

6 Maintenance

The unit must be cool before performing maintenance.

During maintenance, remember:

- The equipment must be maintained by a professional familiar with the safety requirements and risks.
- Only perform maintenance work described in these operating and installation instructions.
- Observe the respective safety regulations and operating specifications when performing any type of maintenance.
- Always use genuine spare parts.

NOTICE



Please refer to the assembly drawings in the appendix when carrying out maintenance.

DANGER



Electrical voltage

Electrocution hazard.

- Disconnect the device from power supply.
- Make sure that the equipment cannot be reconnected to mains unintentionally.
- The device must be opened by trained staff only.
- Regard correct mains voltage.



CAUTION



Tipping hazard

Equipment damage.

Secure the device against tipping, sliding and falling.

CAUTION



Gas leakage

The sample gas pump should not be dismantled under pressure.

DANGER



Danger of explosions, danger of poisoning from poisonous corrosive gases

During maintenance work, depending on the medium used, explosive and/or poisonous corrosive gases could escape, and this could lead to a danger of explosion or could be hazardous to health.

- Inspect the leak tightness of your sampling system before putting the device into operation.
- Ensure that gases that are hazardous to health are discharged safely.
- Turn off the gas supply before beginning any maintenance or repair work and flush the gas lines with inert gas or air. Secure the gas supply so that it cannot be turned on unintentionally.
- Protect yourself during maintenance from poisonous / corrosive gases. Wear appropriate protective equipment.



DANGER



Explosion hazard due to incorrect replacement of components

The replacement of the components requires carefulness. Inexpert operation could lead to explosion.

If you feel uncertain about any details of the operation, please bear in mind that the replacement should be done by the manufacturer only.

CAUTION**Hot surface**

Burning hazard

According to the product type and operation conditions, the temperature of the housing may exceed 50 °C during operation.

Depending on the conditions at the installation site it may be necessary to provide these areas with appropriate warning signs.

Depending on the quality of the sample gas being transported, you may need to occasionally replace the inlet and outlet valves. Instructions for replacing parts can be found in chapter Replacing the inlet and outlet valves.

If the valves are very dirty, particularly after just a short time of operation, you should install a particle filter upstream from the pump. This will significantly increase the operating life.

6.1 Maintenance plan

Component	Interval	Work to be performed	To be performed by
Pump body screws	After 500 h	Tighten screws to 3 Nm	Customer
Complete pump	Every 500 h	Check hose connections, protective and control devices, proper function, dirt, tightness. Replace if damaged or have repaired by Bühler Technologies.	Customer
Complete pump	Every 8,000 h or under high dust load	For cleaning the entire pump, see Cleaning the pump console.	Customer
Valves	Every 8,000 h or if pressure drops	For checking or replacing the valves, see Replacing the inlet and outlet valves.	Customer
Bellow	Every 4,000 h or 6 months	Check by shutting off the suction pipe. Repair if damaged, see Inspecting the bellow.	Customer
	After 2 years	Replace bellows, see Replacing bellow and connecting rod-eccentric-combination.	Customer
Wear parts in contact with media	After 43,800 h or 5 years from date of manufacture	Replace all wear parts in contact with media such as valves, bellows, bypass valve O-ring.	Customer

6.2 Inspecting the bellows

NOTICE



When following preventive maintenance according to the maintenance plan, a crack in the bellows is a rare malfunction, but cannot be completely eliminated.

NOTICE



If the bellows cracked, turn the pump off immediately!

NOTICE



If flammable gases (even above upper explosion limit (UEL)) or toxic gases are supplied, continuous monitoring of the pump is mandatory.

DANGER



Explosion hazard, danger of poisoning!

A crack in the bellows when conveying flammable or poisonous gasses may allow explosive or poisonous gas mixtures to leak or develop.
Monitor the pump with a flow- and/or vacuum monitoring system (see flow diagram).
If a pump defect occurs, shut it off immediately.

Since a crack **in the bellows allows** the ambient atmosphere to be sucked in and the sample gas pump continues to generate pressure, **the bellows on the sample gas pump must be inspected regularly**.

This is done by connecting a suitable shut-off unit and a suitable vacuum pressure gauge ahead of the sample gas input (see illustration). If during operation, after closing the suction line, no negative pressure is produced, the bellows is defective and must be replaced.

Please refer to the Maintenance schedule for maintenance intervals.

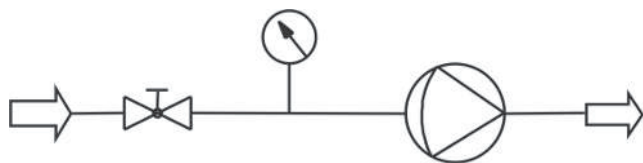


Fig. 2: Inspecting the bellows

6.3 Replacing bellow and connecting rod-eccentric-combination

NOTICE



Restrictions for connecting rod-eccentric replacement

The individual replacement of the eccentric, connecting rod or bearings is not allowed. Only the factory pre-assembled connecting rod-eccentric combination is suitable for replacement by the operator.

Please refer to assembly drawing 42/025-Z02-01-2 in the appendix for this maintenance.

1. Remove the three cross-tip screws (9) and remove the console cover (8) from the pump console (5)
2. Clean any dust and other dirt off the sample gas pump. Wipe off stubborn dirt with a damp, clean cloth (do not use cleaning products containing solvents).
Be sure to observe all notes in chapter Cleaning.
3. Remove the 4 hexagon screws (16) and the spring washers (15) at the top of the pump body (13). PTFE pump bodies also have a mounting ring (14) installed for improved seating stress.
4. Carefully pull the pump body up and out of the pump console. Be careful not to overstretch the bellow (12). If the pump body is stuck to the bellow, try carefully turning it to release it.
5. Hold the bellow just above the follower (10) and unscrew it anti-clockwise. When only changing the bellow, skip to step 14.
6. Remove the 4 hexagon screws (7) and lock washers (6) and remove the pump console from the flange.
7. Loosen and remove the set screw (11) from the eccentric of the crank gear (10). This may either be hexagon socket (SW 2) or star drive (TX 8). Use the proper tool.
8. Now carefully remove the crank gear from the shaft. This is best done with 2 large slot screwdrivers.
9. Clean the shaft and if necessary remove any residue such as frictional corrosion, etc.
Check the fit size of 11k6.
10. Dampen the shaft with resin-free oil prior to assembly.
11. Attach the new crank gear to the shaft and align the locking bore for the set screw with the corresponding bore in the shaft. Avoid using striking tools, as these may damage the ball bearings.
12. Insert the set screw with medium-strength threadlock and tighten to 1.5 Nm. Be sure the flat point of the set screw is properly seated in the bore on the shaft.
13. Now place the pump console over the crank gear again and either align it upward or rotated by 180° and secure with the hexagon screws (7) and lock washers (6) - tightening torque 3 Nm.
14. Check the sealing surface and the pleats of the bellow for damage and dirt.
15. Insert the bellow through the pump console from above and twist it clockwise onto the plunger of the crank gear hand tight.
16. Clean the pump body and check the sealing face for damage.
17. Attach the pump body to the bellow and turn into the desired position in relation to the gas inlet and outlet. On principle the alignment of the pump body is irrelevant.
However, it's important to ensure the marking on the mounting ring or pump body matches the installed valve and its function. There is no difference between inlet valve and outlet valve. Their installation position determines the function. The valves are always labelled "EIN" or "IN" for inlet and "AUS" or "OUT" for outlet.
18. Reattach the pump body with the 4 hexagon screws (16) and spring washers (15) and in the case of PTFE bodies with the mounting ring, and tighten the bolts crosswise, first at 1Nm, then 3 Nm.
19. Lastly, reattach the console cover with the 3 cross-tip screws.
20. Check the sample gas pump for leaks.
21. Perform a test run. At a minimum, the following values must be reached:
Overpressure: 1.7 bar
Negative pressure: -0.65 bar
Flow rate: 400 L/h

Record the maintenance including test values in the „operating log (template)" of the sample gas pump.

6.4 Replacement of the O-ring of the bypass valve (optional)

Please refer to assembly drawing 42/025-Z02-01-2 in the appendix for this maintenance.

- Loosen the two bolts (24) and carefully pull the entire unit, consisting of valve plate (23), spindle (22) and O-ring (21) on the knob (26) out of the pump body (13). On VA pump bodies, unscrew the spindle holder (25) with a SW13 open-end spanner, turning clockwise, and remove the entire unit.
- Remove the old O-ring from the spindle.
- Moisten a new O-ring with suitable O-ring grease (e.g. Fluoronox S90/2) and carefully attach it to the spindle.
- Carefully reinsert the entire unit into the pump body, turning, and tighten the bolts or spindle holder.
- Check the sample gas pump for leaks.

6.5 Replacing the inlet and outlet valves

Please refer to assembly drawing 42/025-Z02-01-2 in the appendix for this maintenance

- Remove the screw-in connections (18) from the pump body (13).
- Unscrew the valves (17) with a wide slot screwdriver. Stainless steel pump bodies have so-called displacers (20) under the valves. These reduce the dead volume and must remain installed on these pump bodies.
- Screw the new valves into the pump body and tighten to max. 1 Nm. Be sure the valve is installed the correct direction. Valves for a permitted gas inlet temperature of max. 100 °C are black/red, and grey/orange for max. 160 °C. Here the red or orange end corresponds to the gas inlet and the black or grey end the gas outlet. The valves at the gas inlet are marked "EIN" and "IN" and "AUS" and "OUT" at the gas outlet. The marking you see looking into the pump body from above determines the valve function.
- Lastly, reinstall the screw-in connections in the pump body. In the case of stainless steel screw-in connections, replace any damaged seals (19).
- Check the sample gas pump for leaks.
- Perform a test run. At a minimum, the following values must be reached:
Overpressure: 1.7 bar
Negative pressure: -0.65 bar
Flow rate: 400 L/h

Record the maintenance including test values in the „operating log (template)" of the sample gas pump.

6.6 Cleaning the pump console

- To clean the inside of the pump console, unscrew the three cross-tip screws (9) of the console cover (8) and remove the cover.
- You can now clean dust and other dirt inside the pump console. Wipe off stubborn dirt with a damp, clean cloth. Do not use cleaning products containing solvents.
- Now reattach the console cover and tighten the three bolts.

For the item numbers, please refer to the assembly drawing 42/025-Z02-01-2 in the appendix.

6.7 Changing the Coupling

Please refer to assembly drawing 42/025-Z02-02-2 in the appendix for this maintenance.

If the coupling breaks, always investigate the cause! If caused by e.g. a frozen bearing, replace the entire head.

- Remove the pump head and motor with coupling flange.
- Remove the coupling flange from the motor.
- After removing the set screw, remove the coupling parts from the shafts and attach a new coupling.
- Screw the coupling flange back onto the motor and install the pump the same as during initial installation.