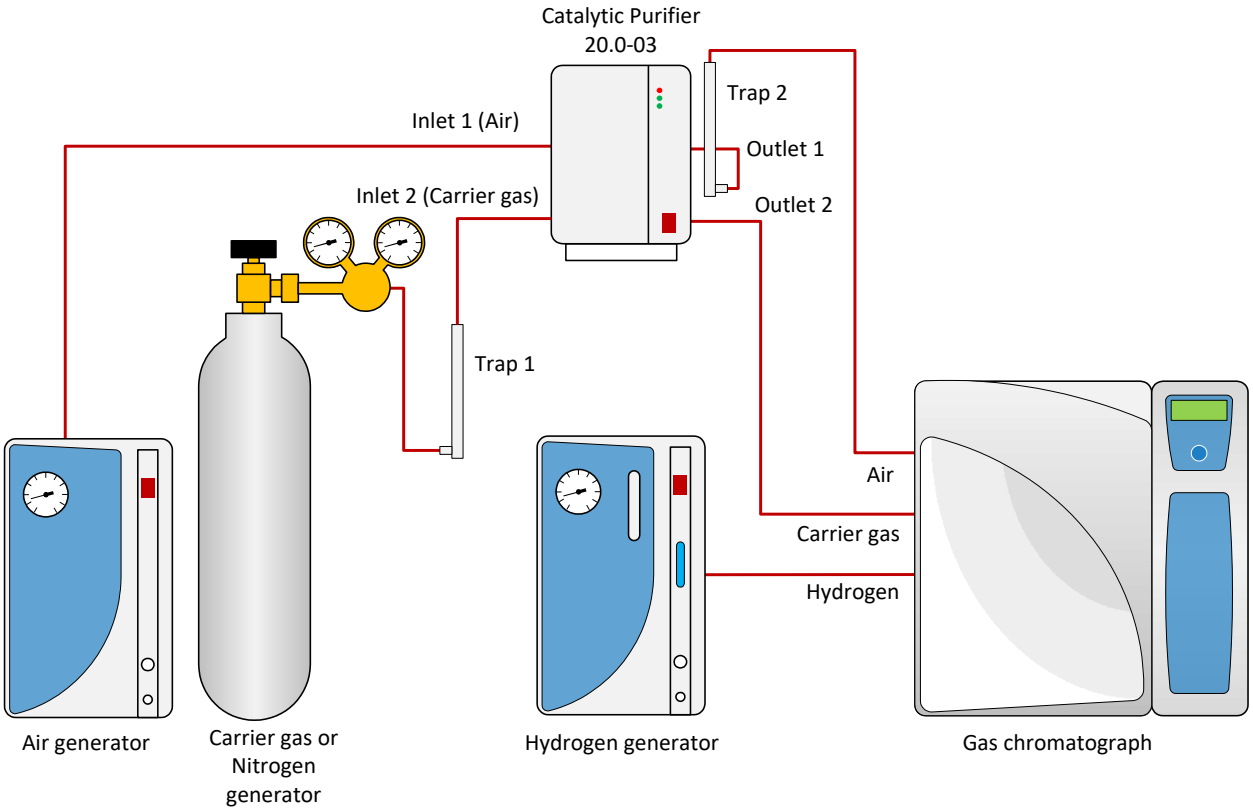


Figure 2 – Gas line connections for the Purifier 20.0-03

Pneumatic connection of air purification channel

Use teflon tubing with rubbery sealing ferrules. When connection, put on each tube end Nut 8.930.167-04, Washer 3 and Ferrule 8.220.272-01.

At outlet 1 of air purification channel Trap 5.886.001-04 with molecular sieves should be installed to remove carbon dioxide and moisture vapors generated in reactor. Trap 5.886.001-04 and the holder 8.128.105 are supplied in shipping kit, use bracket to fix trap on the right side wall of the Purifier.

Pneumatic connection of inert gas purification channel

At inert gas purification channel use metal tubing with metal sealing ferrules. When connection, put on each tube end Nut 8.930.167 and Ferrule 8.658.038-02.

If high moisture content in carrier, install additional Trap 5.886.001 or similar with molecular sieves before the inlet 2 of the Purifier channel.

At the outlet 2 of inert gas purification channel additional indicating oxygen trap can be installed.

Connect power cord to the Purifier. Connect the Purifier to electrical mains.

2.3 Operation

Turn the Purifier on in 45 minutes prior to turning on other instruments and gas sources. This allows heating reactor in advance, to prevent non-purified gas entering chromatograph and save catalyst lifetime.

Use button “O/I” on the front channel of the Purifier to turn the Purifier on.

At work termination, turn the Purifier off after turning off (shutting off) gas sources.

3 Maintenance

Maintenance procedures, depending on purifier modification, are specified below (Table 2):

Table 2 – Maintenance procedures

Procedure	**20.0-01**	**20.0-02**	**20.0-03**	**20.0-04**	**Frequency**
Check for purification quality	+	+	+	+	Permanently
Regeneration of Trap 5.886.001 at air purification channel	+	–	+	–	Once in 6 months
Regeneration of oxygen removal channel	–	+	+	–	See instructions in section 3
Reactor replacement	+	+	+	+	At damage

See below detailed description of maintenance procedures.

Data on maintenance or repair records are entered into the Purifier passport or into the documentation (registration log) of the company operating the Purifier.

3.1 Check for purification quality

Check for purification quality at the purifier outlet is to be observed constantly by visual signs in chromatograph operation. Depending on chromatograph configuration, these visual signs may vary.

Purifier 20.0-02, 20.0-03, inert gas purification from oxygen

Saturation of the reactor and necessity for urgent regeneration can be determined by following signs:

- When operating with ECD detector: increasing background signal.
- When operating with FID detector: insignificant increasing background signal, growing increment between turning off / on of FID make-up gas .
- When operating with capillary column and FID detector: increasing background signal, especially at column temperature programming; uneven baseline at programming.

Once poor gas purification of oxygen removal channel revealed, immediate regeneration of the reactor must be carried out (see p.3.4).

Purifier 20.0-01, 20.0-03, air purification from organic impurities

- When operating with FID: increasing background signal, baseline drift.
- When operating with FPD: appearance of quenching flame effect, which brings to reducing of sulfur components response, especially evident in low concentration range (2 – 10 ppm) at calibration curve check.

If poor gas purification of organics removal channel revealed, do regenerate of trap 5.886.001 located after Purifier (see section 3.2). If this procedure doesn't help, replacement of reactor is recommended.

Take attention that above mentioned signs may be caused by other reasons as well, not only by incorrect operation of the Purifier

Filter 20.0-04, helium purification from impurities

The saturation of the getter and the decrease in its purifying efficiency are assessed by the level of the background signal of PDD detector. An increase in the detector signal indicates the need to replace the reactor; its regeneration is not provided.

3.2 Trap 5.886.001 regeneration

The channel of air purification from organics produces carbon dioxide and moisture vapors which are removed at the outlet by trap 5.886.001. Sorbent (molecular sieves) in the trap 5.886.001 should be baked for regeneration at least once in 6 months typically. At high content of organics in air flow to be purified, recommended more frequent regeneration. Immediate regeneration is required if moisture drops appeared in internal walls of teflon tubing at trap outlet.

Recommendations on baking trap 5.886.001 (suitable for hydrogen generator and compressor traps as well):

- unscrew cap of the filter using wrench (10 mm size);
- take out the glass cloth tampon;
- empty filter adsorbent into metal or china ware;
- bake adsorbent. Baking temperature for MolSieve CaA: (250–400) °C (for deeper cleaning of sorbent it is recommended to set temperature at its top limit). Baking time is (2–4) hours depending on baking temperature and pollution degree;
- fill adsorbent back to the trap periodically packing it by tapping. Sorbent is better to be filled hot;
- on the top the glass cloth tampon should be placed;
- screw in the cap with the sealing teflon disk inside (use wrench 10). Tightening stress should be enough to avoid leaks. Before screwing make sure that there is no any glass cloth fiber on the sealing edge of trap body;
- install the trap on the place it was before, connect it to gas lines.
- check connections for leaks.

3.3 Frequency of regeneration for oxygen removal channel

The Purifier 20.0-02 (-03) does not contain any built-in oxygen indicator at the outlet. When oxygen trap reactor is saturated (it cannot provide satisfied purity of carrier gas), the further operation may damage chromatographic column. Thus, it's crucially important to carry out regeneration of catalyst in reactor timely.

Regeneration of catalyst in oxygen removal reactor of the Purifiers 20.0-02 and 20.0-03 is recommended to carry out if any of cases occurs:

- At replacement of gas cylinder;
- At reaching maximum calculated capacity by oxygen;
- After standing idle with opened reactors fittings.

On simple way, to calculate frequency of reactor regeneration, datasheet on carrier in gas cylinder, confirming the oxygen content, is required. Otherwise, oxygen content may be quantified.

Oxygen amount in gas cylinder with gas to be purified, shall not exceed 10 Liters. For example, in a vessel with capacity of 40 L at the pressure of 15 MPa the oxygen content shall not exceed 0.16 vol. %. If a vessel with oxygen amount exceeding 10 L is used, it is necessary to determine frequency of the Purifier regeneration and observe it strictly (before regeneration use the amount of gas, in which oxygen amount does not exceed 10 L). If oxygen content in carrier gas cannot be quantified, additional indicating oxygen trap is strictly recommended to install in carrier gas line after the Purifier.

3.4 Regeneration of oxygen removal channel

Regeneration of oxygen removal channel in the purifiers 20.0-02 and 20.0-03 is to be carried out timely according to frequency recommendations (p.3.3). For regeneration, follow procedure below:

- disconnect the purifier from carrier gas line, unscrew In 2, Out 2 fittings;
- turn the Purifier on;
- once it is ready for operation, in 30 minutes, connect hydrogen flow to fitting In 2, set flow rate 100 – 150 ml/min.

In (1-5) minutes water shall appear from fitting *Out 2*. Keep regeneration until water drops out. Once water flow is over, the regeneration is finished. After regeneration, the rest of water must be eliminated by flow of pure carrier gas.

- Complete moisture removal is guaranteed within 2 hours at 250 ml/min.

3.5 Reactor replacement

Lifetime or organics removal reactor in the Purifier 20.0-01 is at least 10000 hrs, in the Purifier 20.0-03 is at least 5000 hrs, in the Purifier 20.0-04 is at least 7500 hrs.

Reactor replacement for any model of the Purifier is required if it doesn't provide satisfied purification and regeneration of oxygen removal channel doesn't help. To replace reactor carry out the following steps:

- Turn of the Purifier, if necessary, wait until reactor cooled down (at least 1 hour), put the Purifier on the side wall;
- disconnect all tubes from rear fittings,
- remove cover 9 (Figure 1), releasing 3 screws M3;
- remove lock washers fixing fittings on the rear wall, release fittings.
- unscrew 2 screws M3 fixing reactor in bottom part of the Purifier, take the reactor out;
- install new reactor into thermostat and fit in reverse order.

3.6 Troubleshooting

Possible filter malfunctions that can be eliminated by the end user are listed in Table 3. In case of other malfunctions, please contact the manufacturer or its regional representative.

Table 3 – Troubleshooting procedures

Malfunction signs	**Possible cause**	**Recommendation**
The filter does not turn on when the "I/O" power switch toggle is pressed.	There is no main power.	Check the socket and power cord.
	The fuse has blown.	Replace the fuse.
When there is voltage in the network and the temperature mode is set, the oven does not heat up. The LED "Ready" is blinking or all 3 LEDs are blinking.	The heater or thermostat temperature sensor is faulty.	The thermostat needs to be replaced. Contact the manufacturer (or its representative).

4 Transportation and storage

The packaged purifier may be transported over any distance by any mode of transport, except for unsealed aircraft compartments and open decks of watercraft. The shipping container must be protected from atmospheric precipitation during transportation.

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 Purifier 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.

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

5 Claims

If the Purifier fails to operate during the warranty period, you must:

- draw up a technically substantiated complaint regarding non-compliance with the technical specifications specified in the Passport;
- extract data from the "Acceptance Certificate" section;
- indicate the date, organization, or person who commissioned the Purifier;
- indicate the maintenance activities performed.

It is permissible to send copies of the sections “Acceptance Certificate” and “Maintenance Record”, certified by the head of the enterprise operating the filter.

The claim should be sent to the address:

Special Design Office “Chromatec”, 94 Stroiteley Str., Yoshkar-Ola, Russian Federation 424006; or at Correspondence address: Central post office, P.O. box 84, Yoshkar-Ola, Mari-El republic, Russian Federation 424006. Fax: +7.8362.685916, E-mail: mail@chromatec.ru

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