Sample gas pumps

P4.3, P4.83

Installation and Operation Instructions

Original instructions
Read this instruction carefully prior to installation and/or use. Pay attention particularly to all advises and safety instructions to prevent injuries. Bühler Technologies can not be held responsible for misusing the product or unreliable function due to unauthorised modifications.

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1 Introduction

1.1 Intended use
Sample gas pumps are intended for installation in gas analysis systems for industrial applications.
The way two pumps are aligned in a motor with twin shaft is a cost-effective solution for analysis systems with two independent gas circuits. Applications requiring a quick response time the flow rate of the P4.83 pump can be increased by coupling both gas gas circuits.
The sample gas pump is only intended to convey gaseous media. It is not suitable for liquids.
Please note the specifications in the data sheets on the specific intended use, existing material combinations, as well as pressure- and temperature limits.

<table>
<thead>
<tr>
<th>DANGER</th>
<th>Potentially explosive atmosphere</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Explosion hazard if used in hazardous areas.</td>
</tr>
<tr>
<td></td>
<td>The device is not suitable for operation in hazardous areas with potentially explosive atmospheres.</td>
</tr>
<tr>
<td></td>
<td>Do not expose the device to combustible or explosive gas mixtures.</td>
</tr>
</tbody>
</table>

When installed outdoors, ensure adequate protection from the weather, see chapter Requirements for the set-up location [> page 8]
1.2 Product key

The device is delivered with different configurations. The part number given on the type plate informs you about the specific configuration of your device.

On the type plate you will find the order number as well as the 13-digit product key. This number is a code where each digit (x) describes a certain feature:

<table>
<thead>
<tr>
<th>42 xx x x x x x 9 0 00</th>
<th>Product characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Base model</td>
</tr>
<tr>
<td></td>
<td>P4.3, 2 x 400 L/h</td>
</tr>
<tr>
<td></td>
<td>P4.83, 2 x 800 L/h</td>
</tr>
<tr>
<td></td>
<td><strong>Motor voltage</strong></td>
</tr>
<tr>
<td>1</td>
<td>230 V 50/60 Hz 1.75/1.45 A</td>
</tr>
<tr>
<td>2</td>
<td>115 V 50/60 Hz 3.5/2.9 A</td>
</tr>
<tr>
<td></td>
<td><strong>Pump head position</strong></td>
</tr>
<tr>
<td>1</td>
<td>Normal position vertical</td>
</tr>
<tr>
<td>2</td>
<td>turned by 180°</td>
</tr>
<tr>
<td></td>
<td><strong>Pump head material</strong></td>
</tr>
<tr>
<td>1</td>
<td>PTFE</td>
</tr>
<tr>
<td>2</td>
<td>Stainless steel 1.4571</td>
</tr>
<tr>
<td>3</td>
<td>PTFE with bypass valve *</td>
</tr>
<tr>
<td>4</td>
<td>Stainless steel 1.4571 with bypass valve *</td>
</tr>
<tr>
<td></td>
<td><strong>Valve material</strong></td>
</tr>
<tr>
<td>1</td>
<td>up to 100°C; PTFE / PVDF **</td>
</tr>
<tr>
<td>2</td>
<td>up to 160°C; PTFE / PEEK</td>
</tr>
<tr>
<td></td>
<td><strong>Screw-in connections (for 230 V voltage)</strong></td>
</tr>
<tr>
<td>9</td>
<td>PTFE Pump body</td>
</tr>
<tr>
<td></td>
<td>Stainless steel pump body</td>
</tr>
<tr>
<td>1</td>
<td>DN 4/6 (Standard)</td>
</tr>
<tr>
<td>2</td>
<td>DN 6/8</td>
</tr>
<tr>
<td>3</td>
<td>3/8&quot;-1/4&quot;</td>
</tr>
<tr>
<td>4</td>
<td>1/4&quot;-1/6&quot;</td>
</tr>
<tr>
<td></td>
<td><strong>Screw-in connections (for 115 V voltage)</strong></td>
</tr>
<tr>
<td>9</td>
<td>PTFE Pump body</td>
</tr>
<tr>
<td></td>
<td>Stainless steel pump body</td>
</tr>
<tr>
<td>1</td>
<td>1/4&quot;-1/6&quot; (Standard)</td>
</tr>
<tr>
<td>2</td>
<td>DN 6/8</td>
</tr>
<tr>
<td>3</td>
<td>3/8&quot;-1/4&quot;</td>
</tr>
<tr>
<td>5</td>
<td>DN 4/6</td>
</tr>
<tr>
<td></td>
<td><strong>Mounting accessories</strong></td>
</tr>
<tr>
<td>9</td>
<td>incl. mounting bracket and bumpers</td>
</tr>
<tr>
<td></td>
<td><strong>Connection kit for parallel operation</strong></td>
</tr>
<tr>
<td>0</td>
<td>without</td>
</tr>
<tr>
<td>1</td>
<td>Tubing kit PVDF/PTFE ***</td>
</tr>
<tr>
<td>2</td>
<td>Piping kit 1.4571/1.4401 ***</td>
</tr>
</tbody>
</table>

* not with parallel operation
** not P4.83
*** P4.83 only

If there are special instructions for a pump type, they are marked in the manual.

Take care of the limits of the pump. When ordering spare parts chose for the type matching part numbers (e.g. valves).
1.3 Scope of delivery

<table>
<thead>
<tr>
<th>P4.3</th>
<th>P4.83</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 x Sample gas pump with motor</td>
<td>2 x Sample gas pump with motor</td>
</tr>
<tr>
<td>4 x Rubber-metal bumpers</td>
<td>4 x Rubber-metal bumpers</td>
</tr>
<tr>
<td>1 x Mounting bracket made of 1.4301</td>
<td>1 x Mounting bracket made of 1.4301</td>
</tr>
<tr>
<td>Product documentation</td>
<td>Product documentation</td>
</tr>
<tr>
<td></td>
<td>if necessary, 1 x connection kit (optional)</td>
</tr>
</tbody>
</table>

1.4 Product description

The sample gas pump is designed to transport only gaseous media not liquids.

Please observe the information at the end of these instructions in relation to specific intended use, available materials, pressure and temperature ranges. Regard in particular the information and type of protection given on the type plate.

Sample gases, which still contain humidity, tend to form condensate in the tubes and in the pump body. In such cases the pump head must be mounted with the head pointing down (see chapter Alteration of hanging pump bodies [> page 9]).
2 Safety instructions

2.1 Important advice

Operation of the device is only valid if:

– the product is used under the conditions described in the installation- and operation instruction, the intended application according to the type plate and the intended use. In case of unauthorized modifications done by the user Bühler Technologies GmbH can not be held responsible for any damage,

– when complying with the specifications and markings on the nameplates,

– the performance limits given in the datasheets and in the installation- and operation instruction are obeyed,

– monitoring devices and safety devices are installed properly,

– service and repair is carried out by Bühler Technologies GmbH,

– only original spare parts are used.

This manual is part of the equipment. The manufacturer keeps the right to modify specifications without advanced notice. Keep this manual for later use.

Signal words for warnings

DANGER: Signal word for an imminent danger with high risk, resulting in severe injuries or death if not avoided.

WARNING: Signal word for a hazardous situation with medium risk, possibly resulting in severe injuries or death if not avoided.

CAUTION: Signal word for a hazardous situation with low risk, resulting in damaged to the device or the property or minor or medium injuries if not avoided.

NOTICE: Signal word for important information to the product.

Warning signs

In this manual, the following warning signs are used:

- Warning against hazardous situations
- General notice
- Disconnect from mains
- Wear respirator
- Wear eye/face protection
- Wear protection gloves
- Wear protection gloves
- Warning against hot surface

2.2 General indication of risk

The equipment must be installed by a professional familiar with the safety requirements and risks.

Be sure to observe the safety regulations and generally applicable rules of technology relevant for the installation site. Prevent malfunctions and avoid personal injuries and property damage.
The operator of the system must ensure:
- Safety notices and operating instructions are available and observed,
- The respective national accident prevention regulations are observed,
- The permissible data and operational conditions are maintained,
- Safety guards are used and mandatory maintenance is performed,
- Legal regulations are observed during disposal.

**Maintenance, Repair**

Please note during maintenance and repairs:
- Repairs to the unit must be performed by Bühler authorised personnel.
- Only perform conversion-, maintenance or installation work described in these operating and installation instructions.
- Always use genuine spare parts.

Always observe the applicable safety and operating regulations in the respective country of use when performing any type of maintenance.

---

**DANGER**

**Electrical voltage**

Electrocution hazard.

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

---

**DANGER**

**Toxic, corrosive gases**

The measuring gas led through the equipment can be hazardous when breathing or touching it.

- a) Check tightness of the measuring system before putting it into operation.
- b) Take care that harmful gases are exhausted to a save place.
- c) Before maintenance turn off the gas supply and make sure that it cannot be turned on unintentionally.
- d) Protect yourself during maintenance against toxic / corrosive gases. Use suitable protective equipment.

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**DANGER**

**Potentially explosive atmosphere**

Explosion hazard if used in hazardous areas.

The device is not suitable for operation in hazardous areas with potentially explosive atmospheres.

Do not expose the device to combustible or explosive gas mixtures.

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**CAUTION**

**Tilting risk**

Damage of the device

Secure the device against any sudden translocation during maintenance.

---

**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.
3 Transport and storage

The products should be transported only in its original packaging or a suitable replacement.

When not in use, protect the equipment against moisture and heat. Keep it in a covered, dry and dust-free room at a temperature of -20 °C to +40 °C (-4 °F to 104 °F).

Outdoor storage is **forbidden**. As a matter of principle, the operator must regard all applicable standards according prevention of damage due to lightning, which may otherwise damage the sample gas pump.

The storage room must not be equipped with any ozone-producing devices like fluorescent light sources, mercury arc lamps, electric high voltage devices.

Before restarting the pump after long-term storage or an extended standstill period, the insulation resistance of the winding phase-to-phase and phase-to-ground must be measured. Moist windings could cause leakage current and flash-over. The insulation resistance of the stator windings must be at least 1.5 MΩ, measured at a winding temperature of 20 °C (68 °F). For lower values, drying the winding is required.

The motor shaft should be rotated in regular intervals to ensure sufficient lubrication of the bearings in long term.

To do this, unscrew the three cross-head screws of the housing cover and remove the cover (see fig. 1, fig. 2). The crankshaft is now visible.

---

**CAUTION**

**Contusion hazard**

Contusion of the fingers

Don’t have your fingers caught between eccenter and slide.

---

Fig. 1

Fig. 2
4 Installation and connection

Check the equipment for damage before installation. Among other things, this could be a damaged housing, supply cables, etc. Never use equipment with obvious damage.

4.1 Requirements for the set-up location

<table>
<thead>
<tr>
<th>CAUTION</th>
<th>Equipment damage</th>
</tr>
</thead>
<tbody>
<tr>
<td>!</td>
<td>Protect the equipment, particularly gas connections and gas lines, from dust, falling objects, as well as external blows.</td>
</tr>
<tr>
<td></td>
<td>Lightning</td>
</tr>
<tr>
<td></td>
<td>On principle, the operator must meet all applicable standards with respect to preventing damage to the equipment due to lightning, which could result in equipment damage.</td>
</tr>
</tbody>
</table>

The ventilation must be unobstructed and the exhaust air – and from the adjacent units as well – must not be directly re-siphoned.

The motor is rated for ambient temperatures between -20°C and +60°C and for installation altitudes ≤ 1000 m above sea level.

If installed without the mounting bracket, there must be sufficient spacing between the motor and the rear wall. The further environmental parameters for the set-up location can be found in the data sheet at the end of the operating and installation instructions.

\[ \geq \frac{d}{4} \]

\( d = \) air inlet

4.1.1 Outdoor installation

The sample gas pumps were not specifically designed for outdoor setup. The operating and environmental conditions are crucial for the required types of protection and any additional measures required, such as:

- adequate protection from the weather
- Adjusting the maintenance intervals (e.g. cleaning and replacing wear parts)

Use suitable measures and regular inspections to prevent damage to the equipment from e.g.:

- Corrosion
- Sunlight (temperature peaks and damage from UV rays)
- Moisture from condensation (e.g. due to rapid temperature changes or downtimes)
- Icing
- Insects and microbes
- other animals, e.g. martens, etc.

Please remember that all technical operating parameters of the equipment must also be met with outdoor installation. Specifically:

- Maximum or minimum operating temperatures
- Degree of protection
4.2 Mounting
For installing the pumps at back plates use the support console and the rubber-metal buffers. The buffers also have to be used when the pump is mounted on an existing base plate.

4.3 Special condition moist sample gas
Applications where the sample gas is still moist may result in condensate forming in line and the pump body. In these events the pump head must be suspended (pump body facing down).
If the pump was not ordered this way, it can easily be converted on site.
Install the line between the gas output and condensate drain with a grade so the condensate can drain and does not collect inside the pump or the lines.

4.3.1 Alteration of hanging pump bodies

<table>
<thead>
<tr>
<th>CAUTION</th>
<th>Damage to the device</th>
</tr>
</thead>
<tbody>
<tr>
<td>!</td>
<td>Especially with pump head pointing down, make sure that no dust or small parts can intrude the pump through the ventilations slot. Nevertheless, the slot must not be covered directly. If this is not possible, the pump must not be mounted with pump head pointing downward.</td>
</tr>
</tbody>
</table>

To perform this, unscrew the three Phillips head screws of the casing cover (Figure 3, Figure 4) and remove the cover (also see the spare parts drawing at the end of the operating instructions). The crankshaft drive and the engine flange will now be visible. The pump housing is fixed to the engine flange and/or the intermediate flange (depending on the pump type) with four hexagon bolts (SW8). Unscrew these completely (Figure 5). When unscrewing the last screw, hold the housing tight. Now carefully rotate the housing on the centring of the flange by 180°, screw it tight again (Figure 6, Figure 7) and then re-install the cover (tightening torque of the hexagonal bolts 3Nm). Offsetting the installation of the pump head by 45° is not permitted!
4.4 Connecting the gas lines

The pumps are delivered with customized gas connections. Please compare the part-no. on the type plate with the part-no. explained in chapter "Introduction".

Avoid mixed installations, that is connecting metal tubes to plastic bodies. If this is unavoidable for sporadic applications, screw the metal fitting with utmost care and without any use of force to the PTFE pump body.

Install the tubes in a way that the line at the inlet and outlet is flexible over a sufficient distance (pump vibrates).

**Individual operation**

If the pumps are used in individual operation, the gas feed paths are to be connected to the corresponding pump head. The inlets are labelled with "In" (inlet), the outlets with "Out" (outlet). Ensure that the connections with the gas pipelines are airtight.

**Parallel operation (P4.83 only)**

In parallel operation, the pump heads are connected with the help of the connection set. In doing so, the outlets and inlets of each pump head are to be connected to each other. The inlets are labelled with "In" (inlet), the outlets with "Out" (outlet). The gas path is connected to the corresponding T-pipe of the connection set. The union nut for the securing of the connection set is a component part of the pump.

4.5 Electrical connections

<table>
<thead>
<tr>
<th>WARNING</th>
<th>Hazardous electrical voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The device must be installed by trained staff only.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUTION</th>
<th>Wrong mains voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wrong mains voltage may damage the device.</td>
</tr>
<tr>
<td></td>
<td>Regard the correct mains voltage as given on the type plate.</td>
</tr>
</tbody>
</table>

A switch or power switch (according to IEC 60947-1 and IEC 60947-3) must be installed for the sample gas pump. It must be easily accessible by the user. The switch must be marked as circuit breaker for the device. It must not be installed in the mains power cord and must not interrupt the protective earth conductor. Furthermore, it must disconnect the device from all poles.

The sample gas pump must be secured against unacceptable excessive warming by using a suitable overload protection (motor protection circuit breaker).
Observe the rated current for the setting of the circuit breaker (see the motor identification plate).

Attach the pump in accordance with the circuit diagram on the terminal box housing cover and ensure that the strain relief for the connection line is sufficient. When doing this, ensure that the pump motor has the correct voltage and frequency (voltage tolerance ± 5 % and frequency tolerance ± 2%).

The supply line and earthing cross sections must be adapted to the rated current.

Use at least a wire cross-section of 1.5mm².

Connect the circuit breaker of the motor to the local protective conductor.

Connect the protective conductor in accordance with DIN VDE 0100 without fail to the marked protective conductor terminal.

There must be no foreign objects, dirt or humidity in the terminal box. Close unneeded cable inlet openings and seal the box itself against water and dust. Use the original seal when closing the terminal box.

Unused openings must be closed with approved stoppers.

Observe without fail any different information on the identification plate. The conditions at the operation site must correspond to all the ratings plate information.
5 Operation and control

**NOTICE**
The device must not be operated beyond its specifications.

**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.

**DANGER**
**Toxic, corrosive gases**
The measuring gas led through the equipment can be hazardous when breathing or touching it.

a) Check tightness of the measuring system before putting it into operation.
b) Take care that harmful gases are exhausted to a safe place.
c) Before maintenance turn off the gas supply and make sure that it cannot be turned on unintentionally.
d) Protect yourself during maintenance against toxic / corrosive gases. Use suitable protective equipment.

5.1 Switching on the sample gas pump

**Before switching on the device, ensure that:**
- the hose and electrical connections are undamaged and correctly installed,
- no parts of the sample gas pump have been dismantled (e.g. cover),
- the gas inlet and outlet of the sample gas pump is not shut,
- the preliminary pressure is under 0.5 bar,
- in the event of throttling under 150 l/h (per head in the P4.3) or under 400 l/h (per head in the P4.83) in continuous operation, a bypass is available,
- the ambient parameters are complied with,
- information from the identification plate is complied with,
- the voltage and frequency of the motor correspond to those of the network,
- the electrical connections are fastened tightly and the monitoring devices have been connected and set correctly,
- the air inlet openings and cooling surfaces are clean,
- protective measures have been carried out; earthing!
- the motor is secured correctly,
- the terminal box cover is closed and the cable entry points have been properly sealed.

**When switching the sample gas pump on make sure that**
- no abnormal sounds or vibrations occur.
- the flow rate is neither too low nor too high. This would indicate a cracked bellow.
5.2 Operating the sample gas pump

The sample gas pump is intended exclusively for the pumping of gaseous media. It is not suitable for liquids.

The sample gas pump should be operated without pre-compression. A preliminary pressure of more than 0.5 bar is not permitted. The gas outlet must not be shut. The flow rate per pump head must be at least 50 l/h for the P4.3 and at least 200 l/h for the P4.83 pumps. In the event of throttling under 150 l/h for the P4.3 or under 400 l/h for the P4.83 pumps in continuous operation, the flow rate must be regulated via a bypass. In this case you should choose a version with bypass valve.

NOTICE

Extreme throttling reduces the life time of the bellow.

The output can be adjusted on pumps with built-in bypass valve. Do not apply a lot of force when turning the valve as the valve could otherwise be damaged! The rotation range of the valve is about 7 rotations.
6 Maintenance

Wait until the surface has cooled down before beginning 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.
- When performing maintenance of any type, observe the respective safety and operation regulations.

### NOTICE

Please refer to the spare parts drawings attached when performing maintenance.

### DANGER: Electrical voltage

Electrocution hazard.

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

### DANGER: Toxic, corrosive gases

The measuring gas led through the equipment can be hazardous when breathing or touching it.

- a) Check tightness of the measuring system before putting it into operation.
- b) Take care that harmful gases are exhausted to a save place.
- c) Before maintenance turn off the gas supply and make sure that it cannot be turned on unintentionally.
- d) Protect yourself during maintenance against toxic / corrosive gases. Use suitable protective equipment.

### CAUTION: Tilting risk

Damage of the device

Secure the device against any sudden translocation during maintenance.

### CAUTION: Gas leakage

The sample gas pump should not be dismantled under pressure.

### 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 composition of the sample gas, it may be necessary to replace the in- and out-let valves from time to time.

If the valves are heavily contaminated, especially after a short time, consider installing a particle filter upstream the pump. This increases the service life significantly.

The screws of the fastening ring should be re-tightened after 500 hours of operation with torque 3 Nm.
6.1 Replacing the inlet and outlet valves

1. Screw out the fittings (a/f 17mm) (Fig. I / Fig. II).
2. Screw out the valves with a wide screw driver (Fig. III, Fig. IV, Fig. V) (Do not damage the screw thread!). Please note that the stainless steel pump head includes PTFE displacers. They are placed below the valves are used for a reduction of the clearance volume.
3. Screw in new valves with max. 1 Nm (Fig. V, Fig. IV, Fig. III). Regard the right direction (red or orange: inlet – black or grey: outlet).
4. Screw in the fittings (a/f 17mm) (Fig. VI, Fig. VII). Check tightness. Damaged seals from stainless steel fittings should be replaced.

6.2 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.

1. Remove the three pan-head screws on the housing cover and remove the housing cover. (Figure A)
2. Free the sample gas pump from dust and other impurities.
3. Wipe off the deeply embedded dirt with a damp and clean cloth (do not use any cleaning products that contain solvents).
4. Remove the four SW7 hexagonal bolts on the top of the pump body. For PTFE pump bodies, also remove the fastening ring. (Figure B)
5. Pull the pump body carefully upwards out of the pump bracket. When doing this, ensure that the bellow is not extended. If the pump body should get jammed on the bellow, try to release the pump body by performing careful rotating movements.
6. Hold the bellow from underneath, slightly above the tappet, and unscrew anti-clockwise (Figure C). Lift the bellow upwards out of the pump bracket. If you are only changing the bellow, please proceed with point 13.
7. Remove the four SW8 hexagonal bolts of the pump bracket (Figure D) and lift the pump bracket over the tappet. (Figure E)
8. Remove the SW2 grub screw on the eccentric. (Figure F)
9. Carefully lever the eccentric from the motor shaft / intermediate shaft.
10. Clean the motor shaft / intermediate shaft and inspect for any damage. Control the 11G6 fit size (11.006 to 11.017). (Figure G)
    Oil the motor shaft / intermediate shaft with a resin-free oil.
11. Push the tappet / eccentric (Figure H) uniformly onto the motor shaft / intermediate shaft (do not hit the component parts). Align the position of the hole for the grub screw. (Figure I)
12. Insert the grub screw with Loctite 243 (medium-strength) and tighten to 1.5 Nm. Ensure that the grub screw is also seated in the motor shaft hole / intermediate shaft hole.

13. Guide the pump bracket over the tappet, align it at right-angles to the motor, and secure with DIN 933 M5 x 16 hexagonal screws. Tighten the screws to 3 Nm.

14. Inspect the sealing areas and folds of the bellow for damage and contamination. Clean if necessary.

15. Insert the bellow (Figure J) from above through the pump bracket and screw tightly by hand to the tappet. During the process, again hold the bellow from underneath slightly above the tappet. (Figure C)

16. Clean the pump body and inspect for any damage.

17. Place the pump body on the bellow. Pay attention to the position of the inlet and outlet.

18. Secure the pump body with the fastening ring (only for the PTFE pump body) and hexagonal bolts DIN 933 M4 x 45 V2A and DIN 125 A4,3 V2A washers. Tighten the screws to 3 Nm.

19. Re-secure the housing cover with three DIN 966 M3 x 8 pan-head screws.

20. Connect the pump as described in the “Installation and connection” section and carry out a test run. During the test, at least the following values must be achieved:

   - Excess pressure: $P_{4.3} = 1.7$ bar; $P_{4.83} = 3.5$ bar
   - Negative pressure: $P_{4.3} = -0.65$ bar; $P_{4.83} = -0.75$ bar
   - Flow rate: $P_{4.3} = 400$ l/h; $P_{4.83} = 800$ l/h
6.3 Replacement of the O-ring of the bypass valve (optional)

- Loosen the two screws on the valve plate and carefully remove the entire unit.
  For VA pump body: Unscrew spindle holder with SW13 and pull out the entire unit.
- Coat the new O-ring with suitable O-ring grease (e.g. Fluoronox S90/2) and install in the spindle.
- Carefully reinsert the entire unit into the pump body whilst turning and tighten the screws/spindle holder.
7 Service and repair

This chapter contains information on troubleshooting and correction should an error occur during operation.

Repairs to the unit must be performed by Bühler authorised personnel.

Please contact our Service Department with any questions:

Tel.: +49-(0)2102-498955 or your agent

If the equipment is not functioning properly after correcting any malfunctions and switching on the power, it must be inspected by the manufacturer. Please send the equipment inside suitable packaging to:

Bühler Technologies GmbH
- Reparatur/Service -
Haikortstraße 29
40880 Ratingen
Germany

Please also attach the completed and signed RMA decontamination statement to the packaging. We will otherwise be unable to process your repair order.

You will find the form in the appendix of these instructions, or simply request it by e-mail:

service@buehler-technologies.com.

7.1 Troubleshooting

**CAUTION**  
**Risk due to defective device**

Personal injury or damage to property

a) Switch off the device and disconnect it from the mains.

b) Repair the fault immediately. The device should not be turned on again before elimination of the failure.

---

**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.

<table>
<thead>
<tr>
<th>Problem / Failure</th>
<th>Possible cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump does not start</td>
<td>– Mains disrupted or not correctly mounted</td>
<td>– Check fitting, fuse and switches</td>
</tr>
<tr>
<td></td>
<td>– Motor defect</td>
<td>– Replace motor</td>
</tr>
<tr>
<td>Pump does not transport</td>
<td>– Valves damaged or spoiled</td>
<td>– Blow out valves carefully or replace them or refer to chapter <a href="#">Replacing the inlet and outlet valves</a> [page 15].</td>
</tr>
<tr>
<td></td>
<td>– Bypass valve open</td>
<td>– Close bypass valve</td>
</tr>
<tr>
<td></td>
<td>– O-ring of bypass valve damaged</td>
<td>– Should be repaired by Bühler service or refer to <a href="#">Replacing the O-ring of bypass valve</a></td>
</tr>
<tr>
<td></td>
<td>– Bellow cracked</td>
<td>– Should be repaired by Bühler service or refer to <a href="#">Replacing bellow and connecting rod-eccentric-combination.</a></td>
</tr>
<tr>
<td>Pump noisy</td>
<td>– Crank gear worn-out</td>
<td>– Should be repaired by Bühler service or Replacing bellow and connecting rod-eccentric-combination.</td>
</tr>
<tr>
<td>Premature spider worn-out</td>
<td>– E. g. caused by Ozone contact or similar, affecting a physical change of the spider</td>
<td>– Make sure that physical changes of the spider do not occur</td>
</tr>
<tr>
<td>Tripping by protective device</td>
<td>– Coil- and terminal short circuit</td>
<td>– Measure insulation resistance</td>
</tr>
<tr>
<td></td>
<td>– Start-up time exceeded</td>
<td>– Check start-up conditions</td>
</tr>
</tbody>
</table>
**Tab. 1: Trouble shooting**

### 7.2 Spare parts and accessories

Please also specify the model and serial number when ordering parts.
Upgrade and expansion parts can be found in our catalog.

Available spare parts:

<table>
<thead>
<tr>
<th>Spare part</th>
<th>Part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P4.3</strong></td>
<td></td>
</tr>
<tr>
<td>Bellow</td>
<td>4200015</td>
</tr>
<tr>
<td>Connecting rod / eccentric combination</td>
<td>4200075</td>
</tr>
<tr>
<td>Set of 100 °C valves</td>
<td>4201002</td>
</tr>
<tr>
<td>Set of 160 °C valves</td>
<td>4202002</td>
</tr>
<tr>
<td>O-ring bypass</td>
<td>9009115</td>
</tr>
<tr>
<td><strong>P4.83</strong></td>
<td></td>
</tr>
<tr>
<td>Bellow</td>
<td>4200071</td>
</tr>
<tr>
<td>Connecting rod / eccentric combination</td>
<td>4200034</td>
</tr>
<tr>
<td>Set of 160 °C valves</td>
<td>4202002</td>
</tr>
<tr>
<td>O-ring bypass</td>
<td>9009115</td>
</tr>
</tbody>
</table>

*Tab. 2: Spare parts and accessories*
8 Disposal

Dispose of parts so as not to endanger the health or environment. Follow the laws in the country of use for disposing of electronic components and devices during disposal.
9 Appendices

9.1 Technical Data

<table>
<thead>
<tr>
<th>P4.3/P4.83 Technical Data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage:</td>
<td>see ordering information</td>
</tr>
<tr>
<td>Nominal current:</td>
<td>see ordering information</td>
</tr>
<tr>
<td>Protection class:</td>
<td>electric IP55, mechanical IP20</td>
</tr>
<tr>
<td>Weight:</td>
<td>12.5 kg</td>
</tr>
<tr>
<td>Dead volume:</td>
<td>2 x 8.5 ml</td>
</tr>
<tr>
<td>FM C-US (115 V only)</td>
<td></td>
</tr>
<tr>
<td>FM approval no.:</td>
<td>3038101/3038101C</td>
</tr>
<tr>
<td>Ambient temperature:</td>
<td>max. 60 °C</td>
</tr>
<tr>
<td>Medium temperature:</td>
<td>PTFE/PVDF valves max. 100 °C, PTFE/PEEK valves max. 160 °C</td>
</tr>
<tr>
<td>Materials of parts in contact with mediums by pump type:</td>
<td>PTFE / PVDF (standard pump with 100 °C valves), + PEEK (standard pump with 160 °C valves), + Viton (standard pump with 100 °C valves and bypass valve), + PCTFE, Viton (standard pump with 160 °C valves and bypass valve), + 1.4571 (VA pump body), + 1.4401, Viton (VA pipe fitting), + Viton (VA pump body with bypass valve)</td>
</tr>
</tbody>
</table>

9.2 Feed Curves

### P4.3 (per head)

<table>
<thead>
<tr>
<th>Vacuum</th>
<th>Atmosphere</th>
<th>Excess pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed curve</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### P4.83 (per head)

<table>
<thead>
<tr>
<th>Vacuum</th>
<th>Atmosphere</th>
<th>Excess pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed curve</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### P4.83 (parallel circuit)

<table>
<thead>
<tr>
<th>Vacuum</th>
<th>Atmosphere</th>
<th>Excess pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed curve</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
9.3 Dimensions P4.3 and P4.83 (230 V)

Gas connections of choice (see ordering instructions)

Mounting bracket

Adjustable bypass valve (optional)

9.4 Dimensions P4.3 and P4.83 (115 V)

Gas connections of choice (see ordering instructions)

Mounting bracket

Installation notices:
1) This pump should be installed horizontally
2) If necessary, rotate the pump head during installation. When conveying gasses with condensate content it must be installed valves down.
9.5 Dimensions piping kit/tubing kit for P4.83 with parallel operation

Piping kit

Connections:
230 V DN 4/6
115 V 1/4”

Swivel nut is included with the pump

Tubing kit

Connections:
230 V DN 4/6
115 V 1/4”

Swivel nut is included with the pump
10 Attached documents

- Spare parts drawing P4.3: 42/016-Z01-01-2
- Spare parts drawing P4.83: 42/016-Z01-02-2
- Declaration of Conformity: KX 42 0002
- RMA - Decontamination Statement
Hiermit erklärt Bühler Technologies GmbH, dass die nachfolgenden Produkte den wesentlichen Anforderungen der Richtlinie 2006/42/EG (MRL) in ihrer aktuellen Fassung entsprechen.

Die Produkte sind Maschinen nach Artikel 2 a).

Folgende Richtlinien wurden berücksichtigt:

2014/30/EU (EMV/EMC)
2014/35/EU (NSR/LVD)

Produkt / products: Messgaspumpen / Sample gas pumps
Typ / type: P4.3, P4.83

Das Betriebsmittel ist für den Einbau in Gasanalysesystemen bestimmt und für das Fördern von ausschließlich gasförmigen Medien vorgesehen.

The equipment is designed for installation in gas analyser systems and is designed to transport only gaseous media.

Das oben beschriebene Produkt der Erklärung erfüllt die einschlägigen Harmonisierungsrechtsvorschriften der Union:

The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:

EN ISO 12100:2010
EN 60204-1:2006
EN 61000-6-3:2007 + A1:2011
EN 61000-6-4:2007 + A1 2014

Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt der Hersteller.

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Dokumentationsverantwortlicher für diese Konformitätserklärung ist Herr Stefan Eschweiler mit Anschrift am Firmensitz.

The person authorised to compile the technical file is Mr. Stefan Eschweiler located at the company's address.

Ratingen, den 05.02.2019

Stefan Eschweiler
Geschäftsführer – Managing Director

Frank Pospiech
Geschäftsführer – Managing Director

Bühler Technologies GmbH, Harkortstr. 29, D-40880 Ratingen,
Tel. +49 (0) 21 02 / 49 89-0, Fax. +49 (0) 21 02 / 49 89-20
Internet: www.buehler-technologies.com
RMA-Formular und Erklärung über Dekontaminierung
RMA-Form and explanation for decontamination

RMA-Nr. / RMA-No. 

Die RMA-Nummer bekommen Sie von Ihrem Ansprechpartner im Vertrieb oder Service. You may obtain the RMA number from your sales or service representative.
Zu diesem Rücksendeschein gehört eine Dekontaminierungsanmeldung. Die gesetzlichen Vorschriften schreiben vor, dass Sie uns diese Dekontaminierungsanmeldung ausgefüllt und unterschrieben zurücksenden müssen. Bitte füllen Sie auch diese im Sinne der Gesundheit unserer Mitarbeiter vollständig aus. This return form includes a decontamination statement. The law requires you to submit this completed and signed decontamination statement to us. Please complete the entire form, also in the interest of our employee health.

Firma/ Company
Firma/ Company
Straße/ Street
PLZ, Ort/ Zip, City
Land/ Country

Gerät/ Device
Anzahl/ Quantity
Auftragsnr./ Order No.

Grund der Rücksendung/ Reason for return
☐ Kalibrierung/ Calibration ☐ Modifikation/ Modification
☐ Reklamation/ Claim ☐ Reparatur/ Repair
☐ andere/ Other

Ist das Gerät möglicherweise kontaminiert?/ Could the equipment be contaminated?
☐ Nein, da das Gerät nicht mit gesundheitsgefährdenden Stoffen betrieben wurde. No, because the device was not operated with hazardous substances.
☐ Nein, da das Gerät ordnungsgemäß gereinigt und dekontaminiert wurde. No, because the device has been properly cleaned and decontaminated.
☐ Ja, kontaminiert mit/ Yes, contaminated with:

Bitte Sicherheitsdatenblatt beilegen!/ Please enclose safety data sheet!

Das Gerät wurde gespült mit/ The equipment was purged with:


Falls die Ware nicht gereinigt, also kontaminiert bei uns eintritt, muss die Firma Bühler sich vorbehalten, diese durch einen externen Dienstleister reinigen zu lassen und Ihnen dies in Rechnung zu stellen.

Datum/ Date

rechtswidrige Unterschrift/ Legally binding signature
Die Analyse defekter Baugruppen ist ein wesentlicher Bestandteil der Qualitätssicherung der Firma Bühler Technologies.

Um eine aussagekräftige Analyse zu gewährleisten muss die Ware möglichst unverändert untersucht werden. Es dürfen keine Veränderungen oder weitere Beschädigungen auftreten, die Ursachen verdecken oder eine Analyse unmöglich machen.


Analysing defective assemblies is an essential part of quality assurance at Bühler Technologies.

To ensure conclusive analysis the goods must be inspected unaltered, if possible. Modifications or other damages which may hide the cause or render it impossible to analyse are prohibited.

Electronic assemblies may be sensitive to static electricity. Be sure to handle these assemblies in an ESD-safe manner. Where possible, the assemblies should be replaced in an ESD-safe location. If unable to do so, take ESD-safe precautions when replacing these. Must be transported in ESD-safe containers. The packaging of the assemblies must be ESD-safe. If possible, use the packaging of the spare part or use ESD-safe packaging.

Observe the above specifications when installing the spare part. Ensure the part and all components are properly installed. Return the cables to the original state before putting into service. When in doubt, contact the manufacturer for additional information.