Sample gas pumps

P2.x, P2.8x

Installation and Operation Instructions

Original instructions
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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 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.

**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.

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>56</td>
<td>P2.3 400 L/h</td>
</tr>
<tr>
<td>57</td>
<td>P2.4 400 L/h</td>
</tr>
<tr>
<td>63</td>
<td>P2.83 800 L/h</td>
</tr>
<tr>
<td>64</td>
<td>P2.84 800 L/h</td>
</tr>
</tbody>
</table>

**Motor voltage**

| 1 | 230 V 50/60 Hz. 0.85/0.8 A |
| 2 | 115 V 50/60 Hz. 1.7/1.6 A |
| 5 | 400 V 50/60 Hz. 0.5/0.43 A |

**Pump head position**

| 1 | Normal position vertical |
| 2 | turned by 180° *          |

**Pump head material**

| 1 | PTFE                     |
| 2 | Stainless steel 1.4571   |
| 3 | PTFE with bypass valve * |
| 4 | Stainless steel 1.4571 with bypass valve * |

**Valve material**

| 1 | up to 100°C; PTFE / PVDF ** |
| 2 | up to 160°C; PTFE / PEEK   |

**Screw-in connections (for 230 V and 400 V voltage)**

<table>
<thead>
<tr>
<th>PTFE Pump body</th>
<th>Stainless steel pump body</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN 4/6 (Standard)</td>
<td>6 mm (Standard)</td>
</tr>
<tr>
<td>DN 6/8</td>
<td>8 mm</td>
</tr>
<tr>
<td>3/8&quot;-1/4&quot;</td>
<td>3/8&quot;</td>
</tr>
<tr>
<td>1/4&quot;-1/8&quot;</td>
<td>1/4&quot;</td>
</tr>
</tbody>
</table>

**Screw-in connections (for 115 V voltage)**

<table>
<thead>
<tr>
<th>PTFE Pump body</th>
<th>Stainless steel pump body</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4&quot;-1/6&quot; (Standard)</td>
<td>1/4&quot; (Standard)</td>
</tr>
<tr>
<td>DN 6/8</td>
<td>8 mm</td>
</tr>
<tr>
<td>3/8&quot;-1/4&quot;</td>
<td>3/8&quot;</td>
</tr>
<tr>
<td>1/4&quot;-1/8&quot;</td>
<td>1/4&quot;</td>
</tr>
<tr>
<td>DN 4/6</td>
<td>6 mm</td>
</tr>
</tbody>
</table>

**Mounting accessories**

| 9 | incl. mounting bracket and bumper * |

* not on P2.4 & P2.84

** not on P2.4, P2.83 & P2.84

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>P2.3, P2.83</th>
<th>P2.4, P2.84</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 x Sample gas pump with motor</td>
<td>1 x Pump body with intermediate flange</td>
</tr>
<tr>
<td>4 x Rubber-metal bumpers</td>
<td>1 x Motor</td>
</tr>
<tr>
<td>1 x Mounting bracket made of 1.4301</td>
<td>1 x Coupling flange</td>
</tr>
<tr>
<td>Product documentation</td>
<td>1 x Coupling</td>
</tr>
<tr>
<td></td>
<td>6 x Connecting bolts M6x16</td>
</tr>
<tr>
<td></td>
<td>1 x Mounting ring</td>
</tr>
<tr>
<td></td>
<td>Product documentation</td>
</tr>
</tbody>
</table>

1.4 Product description

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 at the end of this manual on the specific intended use, existing material combinations, as well as pressure- and temperature limits. In addition, please also note the specifications and markings on the nameplates.

The pump head and the drive motor on the P2.4 / P2.84 sample gas pump are isolated for use in hot applications. The sample gas pump has a split adapter which can be mounted with one half inside a heated cabinet while the other half mounted on the outside supports the drive motor. In doing so, wall thicknesses of up to 30 mm can be bridged without additional modifications.

Applications where sample gas is still moist, can result in condensation in the lines and the pump body. In these cases the pump head must be suspended (see item *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
- Warning against electrical voltage
- Warning against respiration of toxic gases
- Warning against acid and corrosive substances
- Warning against potentially explosive atmospheres
- Warning against hot surface

General notice
Disconnect from mains
Wear respirator
Wear eye/face protection
Wear protection gloves

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.

- 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.

### DANGER

**Toxic, corrosive gases**

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

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

### 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.

### 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.

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**CAUTION**  
**Contusion hazard**  
Contusion of the fingers  
Don’t have your fingers caught between eccenter and slide.

![Fig. 1](image1.png)  
![Fig. 2](image2.png)
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

**CAUTION**

**Equipment damage**
Protect the equipment, particularly gas connections and gas lines, from dust, falling objects, as well as external blows.

**Lightning**
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.

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

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.

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

**P2.3 / P2.83**
For mounting the sample gas pump to mounting plates only use the included brackets and rubber-metal buffers. Use these buffers as well if the pump is installed on an existing substructure.

**P2.4 / P2.84**
Please refer to the attached drawings 42/011-14-3 for P2.4 and 42/014-Z05-03-3 for P2.84 for mounting instructions. Here you also find the dimensions for the wall cut-out.

Install the pump always and only with the flange to the housing, cabinet or wall. Fixing the motor in addition is neither required nor admissible because then the system is mechanically over-determined.

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

---

**CAUTION**

Damage to the device

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.

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 (tightly-tightening torque of the hexagonal bolts 3Nm). Offsetting the installation of the pump head by 45° is not permitted!

---

Figure 3
Figure 4
Figure 5
4.4 Connecting the sample gas line

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).

The pumps are marked with “In” for inlet (input) and “Out” for outlet (output). Make sure that the connections to the tubes are tight.

4.5 Electrical connections

**WARNING**

- Hazardous electrical voltage
  - The device must be installed by trained staff only.

**CAUTION**

- Wrong mains voltage
  - Wrong mains voltage may damage the device.
  - Regard the correct mains voltage as given on the type plate.

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 1.5 mm².

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 (P2.x) or under 400 l/h (P2.8x) in continuous operation, a bypass is available,
- the ambient parameters are complied with,
- information on rating plates is observed,
- the voltage and frequency of the motor correspond to those of the network,
- the electrical connections are tightly fastened and the monitoring devices have been connected and configured correctly!
- 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,
- the elastomer sprocket of the coupling (only P2.4 / P2.84) is correctly installed and undamaged.

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 must be at least 50 l/h for the P2.x and at least 200 l/h for the P2.8x pumps. In the event of throttling under 150 l/h for the P2.x or under 400 l/h for the P2.8x 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 screwdriver (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 and 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: \(P_{2.3}/P_{2.4} = 1.7\) bar; \(P_{2.83}/P_{2.84} = 3.5\) bar

Negative pressure: \(P_{2.3}/P_{2.4} = -0.65\) bar; \(P_{2.83}/P_{2.84} = -0.75\) bar

Flow rate: \(P_{2.3}/P_{2.4} = 400\) l/h; \(P_{2.83}/P_{2.84} = 800\) 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.

6.4 Changing the Coupling

In the event of a break in the coupling, the cause for the break must be investigated in every case! If the cause is, for example, a seized-up bearing, then the entire head should be replaced.

- Dismantle the pump head and motor with the coupling flange (see the installation description of the pump).
- Dismantle the coupling flange from the motor.
- After releasing the grub screw, remove coupling parts from the shaft and attach the new coupling.
- Screw the coupling flange to the motor again and re-install the pump as in the original installation.
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 -
Harkortstraße 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 and fault rectification

**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 defective</td>
<td>Replace the 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 “Replacing inlet and outlet valves”.</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 see chapter “Replacing the O-ring of a bypass valve”</td>
</tr>
<tr>
<td></td>
<td>– Bellow cracked</td>
<td>Should be repaired by Bühler service or refer to “Replacing bellow and connection rod-eccentric-combination”.</td>
</tr>
<tr>
<td></td>
<td>– Spider cracked / worn-out</td>
<td>Should be repaired by Bühler service or “Inspecting and replacing the flexible spider”.</td>
</tr>
<tr>
<td>Pump noisy</td>
<td>– crank gear worn-out</td>
<td>Should be repaired by Bühler service or refer to “Replacing bellow and connection rod-eccentric-combination”.</td>
</tr>
<tr>
<td></td>
<td>– Spider worn-out</td>
<td>Should be repaired by Bühler service or “Inspecting and replacing the flexible spider”.</td>
</tr>
<tr>
<td></td>
<td>– Coupling hub loose</td>
<td>Have it repaired by a Bühler service technician or tighten the stud-bolt of the coupling hub to 1.34 Nm</td>
</tr>
<tr>
<td></td>
<td>– Motor hub loose</td>
<td>Replace the motor</td>
</tr>
<tr>
<td>Premature spider worn-out</td>
<td>– E. g. caused by Ozone contact or similar, effecting 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 the start-up conditions</td>
</tr>
<tr>
<td>Poor performance</td>
<td>– Leakage</td>
<td>Re-tighten the head screws, regard allowed torque (see chapter Maintenance).</td>
</tr>
<tr>
<td></td>
<td>– Bellow cracked</td>
<td>Should be repaired by Bühler service or refer to “Replacing bellow and connection rod-eccentric-combination”.</td>
</tr>
<tr>
<td></td>
<td>– Valves defective or contaminated</td>
<td>Blow out valves carefully or replace them or refer to chapter “Replacing inlet and outlet valves”.</td>
</tr>
</tbody>
</table>

*Tab. 1: Troubleshooting and fault rectification*
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>P2.3 / P2.4</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>Flexible spider for coupling</td>
<td>4220011</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>P2.83 / P2.84</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>Flexible spider for coupling</td>
<td>4220011</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>
</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 General specifications for all pumps

**General Specifications**

Nominal voltage / Power input: see ordering information

Protection class:
- Electric IP55
- Mechanical IP20

Dead volume: 8.5 ml

Materials of parts in contact with mediums by pump type:
- PTFE / PVDF (standard pump with 100 °C valves)
- + PEEK (standard pump with 160 °C valves)
- + Viton (standard pump with 160 °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)

9.2 Feed Curves

**P2.3, P2.3C, P2.4, P2.4C**

- Vacuum
- Atmos. pressure
- Excess pressure

**P2.83, P2.84**

- Vacuum
- Atmos. pressure
- Excess pressure

9.3 Technical data for P2.3 and P2.83

**P2.3/P2.83 Technical Data**

<table>
<thead>
<tr>
<th>Weight: 6.5 kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM C-US (115 V only)</td>
</tr>
<tr>
<td>FM approval no.: 3038101/3038101C</td>
</tr>
<tr>
<td>Ambient temperature: max. 60 °C</td>
</tr>
<tr>
<td>Medium temperature: PTFE/PVDF valves max. 100 °C</td>
</tr>
<tr>
<td>PTFE/PEEK valves max. 160 °C</td>
</tr>
</tbody>
</table>

9.4 Technical data for P2.4 and P2.84

**P2.4/P2.84 Technical Data**

<table>
<thead>
<tr>
<th>Weight: 7.5 kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM C-US (115 V only)</td>
</tr>
<tr>
<td>FM approval no.: 3038101/3038101C</td>
</tr>
<tr>
<td>Ambient temperature</td>
</tr>
<tr>
<td>Motor: max. 60 °C</td>
</tr>
<tr>
<td>Pump head: max. 100 °C</td>
</tr>
<tr>
<td>Medium temperature: PTFE/PEEK valves max. 160 °C</td>
</tr>
</tbody>
</table>
9.5 Dimensions P2.3 and P2.83

Gas connections of choice (see ordering instructions)

Adjustable bypass valve (optional)

View "A"

Mounting bracket

9.6 Dimensions P2.4 and P2.84

Gas connections of choice (see ordering instructions)

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.

Wall max. 30
10 Attached documents

- Spare parts drawing P2.3: 42/008-17-3
- Spare parts drawing P2.83: 42/014-01-3
- Assembly and spare parts drawing P2.4: 42/011-14-3
- Assembly and spare parts drawing P2.84: 42/014-Z05-03-3
- Declaration of conformity: KX 42 0001
- RMA - Decontamination Statement
Für alle Übrigen Ersatzteile des Pumpenkopfes siehe Zeichnung 42/008-17-3 für P2.3 Pumpes.

Stößel komplett mit Lager connecting rod with bearing
Art.-Nr.: 4200018

Exzenter, Gewicht und Gewindestift eccentric, counterweight and set screw
Art.-Nr.: 4200074

Schraube / screw
DIN 7985 M5x6
Art.-Nr.: 9011496

Verbindungsschrauben mounting screws

Montagering mounting ring

Kupplungsflansch coupling flange

max 30 Wand wall

45 Schauloch inspection hole

Motor motor

Wandausschnitt mounting cut-out


Alle Rechte vorbehalten

Benennung: Ersatzteil/Montagezeichnung spare parts/assembly drawing
Meßgaspumpe/sample gas pump
P2.4

Art.-Nr.: 42011-14-3E

Datum Name
02.10.98 Veit

Verkauf

Technologien Ratingen

BÜHLER

Zeichnung Nr. 42/008-17-3
Montage:
- Handauschnitt nach Zeichnung herstellen.
- Verbindungsschrauben lösen und Pumpenkopf/Zwischenflansch vom Kupplungsflansch trennen.
- Motor mit Kupplungsflansch von außen und Montagerring von innen miteinander mit passenden Schrauben und Muttern (M6) montieren.
- Pumpenkopf/Zwischenflansch mit Kupplungsehälte und Zahnkranz auf das Gegenstück schieben und mit den Verbindungsschrauben montieren.
- Motor gemäß dem Schaltbild im Gehäusedeckel des Anschlusskastens anschließen.
- Betriebs- und Montageanleitung beachten.

Assembly:
- Cut out wall of cabinet according to drawing.
- Detach mounting screws and separate pump head/intermediate flange from coupling flange.
- Attach motor with coupling flange outside to the mounting ring inside.
- Use properly bolts and nuts (M6).
- Move pump head/intermediate flange into place and make sure that the coupling are aligned with spider in place.
- Use the mounting screws to fix the pump head/intermediate flange with the coupling flange.
- Connect the motor according to the circuit diagram in the cover of the housing of the terminal box.
- Pay attention to the installation and operation instructions.
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:

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

**Produkt / products:** Messgaspumpen / Sample gas pumps

**Typ / type:** P 2.3, P 2.83, P 2.4, P 2.84, P 2.6

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 60204-1:2006**

**EN 61000-6-2:2005**

**EN 55011:2009**

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

[Signature]

Stefan Eschweiler
Geschäftsführer – Managing Director

[Signature]

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 Dekontamination**

**RMA-Form and explanation for decontamination**

**RMA-Nr. / RMA-No.**

Die RMA-Nummer bekommen Sie von Ihrem Ansprechpartner im Vertrieb oder Service. Sie may obtain the RMA number from your sales or service representative.

Zu diesem Rücksendeschein gehört eine Dekontaminationserklärung. Die gesetzlichen Vorschriften schreiben vor, dass Sie uns diese Dekontaminationserklärung 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.

<table>
<thead>
<tr>
<th>Firma/ Company</th>
<th>Ansprechpartner/ Person in charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firma/ Company</td>
<td>Name/ Name</td>
</tr>
<tr>
<td>Straße/ Street</td>
<td>Abt./ Dept.</td>
</tr>
<tr>
<td>PLZ, Ort/ Zip, City</td>
<td>Tel./ Phone</td>
</tr>
<tr>
<td>Land/ Country</td>
<td>E-Mail</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gerät/ Device</th>
<th>Serien-Nr./ Serial No.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Anzahl/ Quantity</th>
<th>Artikel-Nr./ Item No.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Auftragsnr./ Order No.</th>
<th>bitte spezifizieren/ please specify</th>
</tr>
</thead>
</table>

**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:

<table>
<thead>
<tr>
<th>Explosiv/ explosive</th>
<th>Entzündlich/ flammable</th>
<th>Brandfördernd/ oxidizing</th>
<th>Komprimierte Gase/ compressed gases</th>
<th>ätzend/ caustic</th>
<th>giftig, Lebensgefahr/ poisonous, risk of death</th>
<th>gesundheitsgefährdend/ harmful to health</th>
<th>gesundheitsgefährdend/ health hazard</th>
<th>umweltgefährdend/ environmental hazard</th>
</tr>
</thead>
</table>

**Bitte Sicherheitsdatenblatt beifügen/ Please enclose safety data sheet.**

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

_Diese Erklärung wurde korrekt und vollständig ausgefüllt und von einer dazu befugten Person unterschrieben. Der Versand der (dekontaminierten) Geräte und Komponenten erfolgt gemäß den gesetzlichen Bestimmungen._

This declaration has been filled out correctly and completely, and signed by an authorized person. The dispatch of the (decontaminated) devices and components takes place according to the legal regulations.

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

Should the goods not arrive clean, but contaminated, Bühler reserves the right, to commission an external service provider to clean the goods and invoice it to your account.

Firmenstempel/ Company Sign

Datum/ Date

rechtsverbindliche 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.