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.

DANGER

Diffusing pumped media
Explosion hazard! Formation of explosive atmosphere due to escaping flammable gases.
When operating the sample gas pumps with media that tend to diffuse strongly, such as hydrogen (H_2) in high concentrations, it is essential to note that these are not permanently technically leak-proof due to their design. To ensure safe operation, the official regulations for installation and operation must be observed. In addition to regular leakage checks, suitable technical measures such as gas monitoring devices, technical ventilation, etc. must be provided depending on the installation situation.

CAUTION

Use appropriate tools

According to DIN EN 1127-1, the operator is responsible to select and use appropriate tools.

CAUTION

Contamination of cleaned components

For P2.x ATEX-O2 sample gas pumps (item no.: 42.....-O2), contamination with oil, grease, dust, particles, lint, hair, etc. must be ruled out for fire protection reasons when working on components that come into contact with media. If necessary, adapt your operational and organisational measures with regard to the work clothing to be used, hygiene regulations, etc. If necessary, move such work to a suitable, cleaner work area.

CAUTION

Unit leakage rate

With P2.x ATEX-H2 sample gas pumps (item no.: 42.....-H2), the leakage rate is tested at the factory to verify compliance with defined limit values. This may deviate after loosening or retightening cap screws and/or pipe fittings. Carry out a new test if necessary.

4.1 Requirements to the installation site

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.

CAUTION

Avoid vibrations and resonances

The operator is responsible to mount the pump in a way that vibrations and resonance do not cause premature failure resulting in creating an effective ignition source.

The sample gas pump must only be assembled, connected and disassembled in a non-Ex zone with the unit cooled down.

Never block the vent. The exhaust air, including from adjacent units, must not be immediately suctioned in.

When installing without a Bühler mounting bracket, ensure adequate distance between the motor and the back panel (at least 40 mm).

The sample gas pumps are rated for altitudes <= 1000 m. They're available in various styles, and the specific technical data may vary. Therefore, you should always note all of the device-specific data on the pump and motor type plate, along with their specific limits – see Technical Data.

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 Installation

CAUTION	**Damage to the device**
	Protect the device, especially the gas inlets and tubes, against dust, falling parts and external impact.

P2.2 ATEX/P2.72 ATEX

When installing the P2.2 ATEX/P2.72 ATEX on mounting plates, use the included mounting bracket and only the included rubber/metal bumpers. Operation without rubber/metal bumpers is prohibited. These must also be used when installing the pump on an existing substructure. For the hole pattern in the mounting bracket and the motor foot, please refer to the technical data at the end of the operating and installation instructions.

P2.4 ATEX/P2.74 ATEX

When installing the P2.4 ATEX/P2.74 ATEX sample gas pump, please note the assembly drawing **42/025-Z02-02-2**. Before beginning the installation, ensure that the sample gas pump is complete. You will also require 6 x M6 bolts of suitable length and nuts for installation.

The pump head on all pump types can only be aligned turned by 0° or 180°.

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

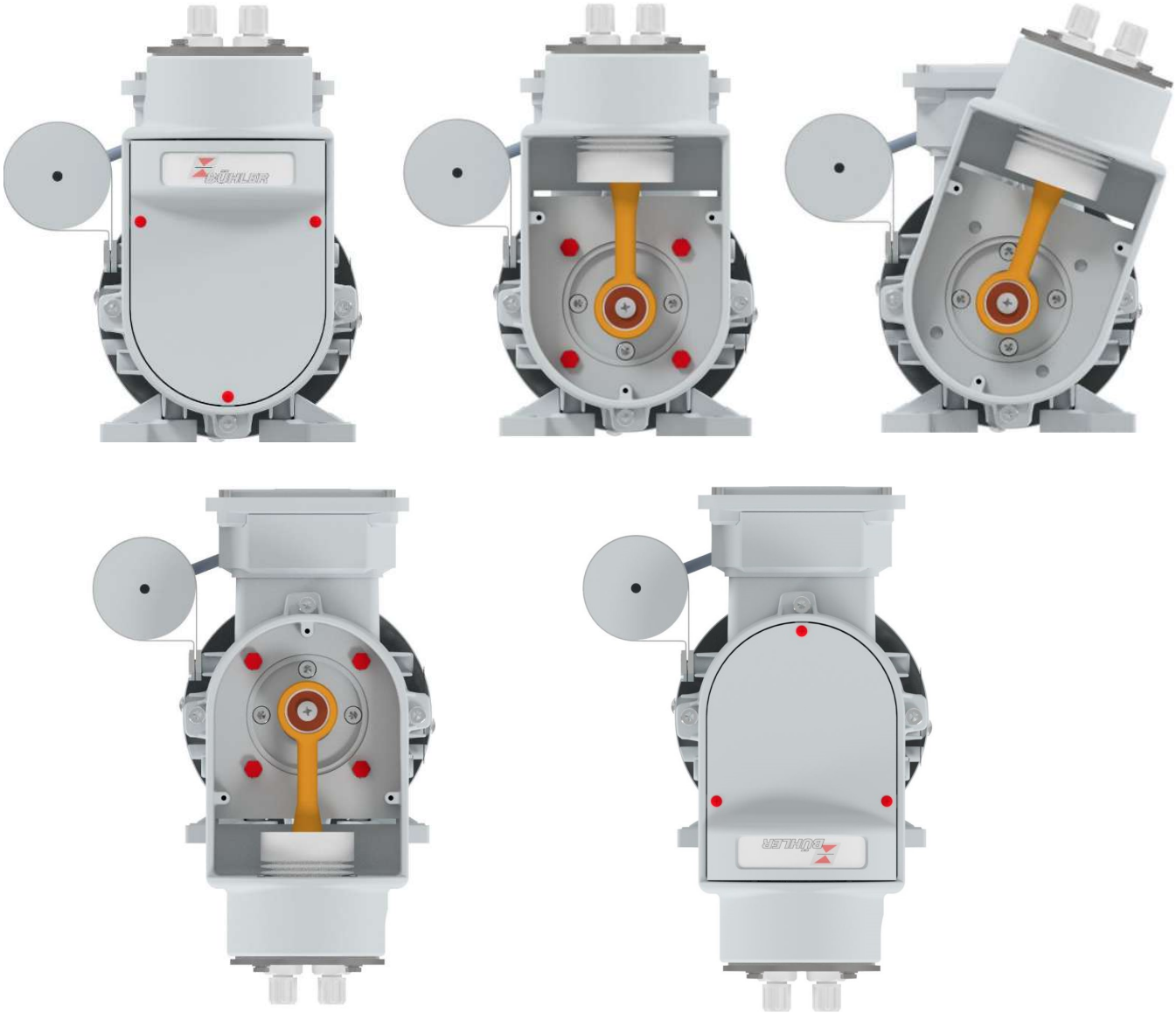
Damage to the device

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.

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

– Remove the three cross-tip screws (9) and remove the console cover (8) from the pump console (5). This exposes the crank gear (10) and the Motor flange or, depending on pump model, the intermediate flange.
– The Pump console attaches to the flange with four hexagon screws (7) and lock washers (6). Completely unscrew these, holding the pump console, and rotate it 180° on the centring of the flange.
– Reinstall all parts in the reverse order. Please note the torque of the hexagon screws (7) is 3 Nm.

Installing the pump head offset by 90° is prohibited!



4.4 Connecting the gas tubes

The pumps are fitted with the connections you have selected (not pre-assembled for sample gas pumps P2.x ATEX-O2). Compare the item number on the type plate with the item number structure in the Introduction [> page 2]

Avoid mixed-material installation, i.e. piping on plastic bodies. If this cannot be avoided in isolated applications, screw the metal connections into the PTFE pump body with care, taking care to avoid use of force.

Lay the lines so that the line at the inlet and outlet remains flexible for an adequate distance (pump vibrates).

The pumps are marked **“In”** for inlet and **“Out”** for outlet. Ensure that the gas line connections are tight.

For P2.x ATEX-O2 sample gas pumps (item no.: 42.....-O2), only RT fittings (tapered thread) are supplied by the factory as separately packaged accessories. These must be fitted with $_2$PTFE sealing tape approved for O applications (see Spare parts and accessories [> page 29]).

4.4.1 Monitoring the sample gas pump

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 bellow 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.

4.4.1.1 General monitoring measures

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

In addition, the flow rate of the pump (to the sample gas outlet) must be monitored with a suitable flow meter.

For more information or Inspecting the bellow [> page 22] the maintenance schedule, please refer to the chapter Maintenance at the end of the operating and installation instructions.

4.4.1.2 Monitoring measures when conveying flammable and/or toxic gasses

Conveying flammable and/or toxic gasses **further requires** continuous monitoring **of the sample gas** pump during operation. This can be done as follows (1) or (2).

1. Flow rate monitor before the pump's gas inlet and after the gas outlet. A sudden reduction of the suction volume / flow volume ahead of the pump and consistent or suddenly increased flow volume after the pump indicates a defective bellow (the pump can convey ambient air suctioned in due to the tear).
2. Vacuum monitoring before the pump's gas inlet and flow monitoring after the gas outlet (see illustration). A sudden drop in the vacuum before the gas inlet indicates a defective bellow.

When conveying flammable gasses above the upper explosive limit (UEL) we further recommend monitoring the lower explosive limit (LEL) in the installation location.

When conveying toxic gasses we recommend MAC monitoring (MAC: Maximum Workplace Concentration) at the installation site.

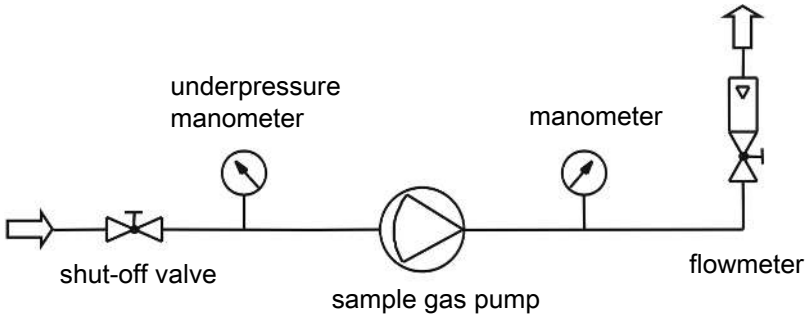


Fig. 1: Sample flow diagram of suitable monitoring

4.5 Electrical connections

WARNING	**Hazardous electrical voltage** The device must be installed by trained staff only.
WARNING	Inverter operation is forbidden!
WARNING	Regard National directives concerning installation and operation of electrical devices in hazardous areas when installing and commissioning the motor (e. g. EN 60079-14).
CAUTION	**Wrong mains voltage** Wrong mains voltage may damage the device. Regard the correct mains voltage as given on the type plate.

Only operate the unit with the factory installed motor. The user must not exchange the unit or replace it with a different motor.

The sample gas pump must be protected against prohibited heating with suitable overload protection (motor protection switch per approval).

Please note the rated current for the motor protection switch settings (see motor type plate).

Verify the pump motor has the correct voltage and frequency: Voltage tolerance ±5 %, frequency tolerance ±2 % - from rated value.

Properly connect the sample gas pump per the respective wiring diagram (see below). If the wiring diagram inside the cover of the terminal box is different, observe that instead. The required tightening torque for the nuts on the terminal board is 1.5 Nm.

Ensure the connecting cable has adequate cable relief. The clamping area of the cable gland is 6-12 mm. The required tightening torque for the cable gland is 5 Nm.

The supply line and earthing cross-sections must be aligned with the rated current. Use a minimum line cross-section of 1.5 mm^2.

Be sure to connect the following protective earth terminals to your on-site earth conductor per local regulations:

– Protective earth terminal inside the motor terminal box.
– Protective earth terminal on the outside of the motor housing.
– Protective earth terminal on the mounting bracket. (The earth bolt on the mounting bracket may alternatively be connected to the protective earth connection on the outside of the motor housing via cable bridge.)

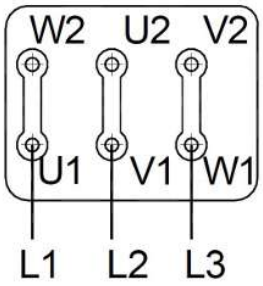
Stray electric currents may not flow through this connection.

No foreign objects, contaminants or moisture may be inside the junction box. Any unused cable gland openings must be sealed with plugs approved for the application (if necessary Atex, IECEx).

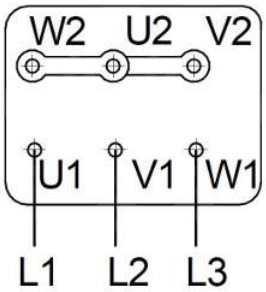
To maintain the IP rating specified by the manufacturer, when sealing the terminal box with the cover ensure the original seal is correctly seated and tighten the bolts at 5 Nm.

Be sure to observe any varying information in the rating plate. The conditions at the site must correspond with all rating plate information.

Three-phase motors
Delta connection
lower voltage



Three-phase motors
star connection
higher voltage



AC motors with operating capacitor