SAMPLING PUMP

CHROMATEC PV-2

USER MANUAL

214.4.471.001UM

214.2.508.006-06UM

P/N 400-1911

Rev. 25.12.2023

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1 Important notes

This User Manual (UM) is intended to get familiar with the Sampling Pump Chromatec PV-2 (hereinafter – the sampling pump) and contains all necessary instructions to ensure its correct operation and maintenance.

Before using the sampling pump 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 Autosampler and to avoid Autosampler 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 Purpose

The sampling pump is designed for air sampling and trapping volatile compounds on sorbent tubes.

Application area is sampling indoor, ambient and workplace air.

The sampling volume is calculated from the flow rate and the sampling time.

The sampling pump is electric, low flow, multi-channel, portable device.

Sampling pump verifications are performed according to handbook "Sampling Pump Chromatec PV-2. Performance verification procedure".

Operation of the sampling pump is carried out by following conditions:

- Air temperature from – 10 to 40 °C;
- Atmospheric pressure from 84 to 107 kPa (from 630 to 800 mm Hg).
- Relative humidity not more than 98 % by 25 °C (non-condensing).

Dust concentration in the air during the operation must not be more than 5 mg/m^3.

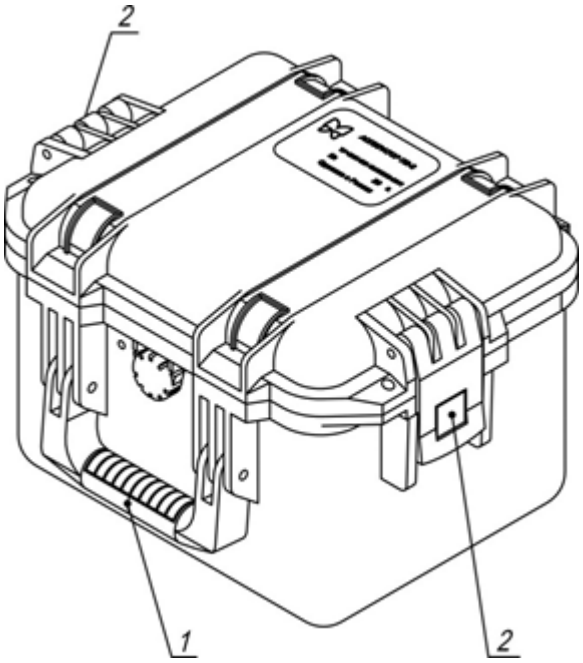
Power supply is provided by 12^{+2}_{-2} VDC.

3 Specifications and Delivery Set

Technical specifications and delivery set are according to Passport 214.4.471.001PS.

4 Overview

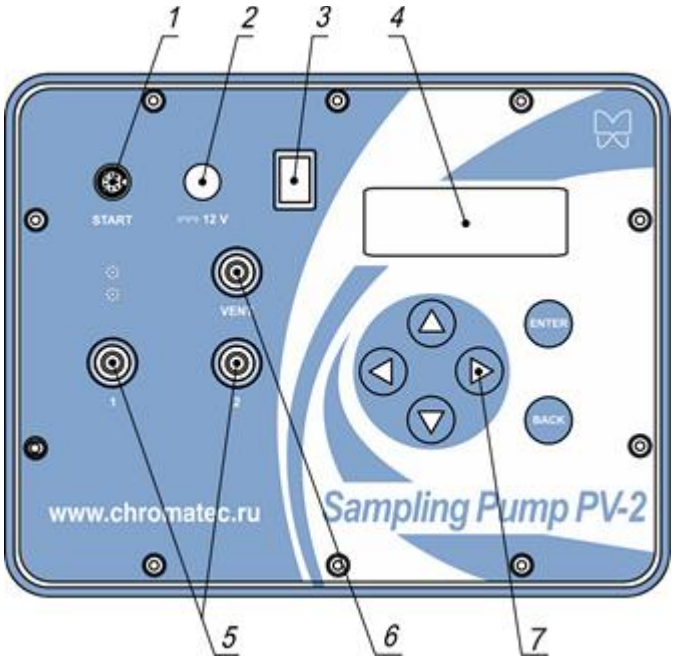
The sampling pump contains the battery 214.5.509.001 (rechargeable Li-polymer battery) with a capacity of 4200 mA/h and voltage 12.8 V. The sampling pump overview is shown in Figure 1.



1 – Handle; 2 – Lock

Figure 1 – Sampling pump P/N 400-1911. Overview

Instrument panel of the sampling pump is shown in Figure 2.



1 – Start connector; 2 – Power supply 12 VDC; 3 – Main switch; 4 – Display; 5 – Sorbent tube connectors; 6– Vent connector; 7 – Keyboard.

Figure 2 – Instrument panel

The instrument panel has sorbent tube and vent connectors, LED display, keyboard, Start connector, power supply 12 VDC connector and mains switch. The main functional units are pump, flow meters and gas flow controllers.

The main functional units of the aspirator are the pump, flow meters and gas flow regulators.

Pneumatic principal drawing is shown in Figure 3.

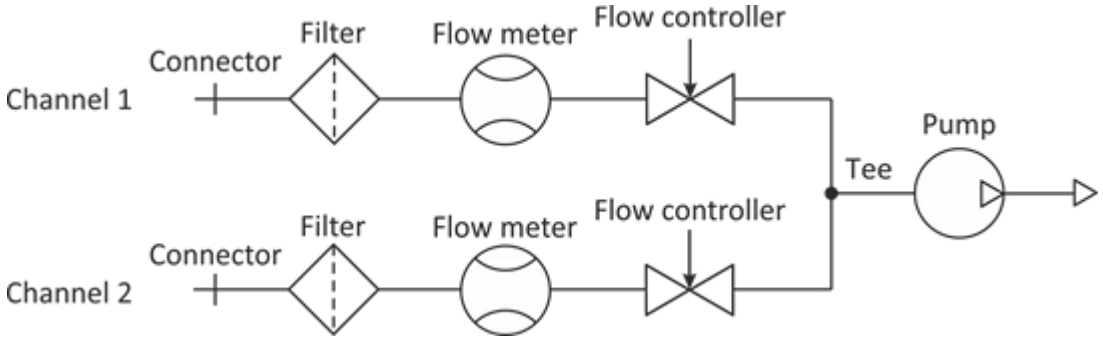


Figure 3 – Pneumatic principal drawing

The principle of operation is pumping of air sample through the sorbent tube. Flow and sampling time are set by control buttons. Display is used to control of the operating parameters. Measurement and maintain a constant flow rate of air are conducted by flow meters and flow controllers. The sampling pump has a built-in controller provides algorithm storage and management of the sampling pump items.

The sampling pump contains following control buttons:

- ENTER – Select the menu item, setting confirmation.
- BACK – Return to the previous menu.
- ▲ and ▼ – Menu browsing.
- ◄ and ► – Change the selected parameter.

The sampling pump has the ambient temperature sensor, the air pressure sensor and the humidity sensor. These sensors are used for viewing operating conditions during sampling.

The aspirator includes a rechargeable battery to ensure autonomous operation.

The sampling pump has the archive that stores parameters of last 20 sampling (date and sampling time, flow rate and volume, as well as sampling conditions – temperature, pressure and humidity.

The sampling pump calculates the volume, corrected to Standard Temperature and Pressure STP (0 °C and 100 kPa) according to:

$$V_{STP} = \frac{Ft}{1000}$$

where *F* – measured flow rate (mL/min); *t* – sampling time (min).

After sampling the sampling pump calculates the volume, corrected to Standard Ambient Temperature and Pressure SATP (25 °C and 100 kPa):

$$V_{SATP} = \frac{V_{STP} 298.15}{273.15}$$

These values are saved in the archive.

5 Operation

5.1 Safety Provisions

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

The aspirator contains a sealed acid-lead accumulator with a control valve for venting gases. The accumulator is non-disassembling and requires no maintenance other than charging.

If sampling air contains flammable, harmful and corrosive gases you should comply with fire safety regulations, as well as the special regulations, developed by the consumer.

5.2 Preparation

- Place the sampling pump on a horizontal surface.
- Connect the sampling pump to the power supply 12 VDC.

Before starting work you should check the battery charge level (Section 4.4). In case of insufficient charge (less than 90%) the battery must be charged according Section 7.1.

It is recommended charging the battery every time after working. Power supply must be connected to the turned off sampling pump.

5.3 Sampling Procedure

To the connections of the aspirator with the help of TPU tube (from the spare parts set) connect the connections 8.652.017 (for connection of sorption tubes with outer diameter of 5 mm) or connections 8.652.507 (for connection of sorption tubes with outer diameter of 6 or 6.35 mm).



Figure 4 - Connection of the TPU tube to the aspirator fittings

Connect the sorbent tube to the fitting by using PU tube and connector 8.652.017 (sorbent tube O.D. 5 mm) or connector 8.652.507 (sorbent tube O.D. 6 mm or 1/4''). For more information, see Figure 5.

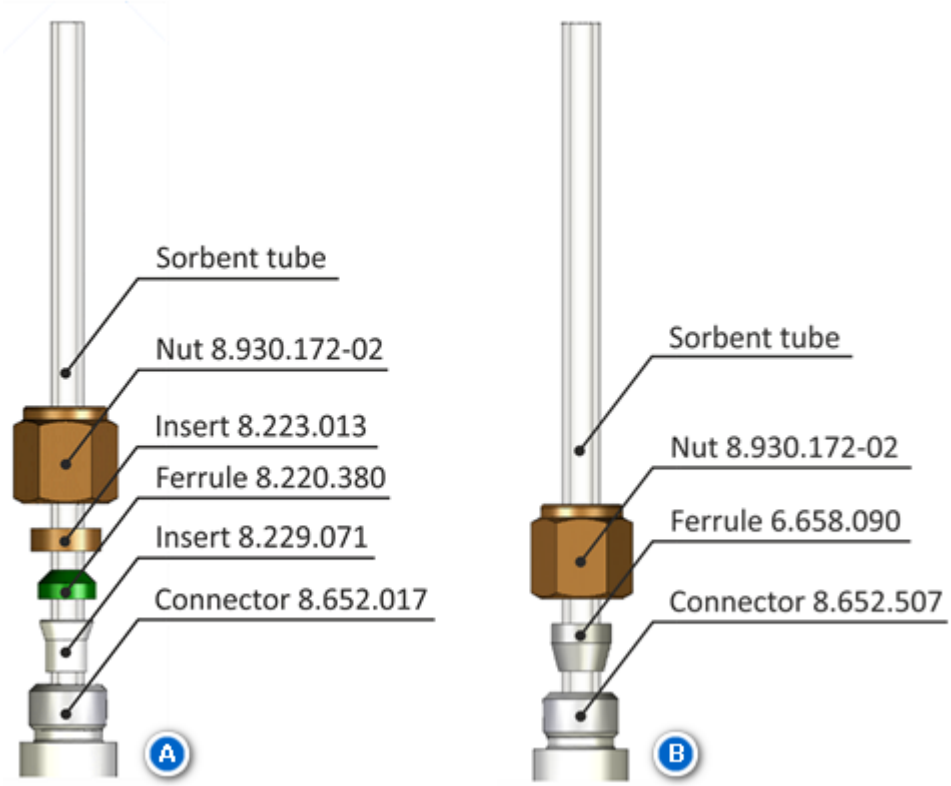


Figure 5 – Sorbent tube connecting: a) O.D. 5 mm; b) O.D. 6 mm or 1/4''

The tube connected to the fitting is shown in Figure 6.



Figure 6 - Connecting the tube to the fitting.

In the main menu press ▲ and ▼ buttons to select **Sampling** menu and press **ENTER** button.

```
Sampling
Start
Time                  10:00
Flow 1             200 mL/m
Flow 2             200 mL/m
```

In the line "Time" by ◄ and ► buttons set the sampling time (min: s). To save press **ENTER** button.

In the line "Flow 1" by ◄ and ► buttons set the gas flow in the Channel 1 (ml/min). To save press **ENTER** button.

In the line "Flow 2" by ◄ or ► buttons set the gas flow in the Channel 2 (ml/min). To save press **ENTER** button.

```
Sampling
Start
Time                  10:00
Flow 1             200 mL/m
Flow 2             200 mL/m
```

Press ▲ and ▼ to select **Start** and press **ENTER** button.

You can control flow rates and sampling time in **Sampling** menu when pumping is running.

During sampling the transition to other sections of the menu are not available.

After sampling the pump will stop automatically. To stop the pump at the sampling select the line "Stop" and press **ENTER** button.

5.4 Information

To view the temperature, pressure, humidity, battery charge and other information in the main menu by pressing ▲ and ▼ buttons select the **Info** menu and press **ENTER** button.

```
       Information
Temperature          25,6 C
Pressure          100,8 kPa
Humidity               45 %
Battery charge        100 %
Time                  15:13
Data               10.11.12
Version             1.01.01
```

4.5 History

To view last 20 samplings in the main menu by pressing ▲ and ▼ buttons select the **History** menu and press **ENTER** button.

```
         History
N: 1       15:17 10.11.12
N: 2       14:11 10.11.12
N: 3       13:19 10.11.12
```

Press ▲and▼ buttons to select date and time of sampling and press **ENTER** button.

```
         History
Data       15:17 10.11.12
Time             10:00
Ch1 F          200 mL/m
Ch1 V (STP)     2,000 L
Ch1 V (SATP)    2,144 L
Ch2 F          200 ml/m
Ch2 V (STP)     2,000 L
Ch2 V (SATP)    2,144 L
Temperature      25,6 C
Pressure       100,8 kPa
Humidity           45 %
```

In **History** menu you can find following information:

- Time and date of sampling.
- Sampling time (min: s)
- Ch1 F – the average flow rate on the channel 1
- Ch1 V (STP) – pumped volume on the channel 1, by STP,
- Ch1 V (SATP) – pumped volume on the channel 1, by SATP,
- Similar information for channel 2,
- Temperature, pressure and humidity.

6 Setting Parameters

In the main menu by using ▲ and ▼ buttons select **Setup** menu and press **ENTER** button.

For the date and time settings by using ▲ and ▼ buttons select the line "Date, time" and press **ENTER** button.

The line "Calibration" allows you to calibrate the sampling pump (Section 7.4).

The line "Service" carries the sampling pump to Service Mode for troubleshooting.

7 Troubleshooting

The Table 1 contains common failures, possible causes and relevant remedy actions to be provided by User. If any other problem arises, please contact to manufacturer or its regional office.

Table 1 – Troubleshooting

Problem	**Possible cause**	**Remedy action**
Sampling pump does not turn on when powered by the internal battery	Low battery charge	Charge battery
Sampling pump does not pump air through a sorbent tube	Leak in gas line	Check leak. Determine the leak and eliminate it
	Clogged filter	Replace filter
	Tightly packed sorbent tube	Re-pack sorbent

8 Maintenance

8.1 Charging the Battery

Charging is carried out when the battery is discharged during operation of the sampling pump.

To extend the service life of the battery to prevent deep discharge (less than 10%).

To charge the battery, you should connect the sampling pump to the power supply. The charging time depends on the discharge level and is at least 2 hours.

8.2 Leak Check

Leak test carried out on each channel using a gas diagram shown in Appendix A.

The procedure for leak check:

- Connect the connector 1 to the tee-joint.
- Close adjustable restrictor.
- Go to the Service menu.
- Set the flow rate for channel 1 – 200 mL/min.
- Turn on the pump.
- After stabilizing the vacuum gauge stop the pump.
- Fix the pressure (P1) on the vacuum gauge.

After 10 min fix the pressure (P2) on the vacuum gauge

Similarly check the channel 2 by connecting to the tee-joint to the connector 2.

Sampling pump considered no leak, if the pressure change (P2 – P1) of each channel for 10 minutes is not more than 3 kPa (about 0.03 Bar).

8.3 Filter Replacement

Replacing the filter is carried out when it is clogged.

The procedure for replacing the filter:

- Turn off the screws and remove the control panel.
- Disconnect tubing from the filter.
- Connect the new filters to tubing.
- Install control panel and tighten the screws.

8.4 Calibration

Calibration is carried out if accuracy variance between reading and actual flow rate is more then 5 %. Calibration is performed using a gas diagram shown in Appendix B.

The procedure for calibration:

- In the main menu select **Setup** menu and press **ENTER** button.
- Select the line "Calibration" and press **ENTER** button.
- Select 'Channel 1 20 ml/min " and press **ENTER** button.
- After the pump is turned on fix flow rate on the reference flow meter.
- Enter flow rate value in the "Reference" line and press **ENTER** button.
- Similarly calibrate for each channel for 20, 50, 100, 150, and 200 mL/min.

9 Transportation and Storage

Ensure adequate protection of shipping container from atmospheric precipitations.

Shipping requirements:

- ambient temperature between – 50 and 50 °C;
- maximum RH 98 % at 35 °C;
- avoid any dust or aggressive vapors in air.

Keep the package until the warranty period expires.

Before using the sampling pump taken from warehouse in cold weather, leave it at ambient temperature for 4 hours.

10 Claims

In case of sampling pump 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 performed maintenance procedures.

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

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

Appendix A

Gas diagram for leak check

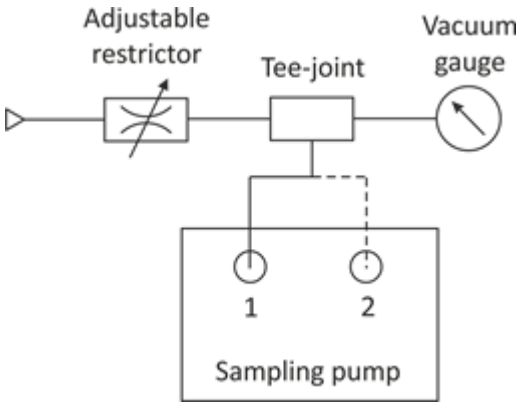


Figure A.1 - Gas scheme for leak tightness test

Appendix B

Gas diagram for calibration

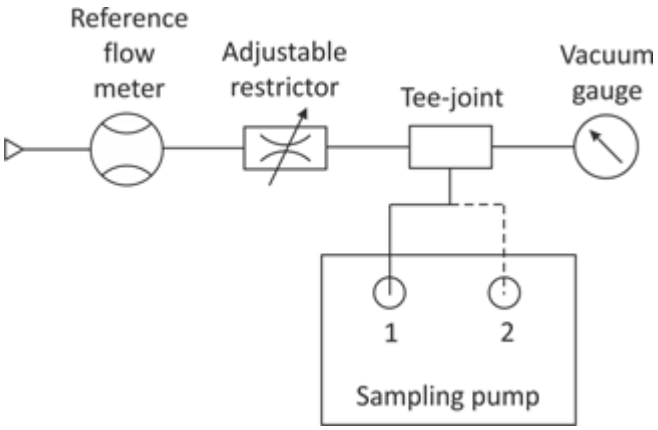


Figure B.1 - Gas diagram for calibration of flow measurement channels