# Type 8880-PW / PB / PT

## Vessel Pressure Control System

# Operating Instructions

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We reserve the right to make technical changes without notice.



Operating Instructions 2511/02_EU-ml_60039158 / Original DE

# Table of contents

# 1. OPERATING INSTRUCTIONS

The operating instructions describe the entire life cycle of the system. Keep these instructions in a location which is easily accessible to every user and make these instructions available to every new owner of the product.

**The operating instructions contains important safety information!**

Failure to observe these instructions may result in hazardous situations.

- The operating instructions must be read and understood.

## 1.1. Symbols

**DANGER!**

**Warns of an immediate hazard!**

Failure to heed this warning will result in death or serious injury.

**WARNING!**

Warns of a potentially dangerous situation!

Failure to heed this warning may result in death or serious injury.

**CAUTION!**

**Warns of a potential danger!**

Failure to observe may result in moderate or minor injuries.

**NOTE!**

**Risk of damage to property!**

Failure to observe may result in damage to the device or the system.

Indicates important additional information, tips and recommendations.

Refers to information in these operating instructions or in other documentation

- Indicates an instruction to avoid risks

→ Indicates a work step that you must carry out

## 1.2. Definition of the term "system"

The term "system" used in these operating instructions always refers to the type 8880 vessel pressure control system.

# 2. INTENDED USE

**Unauthorised use of the type 8880 vessel pressure control system may be dangerous to people, nearby equipment and the environment.**

**The system is designed to maintain constant pressure in vessels and tanks.**

- The following applies for use in areas at risk of explosion:
  **All** components of the system must be Ex-approved and bear an Ex type label!
  The system may only be used in accordance with the specifications on the Ex type label and the additional ATEX instructions.
- When using the system, the permissible data, operating and usage conditions specified in the contract documents and the operating instructions must be observed. The intended applications are listed in chapter "6. Technical data".
- In view of the multitude of possible applications, the system must be checked to ensure it is suitable for the specific application.
- The system may only be used in conjunction with products and components from other manufacturers that are recommended and approved by Bürkert.
- Prerequisites for safe and trouble-free operation include correct transport, appropriate storage and installation, as well as careful operation and maintenance.
- Do not expose the system to direct sunlight.
- Use the system only as intended.

# 3. BASIC SAFETY INSTRUCTIONS

These safety instructions do not take into account any contingencies or incidents that may occur during installation, operation and maintenance.

The operator is responsible for compliance with local safety regulations, including those relating to personnel.

**DANGER!**

**Explosion risk in areas at risk of explosion!**

Improper use in areas at risk of explosion may result in explosions.

- All components of the system must have permission for use in areas at risk of explosion!
  The additional instructions containing safety information for areas at risk of explosion (Ex) must be followed.

**WARNING!**

**Risk of injury from high pressure in the system.**

- Before working on the system, switch off the pressure and vent/drain the lines.

**Risk of injury from electric shock.**

- Before reaching into the system, switch off the power supply and secure against reactivation!
- Observe all applicable accident prevention and safety regulations for electrical devices!

**WARNING!**

**General hazardous situations.**

To prevent injuries, ensure that:

- The system may only be operated in perfect condition and in accordance with the operating instructions.
- Secure the system against unintentional activation.
- Installation and maintenance may only be carried out by trained specialists.
- After an interruption in the power supply, ensure that the process is restarted in a controlled manner.
- Observe accepted engineering practice.
- Do not make any changes to the interior or exterior of the system, and do not place mechanical strain on it.

**NOTE!**

**Electrostatically sensitive components/assemblies!**

The system contains electronic components that are susceptible to the effects of electrostatic discharging (ESD). Every contact with electrostatically charged persons or objects endangers these components. In the worst-case scenario, they will be destroyed immediately or will fail after start-up.

- Observe the requirements of DIN EN 61340-5-1 in order to minimise and/or avoid the possibility of damage caused by sudden electrostatic discharge!
- Do not touch electronic components while the operating voltage is switched on!

# 4. GENERAL INFORMATION

## 4.1. Contact addresses

**Germany**

Bürkert Fluid Control Systems
Sales Center
Christian-Bürkert-Str. 13-17
D-74653 Ingelfingen

Phone: + 49 (0) 7940 - 10 91 111
Fax: + 49 (0) 7940 - 10 91 448
Email: info@burkert.com
Website: www.burkert.com

**International**

Further contact details are available at:
https://country.burkert.com/?url=man-contact.

## 4.2. Information online

Operating instructions and data sheets for the type 8880 and other components can be found on the internet:

https://country.burkert.com

The following table lists the direct links/QR codes for type 8880 and its components:

| Type | Image | QR code | Type | Image | QR code |
|---|---|---|---|---|---|
| **8880** |  | | 8325 |  | |
| 2103 |  | | 8692 |  | |
| 2301 |  | | 8693 |  | |
| 2380 |  | | 8694 |  | |
| 2518 |  | | 8696 |  | |

## 4.3. Warranty

The warranty only applies if the system is used as intended and in compliance with the specified application conditions.

# 5. DESCRIPTION OF THE DEVICE

## 5.1. General description/components

Type 8880 usually contains the following components:

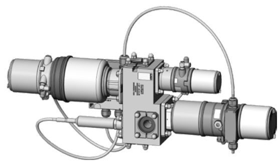
- **Valve block/body** made of stainless steel with integrated valve seats,
- **2 control valves** (inlet, exhaust),
- **Positioner** (type 8696 or 8694),
- **Process/position controller** (type 8693, modified),
- **Pressure transmitter,**
- Internal connecting cables**.**

The system **communicates** via:

- 4...20 mA signals for pressure set-point value and feedback,
- Display/pushbuttons on type 8693,
- Service interface (see operating instructions for types 869x).

For details, see chapter “8” on page 23.

A special variant – designed to prevent the tank from collapsing – is the **pressure control system with a bypass valve**.

| | |
|---|---|
|  | All specific details regarding this bypass variant are summarised in chapter “9. Type 8880 with bypass valve” on page 28.<br><br>Example 8880-PB04 or PB05 |

## 5.2. Structure/components

The following examples show the wide range of possible applications for the components (see also the data sheet for type 8880).

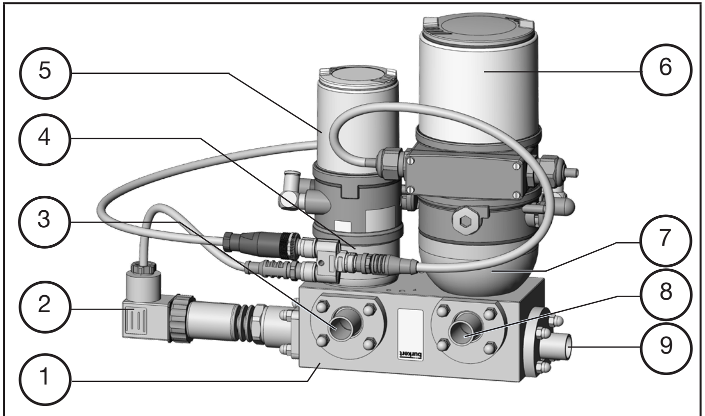



*Fig. 1: Design: block variant (example 8880-PB01)*

Key:

| Item | Description | Item | Description |
|---|---|---|---|
| (1) | Valve block/body | (6) | Process and position controller (type 8693) |
| (2) | Pressure transmitter | | |
| (3) | Media inlet | (7) | Exhaust valve V2 |
| (4) | Inlet valve V1 | (8) | Exhaust |
| (5) | Positioner (type 8696/8694) | (9) | Tank connection |

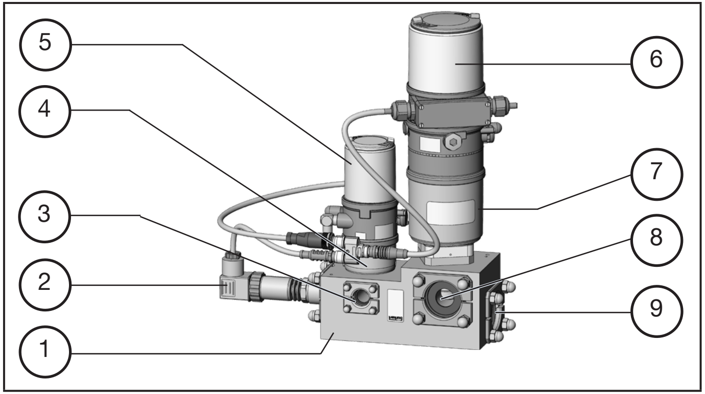



*Fig. 2: Design: block variant (example 8880-PB03)*

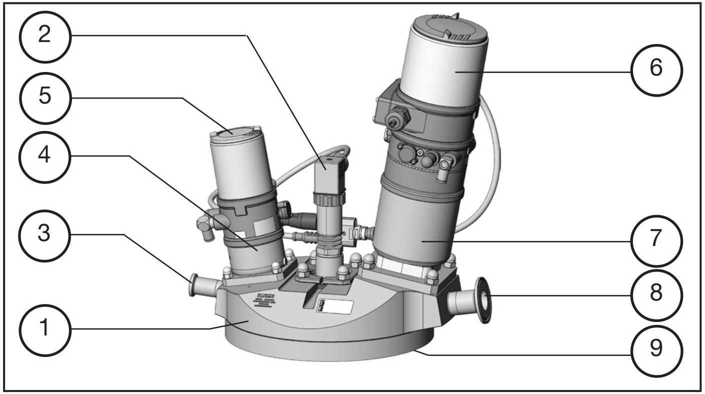



*Fig. 3: Design: tank-integrated variant (example 8880-PT01)*

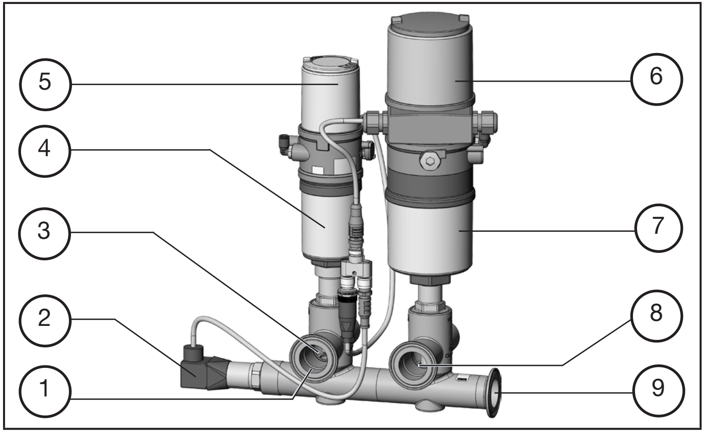



*Fig. 4: Design: seat valve variant (example 8880-PW01)*

**The properties** of the system can be selected. Further details can be found in the data sheet for type 8880 on our website.

**Further variants** and options available on request (see "4.1").

Further details on **types 8692/93 and 8696 or 8694** can be found in the relevant documentation on our website: https://country.burkert.com.

## 5.3. Functional diagram

The following diagram shows the main components of the system, the fluidic principle and the connections of the controller.

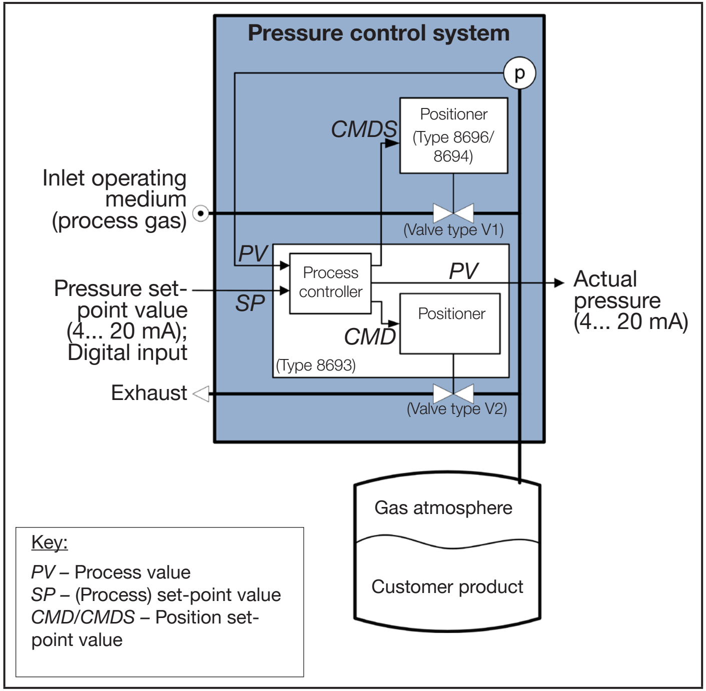
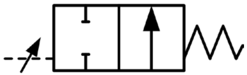



*Fig. 5: Functional diagram*

## 5.4. Control function A (normally closed), B (normally open)

The control function (CF) of the valves is shown in the following pictograms:

| | |
|---|---|
|   **A**: normally closed (NC) |   **B**: normally open (NO) |
| Pneumatically controlled, closed in rest position by spring force | Pneumatically controlled, opened in rest position by spring force |

The CF of the valves can be found in the Bürkert type code.

The inlet valve usually has CF A. The exhaust valve can have either CF A or CF B, which results in different fail-safe behaviour:

| CF of the exhaust valve | Fail-safe behaviour |
|---|---|
| A | Maintaining tank pressure |
| B | Tank vented |

# 6. TECHNICAL DATA

## 6.1. Conformity, standards, approvals

The system complies with the relevant EU harmonisation legislation.

The harmonised standards applied in the conformity assessment procedure are listed in the current version of the EU declaration of conformity.

(The following applies to **areas at risk of explosion**: each component of the system requires its own Ex approval – see chapter “2” and “3”.)

## 6.2. Type label for type 8880 (example)

The type label for the system (type 8880) is marked with 8880 in line 1 (sub-components may also have their own type label).

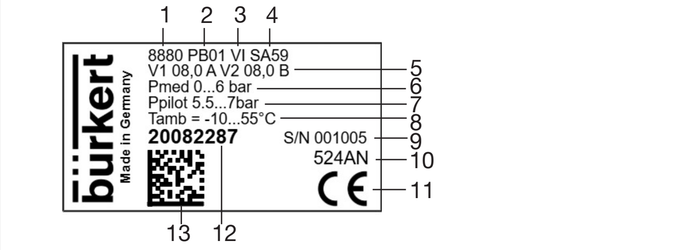



*Fig. 6: Type label for type 8880 – example*

Key:

| | |
|---|---|
| 1 | Type 8880 |
| 2 | **Block configuration,** e. g.:<br>PB01 Block variant, sterile orbital connection piece<br>PB03 Block variant, integrated clamp contour<br>PB05 Block variant, inlet bypass block-integrated<br>PW01 Variant with modular welded body<br>PT01 Tank-integrated variant |
| 3 | **Body material**, e. g.:<br>VA Stainless steel<br>VI 1.4435 BN2<br>VN 1.4410<br>VK 1.4539 |
| 4 | **Tank port connection**, e. g.:<br>GM86 Threaded connection G 1<br>SA44 Welded connection 33.7 x 2<br>SA59 Welded connection 18 x 1<br>SD42 Welded connection 19 x 1.5<br>TC44 Clamp connection 50.5 x 33.7 x 2<br>TG04 Clamp connection 50.5 x 25.4 x 1.65<br>TG05 Clamp connection 50.5 x 38.1 x 1.65 |
| 5 | Specification inlet valve V1 and exhaust valve V2:<br>seat size and CF (see also “5.4”) |
| 6 | Medium pressure in bar(g) |
| 7 | Pilot air pressure in bar(g) |
| 8 | Ambient temperature |
| 9 | Serial number S/N |
| 10 | Date of manufacture (encoded) |
| 11 | CE mark (possibly other icons) |
| 12 | ID number |
| 13 | Data Matrix (identification and serial number) |

## 6.3. Operating conditions

**WARNING!**

**Risk of injury if the permissible operating conditions are not observed!**

Important system-specific technical specifications are indicated on the type label.

- Observe the permissible operating conditions.

| | |
|---|---|
| Ambient temperature | -10 °C to +55 °C |
| Protection class | IP65/67 according to EN 60529 |

## 6.4. Media data

| | |
|---|---|
| Operating medium (process gas) | Air/nitrogen/carbon dioxide (or other media compatible with the materials used) |
| Medium temperature | 8880-PW: -10 to +100 °C;<br>8880-PB/PT: -10 to +70 °C<br>on request: special version for steam sterilisation with max. +134 °C (short-term) |
| Operating pressure | Typically 0 to 6 bar(g) (see type label) |
| Port connections | Welded connection/clamp connection/ flange connection/threaded connection (sizes on request) |

## 6.5. Mechanical data

| | |
|---|---|
| Dimensions | See data sheet for type 8880 |
| Weight | Approx. 5 to 16 kg |
| Body material | e. g.: 1.4435, 1.4410 (others on request) |
| Sealing material | e. g.: PTFE, EPDM (others on request) |

## 6.6. Pneumatic data

| | |
|---|---|
| Control medium | Air, neutral gas – quality classes as per ISO 8573-1:<br>dust content: quality class 7,<br>water content: quality class 3,<br>oil content: quality class X |
| Pressure range | 5.5... 7 bar(g) |
| Control functions (valves type 1 and 2) | A (NC – normally closed),<br>B (NO – normally open) |
| Pilot air ports | G1/8 threaded connections with mounted elbow fittings for ø 6 hoses;<br>mounted silencer for exhaust air |

## 6.7. Electrical data

| | |
|---|---|
| Operating voltage | 24 V DC ± 10% |
| Power consumption | < 10 W |
| Electrical data | Defined by the type 869x used |
| Electrical connections | Cable glands and connection terminals for type 8693 – see chapter "7.5" on page 19 |
| Earthing | Ground terminal – connection to valve block (M5 screw as additional fastening point for ring cable lug) |

# 7. INSTALLATION

## 7.1. Safety instructions

**DANGER!**

**Explosion risk in areas at risk of explosion!**

Improper use in areas at risk of explosion may result in explosions.

- The additional instructions for Ex-approved components, which contain safety information for areas at risk of explosion, must be observed (see also chapters “2” and “3” on page 6).

**WARNING!**

**Risk of injury from high pressure in the system.**

- Before working on the system, switch off the pressure and vent/ drain the lines.

**Risk of injury from electric shock!**

- Before reaching into the system, switch off the power supply and secure against reactivation!
- Observe all applicable accident prevention and safety regulations for electrical devices!

**Risk of injury due to improper installation!**

- It must only be installed by qualified and skilled staff with the appropriate tools.

**Risk of injury from unintentional activation of the system/devices and uncontrolled restart of the system.**

- Secure system against unintentional activation.
- Following installation, ensure a controlled restart.

**Type 8880 with bypass valve:**

Special details regarding the installation of the bypass variant can be found in chapter “9. Type 8880 with bypass valve” on page 28.

## 7.2. Installation position

**Ensure self-draining.**
It is the responsibility of the system manufacturer and operator to ensure that the system is self-draining.
See examples in “Fig. 7” and “Fig. 9”.

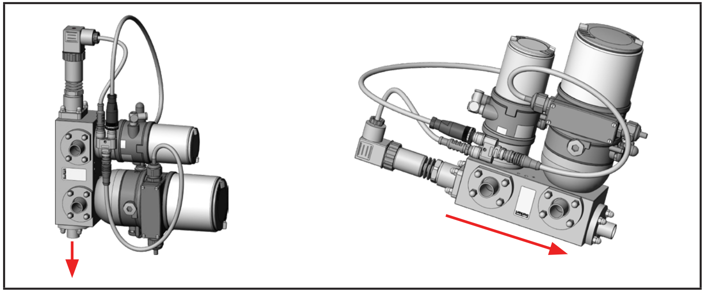


*Fig. 7: Self-draining position of block variants (examples)*

Two M8 threaded holes can be used for additional support of the block. The four screws for each control valve should remain accessible for valve removal so that the bellows can be replaced as described in the operating instructions for bellows valves.

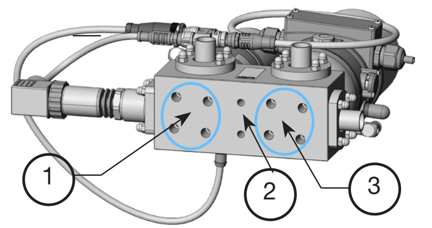
| | |
|---|---|
| **(1)** 4 screws for inlet valve<br>**(2)** Threaded holes for two M8 screws for (additional) fastening of the valve block<br>**(3)** 4 screws for exhaust valve |  |

*Fig. 8: Accessibility of the screws for securing the valves*

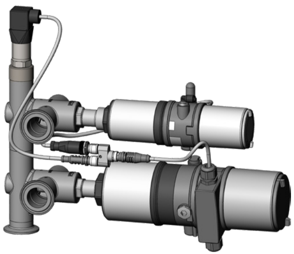


*Fig. 9: Preferred installation position for variant PW01*

## 7.3. Installation of the system

### 7.3.1. Installation into the pipeline

**Robust and secure installation**

It is the responsibility of the system manufacturer and operator to ensure robust and safe installation. The ratio of the size and length of the tube to the weight of the system must be taken into account.

→ Clear impurities from pipelines (sealing material, swarf etc.).

→ Before connecting the system, ensure that the pipelines are flush. Support and align pipelines if necessary.

→ Connect the system to the pipe system/tank.

### 7.3.2. Installation of the block variant

The block variant is typically equipped with welded connections flanged to the block (sterile quick connection) – see “Fig. 10”.

The actuators therefore do not need to be removed from the valve block.

**Procedure for flanged welded connections:**

→ Loosen the flange rings over the welded connections and slide them over the pipelines.

→ Weld the connection pieces (without O-rings) to the pipelines.

→ Connect the block to the connection pieces by fastening the flange rings (reinstall the O-rings beforehand).

→ Always lubricate the threaded bolts when reinstalling the welded fittings after removal.

→ If the pipeline system cannot provide sufficient support, the valve block must be additionally secured using the two M8 threaded holes (see “Fig. 8”).

**Welded fittings:**

Lubricate the thread and pay attention to the O-rings!

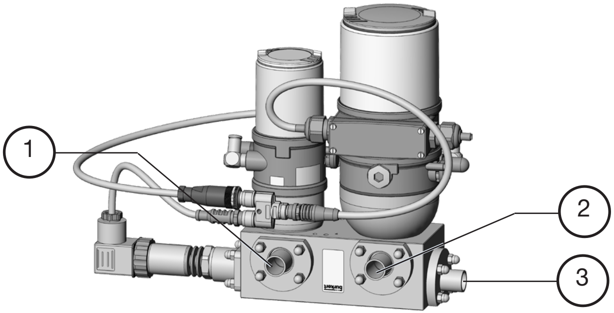



*Fig. 10: Media connections (8880-PB01)*

Key:

| Position | Description |
|---|---|
| (1) | Media inlet |
| (2) | Exhaust |
| (3) | Tank connection |

Variants with integrated clamp contour are also available (e.g. 8880-PB03, see “Fig. 2”).

## 7.3.3. Installation of the tank-integrated variant

**NOTE!**

**Risk of damage to parts/components due to heat during the welding process!**

- Before welding the valve body, remove all valves, actuators, seals and other components mounted on the valve body so that only the steel part remains.

**Risk of mechanical damage to bellows, diaphragm or seat contour!**

- When removing the actuator with controller from the valve body, ensure that the valve is in the open position.

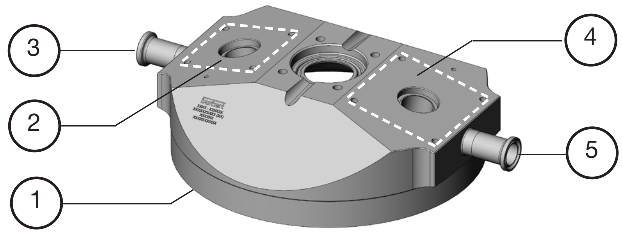



*Fig. 11: Welded connection for valve body on a tank*

Key:

| Item | Description | Item | Description |
|---|---|---|---|
| (1) | Welded connection to the tank | (4) | Large flange interface for exhaust valve |
| (2) | Small flange interface for the inlet valve | | |
| (3) | Media inlet | (5) | Exhaust |

→ For valves with control function A (NC):
Switch the positioner to the MANUAL operating state and open the valve. (For details on opening the valve, see the description in the relevant operating instructions for the types used.)

→ Loosen the nuts on the bolts and remove the actuators, including the seals.

→ Weld the valve body before the installation of the tank.

**NOTE!**

**Risk of damage to parts/components during the welding process!**

- Information on vessels and welding instructions can be found in the ASME VIII Division I standard. Before commencing welding work, check the specified batch number on the supplied manufacturer's certificate 3.1.
- Observe the laws and regulations applicable in the respective country with regard to the qualification of welders and the execution of welding work.

**Before welding, ensure that:**

- welding equipment and materials suitable for the valve body are used.
- the valve body does not collide with other equipment components. The assembly and disassembly of actuator, sensor and other components must be possible.
- a minimum distance between two weld seams is maintained, which is three times the thickness of the container wall.
- the hole in the tank and the weld edge of the valve body are the same size. A smooth transition from the valve body to the container wall must be ensured (regrind if necessary).

**Avoid deformations and stresses inside the containers:**

→ Insert the flange into the hole so that the flange surface touches the container surface.

→ Attach the flange using four spot welds and check the position of the valve body.

→ Weld the valve body evenly to the inside and outside of the container.

→ Allow weld seams to cool.

→ Smooth and brush weld seams.

→ Then connect the valve body to the pipeline system.

→ Before reinstalling seals, actuators and other parts:
- ensure that the valves are in the open position.
- check the correct position of all (seal) parts.

→ Reattach the actuators to the bolts using the nuts, observing the maximum tightening torque (4.5 Nm).

## 7.4. Pneumatic installation

**WARNING!**

**Risk of injury from high pressure in the system.**

- Before working on the system, switch off the pressure and vent/drain the lines.

**WARNING!**

**Risk of injury from unsuitable connections!**

The use of hoses or pipelines that cannot withstand the pressure and temperature range can lead to dangerous situations.

- Only use connections that are permitted for the specified pressure and temperature range.
- Observe the specifications in the manufacturer's data sheet.

**Ensure that the system is functioning properly:**

- Ensure that no back pressure builds up.
- Use connecting pipes with sufficient cross-section.
- The exhaust air line must be designed in such a way that no water or other liquids can enter the system through the exhaust air port 3.
- During operation, fluctuations in pilot pressure must be kept to a minimum (max. ±10%). The control parameters calibrated with the *X.TUNE* function are not optimal for larger fluctuations.

**Connection of the pilot air** (see "Fig. 12")

→ Connect the pilot air to the pilot air port 1 of the type 869x controller.

→ Fit an exhaust air line or a silencer to exhaust air port 3 of the type 869x controller.

If used in an aggressive environment, we recommend conveying all free pneumatic connections into a neutral atmosphere with the aid of a pneumatic hose.

The systems are supplied as standard with elbow plug-in fittings for the pilot air and silencers for the exhaust air.

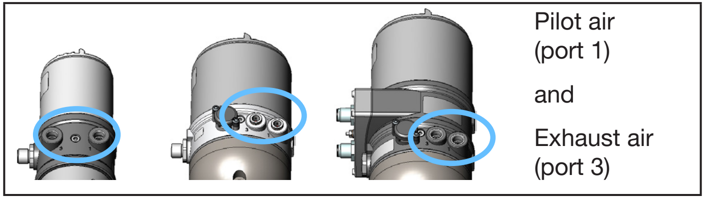



*Fig. 12: Pneumatic ports (for types 8696, 8694, 8692/3)*

## 7.5. Electrical installation

**DANGER!**

**Explosion risk in areas at risk of explosion!**

Improper use in areas at risk of explosion may result in explosions.

- The additional instructions for Ex-approved components, which contain safety information for areas at risk of explosion, must be observed (see also chapters "2" and "3" on page 6).

**WARNING!**

**Danger of electric shock!**

- Before reaching into the system, switch off the power supply and secure against reactivation!
- Observe all applicable accident prevention and safety regulations for electrical devices!

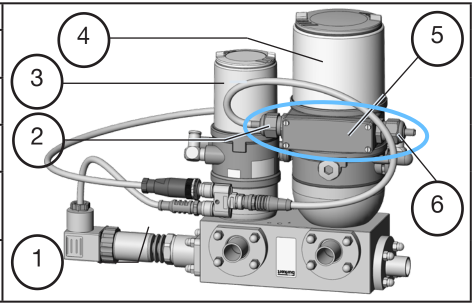
| | |
|---|---|
| **(1)** Pressure transmitter |  |
| **(2)** Cable gland to internal components | |
| **(3)** Positioner type 8696/8694 | |
| **(4)** Process controller type 8693 (modified) | |
| **(5)** Connection terminal with two cable glands | |
| **(6)** Cable gland to PLC | |



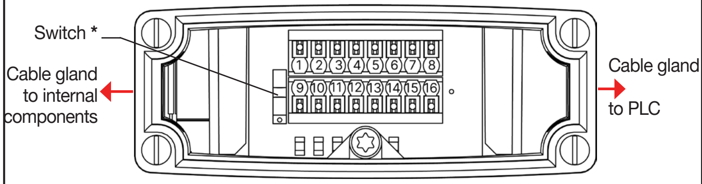
*Fig. 13: Electrical ports (factory-wired)*

The type 8693 process controller is equipped with two cable glands on the connection terminal.

One of the cable glands is intended for wiring the internal system components and is normally wired by Bürkert (terminals 1 to 3, 9 to 13).

The connection to the power supply and the PLC signals is made via the second cable gland (terminals 4 to 8, 14 to 16).

Terminals of type 8693:





| Line | to internal components | | | to the PLC | | | | |
|---|---|---|---|---|---|---|---|---|
| Signal | Analogue Slave GND | Analogue Slave + | Digital out put + | Analogue feedback GND | Analogue feedback + | Digital input + | Set-point value GND | Set-point value + |
| **Terminal** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
| | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** |
| Signal | Process 3 | Process 2 | Process 1 | 24 V (output) | GND (output) | not assigned | GND (input) | 24 V (input) |
| Line | to internal components | | | | | | to the PLC | |

*Table 1: Terminal assignment for type 8693 (modified)*

** for internally supplied transmitter: switch down*

→ Loosen the four fastening screws on the connection cover and remove the cover. The connection terminals of type 8693 are now accessible.

→ Push the cable through the cable gland.

→ Connect the contacts according to table "Table 1".

→ Tighten union nut of cable gland (tightening torque approx. 1.5 Nm).

→ Place the connection cover with the seal inserted onto the electrical connection housing and tighten crosswise (tightening torque max. 0.7 Nm).

**!** For the variant with extended terminal box (var. Code MB15) the connection to the power supply and the PLC signals is made via the terminal box (see "7.6.3" or "9.1.2").

## 7.6. System-internal cabling

The connection of system-internal components (such as the positioner of the inlet valve or the pressure transmitter) to the process controller is usually carried out by Bürkert.

The following information is intended for maintenance purposes or for the connection of an external transmitter only.

### 7.6.1. Y-cable assignment

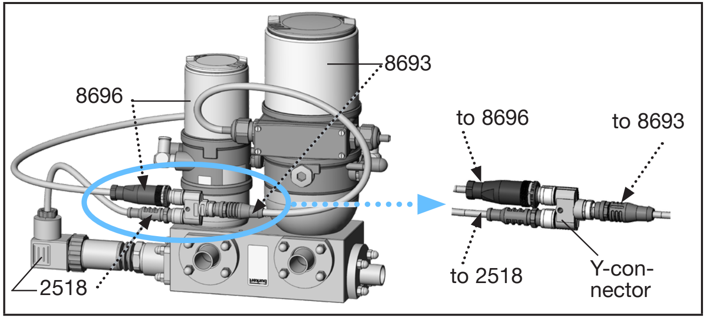



*Fig. 14: Y-cable for electrical connection of components*

When using a Y-shaped cable, the pin assignment is as follows:

| Assignment | Terminal on 8693 | Wire colour cable 8693 | **Pin M12 Y-connector** | Wire colour cable 8696 | Pin M12 8696 | Wire colour cable 2518 | Pin on 2518 |
|---|---|---|---|---|---|---|---|
| 24 V | 12 | Brown | **1** | Yellow | 4 | Brown | 1 |
| Process 1 | 11 | White | **2** | | | White | 2 |
| GND | 13 | Blue | **3** | Green | 3 | | |
| Analogue Slave + | 2 | Black | **4** | White | 1 | | |
| Analogue Slave GND | 1 | Grey | **5** | Brown | 2 | | |
| Process 2 | 10 | bridged (9–10) | | | | | |
| Process 3 | 9 | | | | | | |

*Table 2: Pin assignment of the Y-cable*

## 7.6.2. Terminal box assignment

In some cases (e.g. for Ex applications), a terminal box is used.

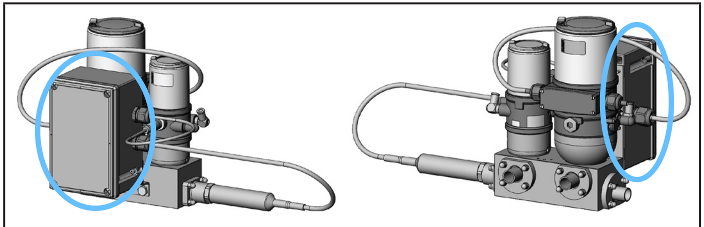
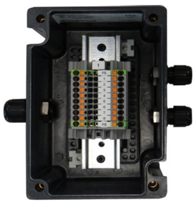


*Fig. 15: Terminal box (example)*

Terminals inside the terminal box –



For assignment, see “Table 3”

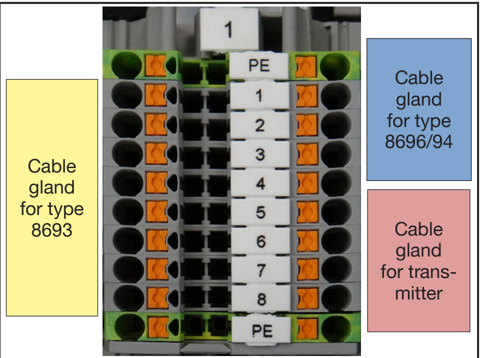



*Fig. 16: Terminal box and terminals*

| Terminal on 8693 | | Wire colour | Assignment | **Terminal** | Assignment | Wire colour | | Pin on component *) |
|---|---|---|---|---|---|---|---|---|
| 1 | Cable gland for type 8693 | Green | Analogue Slave GND | **1** | SP GND | White | Cable gland for 8696/94 | 2 |
| 2 | | Yellow | Analogue Slave + | **2** | SP+ | Brown | | 1 |
| 12 | | Brown | 24 V (output) | **3** | 24 V | Black | | 4 |
| 13 | | Blue | GND (output) | **4** | GND | Blue | | 3 |
| | | (Terminal 3 and 5 bridged) | (24 V output) | **5** | Sensor+ | Brown | Cable gland for transmitter | U+ |
| 11 | | Grey | Process 1 | **6** | Sensor | Blue/ (Green) | | U- |
| 10 | | Red | Process 2 | **7** | (GND) | (Terminal 7 and 8 bridged) | | - |
| 9 | | White | Process 3 | **8** | GND | | | - |

*Table 3: Pin assignment in the terminal box*

For the assignment of the bypass variants of type 8880, see chapter “9”.

## 7.6.3. Assignment of extended terminal box (variable code MB15)

In the variant with an extended terminal box, the contacts for the customer's port (power supply, PLC signals) are also routed via the terminal box:

---

**) “Pin on component”: Pin on respective (individual) component of type 8880*

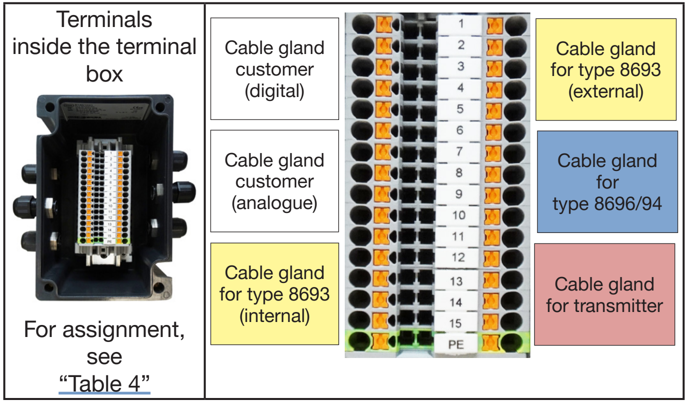



*Fig. 17: extended terminal box and terminals*

| Terminal on 8693 | | Wire colour | Assignment | **Terminal** | Assignment | Wire colour | | Term./ Pin on comp. |
|---|---|---|---|---|---|---|---|---|
| | Cable gland Customer (digital) | | 24 V | **1** | 24 V (input) | Brown | Cable gland for type 8693 **(external)** | 16 |
| | | | GND | **2** | GND (input) | Blue | | 15 |
| | | | Digital input + | **3** | Digital input + | Pink | | 6 |
| | Cable gland Customer (analogue) | | Set-point value + | **4** | Set-point value + | Yellow | | 8 |
| | | | Set-point value GND | **5** | Set-point value GND | Green | | 7 |
| | | | Analogue feedback + | **6** | Analogue feedback + | Red | | 5 |
| | | | Analogue feedback GND | **7** | Analogue feedback GND | White | | 4 |
| 1 | Cable gland for type 8693 (internal) | Green | Analogue Slave GND | **8** | SP GND | White | Cable gland for type 8696/94 | 2 |
| 2 | | Yellow | Analogue Slave + | **9** | SP+ | Brown | | 1 |
| 12 | | Brown | 24 V (output) | **10** | 24 V | Black | | 4 |
| 13 | | Blue | GND (output) | **11** | GND | Blue | | 3 |
| | | (Terminal 10 and 12 bridged) | (24 V output) | **12** | Sensor+ | Brown | Cable gland for transmitter | U+ |
| 11 | | Grey | Process 1 | **13** | Sensor | Blue/ (Green) | | U- |
| 10 | | Red | Process 2 | **14** | (GND) | (Terminal 14 and 15 bridged) | | - |
| 9 | | White | Process 3 | **15** | GND | | | - |

*Table 4: Pin assignment in the extended terminal box*

*("Term./Pin on comp.": Terminal or pin on respective (individual) component of Type 8880)*

# 8. FIRMWARE/SOFTWARE

**No adjustments are necessary for normal operation.**
The following instructions are intended for authorised personnel only! See also the operating instructions for type 869x.

**Firmware updates** should only be carried out by authorised technical personnel.
**Downgrading** from the installed versions to a lower version will result in the total loss of system parameters as well as calibration and factory data.

For information on **the communication software**, see chapter "8.4. Bürkert Communicator" on page 27.

Before installing the hardware, the communication software (type 8920 "Bürkert Communicator") must be installed on the PC as described in the operating instructions for type 8920 and in chapter "8.4" on page 27.

**Type 8880 with bypass valve:**
For further information on communication, see chap. "9. Type 8880 with bypass valve" on page 28.

## 8.1. Firmware type 8693 (modified)

The type 8693 process controller is supplied with **special firmware (ID 60014312)** for (tank) pressure control. This firmware differs from the standard device of type 8693 in the following ways.

### 8.1.1. PID process controller P.CONTROL

- **Extended for master-slave controller of:**
  - Exhaust control valve with master process controller (type 8693) and
  - Inlet control valve with external slave positioner (type 8696/8694)
- **Capping of the integral (I) term when the set-point value is reached:** During the initial pressure build-up in the tank, the actuating variable of the controller is maximised when the I term is active, which would lead to massive overshoot when the pressure set-point value is reached. Therefore, the I term is reset to zero when the set-point value is reached.
  In other applications (e.g. continuous readjustment during ongoing product removal), this can lead to unfavourable control behaviour: cyclical closing and readjustment of the inlet valve. This can be avoided by adjusting the parameters accordingly, e.g. increasing the dead band, adjusting the P and I components => bringing the actual value into the dead band without reaching the set-point value.
- **Fixed SP cutoff*) and limiter functionality:**
  SP < 1% (of SP range) = 0%,
  SP > 99% (of SP range) = 99%

  ***)** *The sealing function (CUTOFF) of the standard firmware for type 8693 is still implemented and effective.*
  *The modified firmware for type 8693 (8880) has an additional SP behaviour (which acts on the signal input) as described above*
- **Special exhaust ramp functionality:**
  - The parameter EXHOPN (menu P.CONTROL —> PID.PARAMETER) defines the ramp time [in seconds] of the position set-point value CMD from 0% to 100%.

    EXHOPN = 0 s disables the special exhaust ramp functionality.

- Is activated:
  if SP < 1% (of the SP range)
- Is deactivated:
  if SP ≥ 1.0% (of the SP range) for internal SP;
  if SP ≥ 1.5% (of the SP range) for external analogue SP
- Only in AUTOMATIC operating state: if the special ramp function was active, the inlet valve is closed and the exhaust valve is opened. The position set-point value CMD is increased from the current position to the 100% position within the configured ramp time.
- When Tank Clean Mode is active, it takes precedence over the active special exhaust ramp functionality

• **Tank Clean Mode:**
  - The digital input must be configured as "Tank Clean Mode" (BINARY.IN menu)
  - Only in AUTOMATIC operating state:
    If digital input = ON —> exhaust valve closed (due to potentially aggressive aerosols) and inlet valve controlled
  - When Tank Clean Mode is active, it takes precedence over the active special exhaust ramp functionality

• **Priority in AUTOMATIC operating state:**

| | | | | | | |
|---|---|---|---|---|---|---|
| Safety setting (SIG.ERROR) | > | Tank Clean Mode | > | Special exhaust ramp functionality | > | Normal AUTOMATIC operating state |

• **P.Q'LIN and P.TUNE functions are not supported**

• **Parameter PCO.init:**
  Only the settings "standard" and "zero-init" are available (not "bumpless"); the factory setting is "standard"

> **!** If P.CONTROL is deactivated via the ADD.FUNCTION menu or the communication software, the function for the analogue output is automatically reset to POS (if SP or PV was selected).
>
> If P.CONTROL is enabled via the ADD.FUNCTION menu or the communication software, the function for the analogue output must be set manually to PV (menu—> OUTPUT —> ANALOGUE —> OUT).

## 8.1.2. Analogue output OUT ANALOG

If PV (actual pressure) is selected as the analogue output, the scaling of the analogue output signal can be set (menu OUTPUT —> ANALOGUE —> OUT.scale)

- **as PV input signal set (PV-SCALE selected) or**
- **adapted to the user's requirements (PV-SCALE deselected, OUTmin, OUTmax set)**

## 8.1.3. Digital input BINARY.IN

The digital input function "Tank Clean Mode" is only supported if P.CONTROL is enabled.

> **!** If BINARY.IN is deactivated via the ADD.FUNCTION menu or the communication software, the function of the digital input is automatically reset to "SafePos".
>
> If BINARY.IN is enabled via the ADD.FUNCTION menu or the communication software, the digital input must be set manually to "Tank Clean Mode".

### 8.1.4. Control of inlet valve/ slave positioner type 8696/8694

| Settings | Situation | Analogue output to slave positioner 8696/8694 | (Tank) inlet valve |
|---|---|---|---|
| P.CONTROL active | Normal AUTO-MATIC operating state | 4...20 mA | controlled by P.CONTROL |
| | MANUAL operating state, X.TUNE, SafePos | 4 mA | closed |
| P.CONTROL inactive | Inlet valve closed | 4 mA | closed |

## 8.2. Fail-safe position

With the preconfigured settings for the type 8693 and 8696/8694 positioners according to chapter 8.3, the system behaves as follows:

| Situation | Reaction of the system |
|---|---|
| Pilot air does not reach minimum pressure | The valves either remain in their rest position (NC/NO) or the set-point value is not reached. |
| Disconnection of the power supply | Both valves in rest position (NC/NO) |
| Missing actual value from the pressure transmitter or set-point value from the PLC | The system moves to the fail-safe position if the preconfigured settings are used: both valves in rest position (NC/NO) |
| Type 8696/8694 has lost the position set-point value from the type 8693 master positioner | With preconfigured settings: inlet valve closed (NC) |

## 8.3. Preconfigured settings

The system is delivered with preconfigured settings.

Both positioners type 8693 and 8696/8694 have already undergone an autotune (X.TUNE) with approx. 6 bar(g) pilot air and without media pressure.

**!** Restarting X.TUNE is recommended in the following cases:

- significant change in the pressure level of the pilot air
- after replacing the bellows/sealings
- after (re)installation of one of the type 8693 / type 8696/8694 positioners

### 8.3.1. Type 8693 process controller (modified)

| Menu (type 8693) | Parameter name | Precon-figured value | Comment |
|---|---|---|---|
| ADD.FUNC-TION | CUTOFF<br>DIR.ACT<br>X.LIMIT<br>P.CONTROL<br>SIG.ERR<br>BINARY.IN<br>OUTPUT<br>SERVICE.BUES<br>EXTRAS | enabled<br>enabled<br>enabled<br>enabled<br>enabled<br>enabled<br>enabled<br>enabled<br>enabled | These functions must be enabled at a minimum.<br>**Disabled SAFEPOS function** is a necessary setting for the safety position of this system.<br>**Do NOT enable!** |
| CUTOFF | Min<br>Max<br>CUT.type | 1%<br>100%<br>XCO | |
| DIR.ACT | DIR.ACT | RISE/FALL | RISE for NC valves,<br>FALL for NO valves, |
| X.LIMIT | Min<br>Max | 2%<br>100% | |
| P.CONTROL<br>-><br>PID.PARA-METER | **DBND**<br>**KP**<br>**TN**<br>TV<br>X0<br>FILTER<br>**EXHOPN** | 0.4%<br>0.10<br>10 s<br>0 s<br>0.0%<br>0<br>0 s | **The parameters in bold type** can be used for adjustment to specific plant conditions/ tank sizes.<br>If necessary, the PID parameters can be adjusted to local requirements **by authorised personnel.** |
| P.CONTROL<br>–> SETUP | PV-INPUT | 4...20 mA | |
| P.CONTROL<br>–> SETUP<br>–> PV-SCALE | PVmin<br>PVmax | 0 mbar<br>6,000 mbar ***)**<br>(example) | ***)** *according to type code (features MMIB, MMAB)* |
| P.CONTROL<br>–> SETUP | SP-INPUT | External | |
| P.CONTROL<br>–> SETUP<br>–> SP-SCALE | SPmin<br>SPmax | 0 mbar<br>6,000 mbar ***)**<br>(example) | ***)** *according to type code (features MMIB, MMAB)* |
| P.CONTROL | P.CO-INIT | standard | |
| SIG.ERR<br>–> SP/CMD Input | SP/CMD Input<br>SAFEPOS | Error on<br>SafePos on | Required settings for the safety position of this pressure control system in the event of a fault in the PV or SP input signal.<br>**Do NOT change!** |
| SIG.ERR<br>–> PV input | PV input<br>SAFEPOS | Error on<br>SafePos on | |
| BINARY.IN | BINARY.IN<br><br>BIN.IN type | Tank Clean Mode<br>Normally open | |
| OUTPUT<br>-> ANA-LOGUE | OUT.ANALOG<br>OUT.type | PV<br>4…20 mA | |
| OUTPUT<br>-> ANA-LOGUE -><br>OUT.scale | PV.SCALE<br>OUTmin<br>OUTmax | deactivated<br>*0 mbar*<br>6,000 mbar***)**<br>*(example)* | ***)** *according to type code (features MMIB, MMAB)* |
| EXTRAS | START-UP. ITEMS | PV | |
| Additional settings for the **bypass variant** – see chapter “9.2” on page 32! | | | |

### 8.3.2. Positioner type 8696/8694

The settings can only be adjusted by authorised personnel using communication software – see chap. "8.4. Bürkert Communicator".

| Menu (type 8696) | Parameter name | Precon-figured value | Comment |
|---|---|---|---|
| Position con-troller -> Auxiliary functions | CUTOFF<br>X.LIMIT | enabled<br>enabled | These functions must be enabled at a mini-mum. |
| Position con-troller -> CUTOFF | Lower bound<br>Upper bound | 1%<br>100% | |
| Position con-troller -> X.LIMIT | Minimum<br>Maximum | 2%<br>100% | |
| Position con-troller -> Auxiliary functions | SAFEPOS | deactivated | **Disabled SAFEPOS function** is a necessary setting for the safety position of this system. **Do NOT enable!** |
| Set-point value input | Standard signal | 4...20 mA, 4-wire | |
| Set-point value input | Cable break detection | Out of specification | Required settings for the safety position of this positioner in the event of a CMD input signal error. **Do NOT change!** |
| Digital input | Digital input | Off | Digital input is not used in the system. |

## 8.4. Bürkert Communicator

The Bürkert Communicator software is designed for communication with many Bürkert devices.

*The operating instructions with a detailed description of installation and operation, as well as the Bürkert Communicator PC software package (type 8920) can be downloaded free of charge from the Bürkert home page.*

→ First, download the software and the corresponding operating instructions for type 8920 (Bürkert Communicator) and for types 869x: https://country.burkert.com

→ Then install the "Bürkert Communicator" software package on a PC.

→ Then connect the type 869x to the PC – this requires a special USB adapter set, which is listed in the "Accessories" chapter of the respective operating instructions for type 869x.

# 9. TYPE 8880 WITH BYPASS VALVE

A third valve with a type 8691 control head is provided for rapid pressurisation, i.e. to prevent the tank from collapsing – see illustrations below.

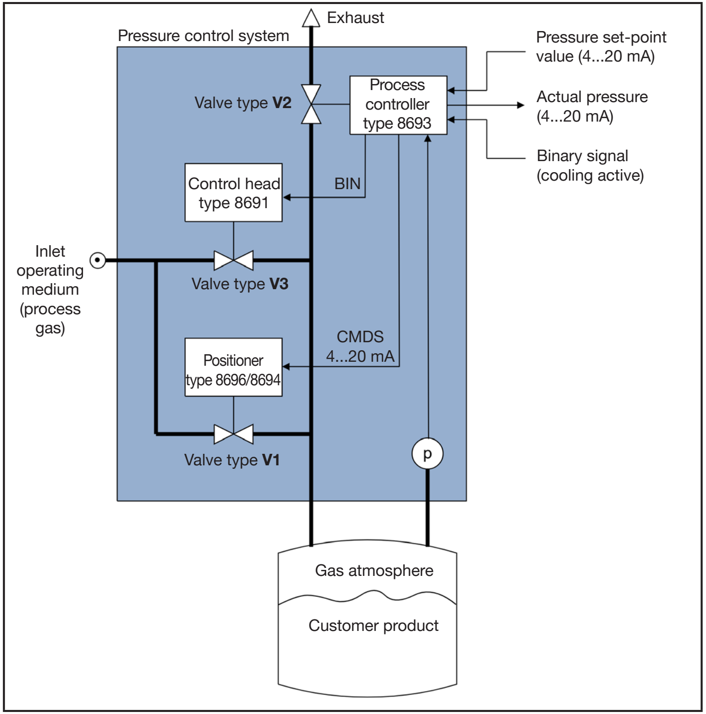



*Fig. 18: Functional diagram*

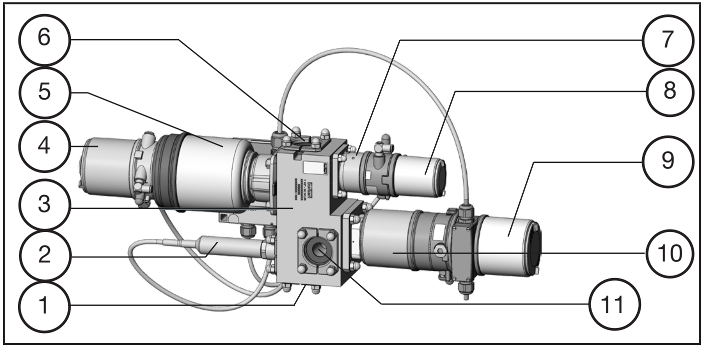



*Fig. 19: Special variant: bypass variant (example 8880-PB05)*

Key:

| Item | Description | Item | Description |
|---|---|---|---|
| **(1)** | Tank connection | **(7)** | Inlet valve V1 |
| **(2)** | Pressure transmitter | **(8)** | Positioner type 8696/8694 |
| **(3)** | Valve block/body | **(9)** | Process/position con-troller type 8693 |
| **(4)** | Control head type 8691 | **(10)** | Exhaust valve V2 |
| **(5)** | Bypass valve V3 | **(11)** | Exhaust |
| **(6)** | Media inlet | | |

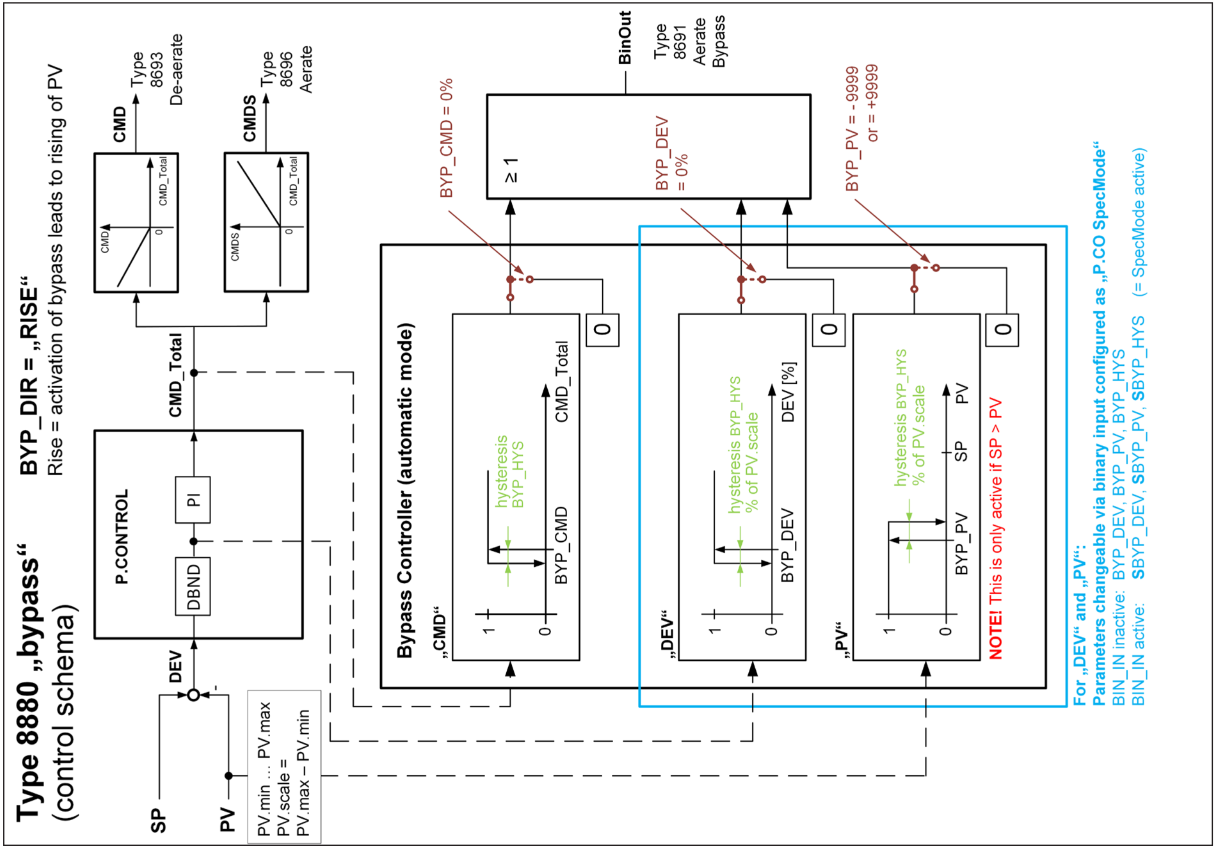



*Fig. 20: Control scheme for bypass variant*

# 9.1. Installation of the bypass variant

For general information on safety, mechanical, pneumatic and electrical installation, see also chapter "7".

## 9.1.1. Terminal box assignment, bypass variant

The connection to the power supply and the PLC signals is made via the cable gland on the type 8693 process controller in accordance with chapter "7.5".

If a terminal box is used for system-internal cabling, the pin assignment is as follows (for maintenance purposes or for the connection of an external transmitter only).

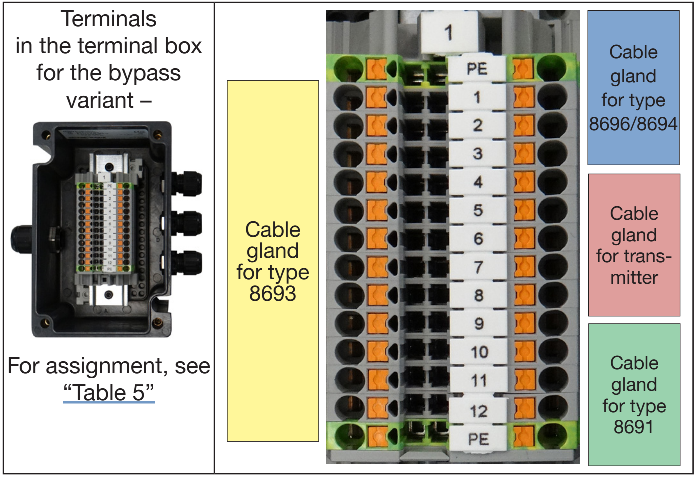



*Fig. 21: Terminal box with internal connection terminals*

| Terminal on 8693 | | Wire colour | Assignment | **Terminal** | Assignment | Wire colour | | Pin on component *) |
|---|---|---|---|---|---|---|---|---|
| 1 | Cable gland for type 8693 | Green | Analogue Slave GND | **1** | SP GND | White | Cable gland for type 8696/8694 | 2 |
| 2 | | Yellow | Analogue Slave + | **2** | SP + | Brown | | 1 |
| 12 | | Brown | 24 V (output) | **3** | 24 V | Black | | 4 |
| 13 | | Blue | GND (out-put | **4** | GND | Blue | | 3 |
| - | | (Terminal 3 and 5 bridged) | (24 V output) | **5** | Sensor+ | Brown | Cable gland for transmitter | U+ |
| 11 | | Grey | Process 1 | **6** | Sensor | Blue/ (Green) | | U- |
| 10 | | Red | Process 2 | **7** | (GND) | (Terminal 7 and 8 bridged) | | - |
| 9 | | White | Process 3 | **8** | GND | | | - |
| - | | (Terminal 3 and 9 bridged) | (24 V output) | **9** | 24 V | Brown | Cable gland for type 8691 (pins for 8691) | 3 / 24 V+ |
| - | | (Terminal 4 and 10 bridged) | (GND output) | **10** | GND | Green | | 3 / 24 V- |
| 3 | | Pink | Digital output+ | **11** | Valve+ | White | | 4 / Valve+ |
| - | | (Terminal 4 and 12 bridged) | (GND output) | **12** | Valve | Yellow | | 4 / Valve- |

*Table 5: Pin assignment in the terminal block*

*) *"Pin on component": Pin on respective (individual) component of type 8880*

## 9.1.2. Assignment of extended terminal box bypass variant (variable code MB15)

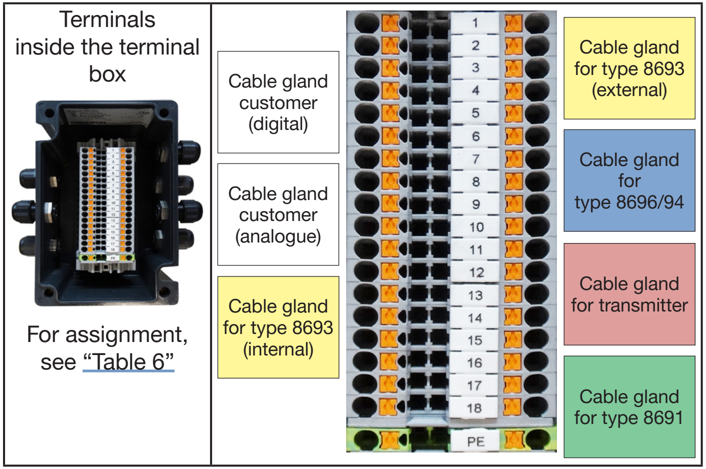



*Fig. 22: extended terminal box and terminals*

In the variant with an extended terminal box, the contacts for the customer's port (power supply, PLC signals) are also routed via the terminal box:

| Terminals to 8693 | | Wire colour | Assignment | **Terminal** | Assignment | Wire colour | | Term./pin of component |
|---|---|---|---|---|---|---|---|---|
| | Cable gland Customer (digital) | | 24 V | **1** | 24 V (input) | Brown | Cable gland for type 8693 **(external)** | 16 |
| | | | GND | **2** | GND (input) | Blue | | 15 |
| | | | Digital input + | **3** | Digital input + | Pink | | 6 |
| | Cable gland Customer (analogue) | | Set-point value + | **4** | Set-point value + | Yellow | Cable gland for type 8693 **(external)** | 8 |
| | | | Set-point value GND | **5** | Set-point value GND | Green | | 7 |
| | | | Analogue feedback + | **6** | Analogue feedback + | Red | | 5 |
| | | | Analogue feedback GND | **7** | Analogue feedback GND | White | | 4 |
| 1 | Cable gland for type 8693 **(internal)** | Green | Analogue Slave GND | **8** | SP GND | White | Cable gland for type 8696/94 | 2 |
| 2 | | Yellow | Analogue Slave + | **9** | SP+ | Brown | | 1 |
| 12 | | Brown | 24 V (output) | **10** | 24 V | Black | | 4 |
| 13 | | Blue | GND (output) | **11** | GND | Blue | | 3 |
| | | (Terminal 10 and 12 bridged) | (24 V output) | **12** | Sensor+ | Brown | Cable gland for transmitter | U+ |
| 11 | | Grey | Process 1 | **13** | Sensor | Blue/ (Green) | | U- |
| 10 | | | Process 2 | **14** | optional | | | - |
| | | (Terminal 10 and 15 bridged) | (24 V output) | **15** | 24 V | Brown | Cable gland for type 8691 | 3 / 24 V+ |
| | | (Terminal 11 and 16 bridged) | (GND output) | **16** | GND | Green | | 3 / 24 V- |
| 3 | | Pink | Digital output + | **17** | Valve + | White | | 4 / Valve+ |
| | | (Terminal 11 and 18 bridged) | (GND output) | **18** | Valve - | Yellow | | 4 / Valve- |

*Table 6: Pin assignment in the extended terminal box*

The contacts “Process 2” and “Process 3” are bridged at the terminals of type 8693 (terminals 9 and 10).

## 9.2. Additional information on communication/firmware

Additional settings for type 8693 (see also chapters “8.3” and “8.3.1” on page 26):

| Menu (type 8693) | Parameter name | Preconfigured value | Comment |
|---|---|---|---|
| P.CONTROL<br>-> PID.PARA-METER<br>-> P.CO-BY-PASS | BYP_DEV<br>BYP_HYS<br>BYP_PV<br>SBYP_DEV<br>SBYP_HYS<br>SBYP_PV<br>BYP_DIR<br>BYP_CMD | 50.0%<br>10.0%<br>100 mbar<br>50.0%<br>10.0%<br>100 mbar<br>0/Rise<br>80% | |
| BINARY.IN | BINARY.IN<br><br>BIN.IN type | P.CO<br>SpecMode<br>Normally open | Parameter switching for bypass via digital input |
| OUTPUT<br>-> BIN-1 | BIN-1<br><br>OUT.type | P.CO-BYPASS<br><br>Normally open | Controller of the by-pass via digital output |
| For further settings for type 8693, see chapter “8.3.1” on page 26! | | | |

# 10. START-UP

## 10.1. Safety instructions

**WARNING!**

**Risk of injury due to improper operation!**

Improper operation can result in injury and damage to the equipment and the surrounding area.

- Before start-up, ensure that the operating personnel are familiar with the contents of the operating instructions and have fully understood it.
- Observe the safety instructions and intended use.
- The system may only be operated by appropriately trained personnel.

## 10.2. Start-up process

After the system has been assembled/installed in the plant, control and monitoring are handled by the PLC.

For both positioners, autotuning (X.TUNE) without media pressure is recommended after installation of the system.

No operator intervention directly on the system is required for normal operating situations.

It is recommended to check the control behaviour with the default settings for the respective plant conditions. Information on any necessary adjustments or modifications can be found in chap. “8.3. Preconfigured settings” on page 25.

# 11. MAINTENANCE/SERVICE

## 11.1. Safety instructions

**WARNING!**

**Risk of injury from high pressure in the system.**

- Before working on the system, switch off the pressure and vent/drain the lines.

**Risk of injury from electric shock!**

- Before reaching into the system, switch off the power supply and secure against reactivation!
- Observe all applicable accident prevention and safety regulations for electrical devices!

**Improper maintenance may result in injury!**

- Maintenance may only be carried out by authorised technicians using the appropriate tools!
- Observe the permitted tightening torques.

**Risk of injury from unintentional activation and uncontrolled restart of the system.**

- Secure system against unintentional activation.
- Ensure a controlled restart after maintenance is completed.

## 11.2. Maintenance/service interval

When used in accordance with these operating instructions, the system is maintenance-free.

As long as the system is not operated under the most adverse conditions (e.g. high temperatures/pressures), the recommended maintenance interval for the first replacement of the bellows/sealings and seals is a maximum of $10^6$ switching cycles or one year of operation.

The maintenance interval can be extended under consistent operating conditions if the bellows/sealings show only minor signs of wear.

If leaking or showing signs of wear, the relevant parts have to be replaced (see chapter "13").

During all maintenance and service work, ensure that no dirt enters the system.

For the replacement of spare parts and maintenance/servicing, please refer to the respective operating instructions for the system components.

# 12. MALFUNCTIONS/ TROUBLESHOOTING

If faults occur, first check the electrical connections, the fluid connections and the inlet pressure. Also check whether assembly/ installation has been carried out in accordance with the operating instructions.

If the system still does not function correctly, contact the responsible Bürkert service department (see chapter "4.1" on page 7).

| Malfunction | Cause/Remedial measures |
|---|---|
| The actual pressure signal PV is not output at the analogue output. | P.CONTROL is deactivated for type 8693 or PV is not selected as analogue output for type 8693.<br>→ P.CONTROL must be enabled for type 8693 (menu --> ADD.FUNCTION)<br>→ The analogue output for type 8693 must be set manually to PV (menu --> OUTPUT --> ANALOG OUT).<br>→ See also chapter "8.1.1" |
| The actual pressure signal PV is not displayed correctly. | Incorrect scaling of the analogue PV input signal for type 8693.<br>→ Check whether the scaling of the PV input signal for type 8693 (menu ->; P.CONTROL --> SETUP --> PV-SCALE) matches the scaling of the pressure transmitter. |
| The signal for the actual pressure PV is output at the analogue output with incorrect scaling. | Incorrect scaling of the analogue output for type 8693.<br>→ Check the settings for scaling the output for type 8693 (menu --> OUTPUT --> ANALOG OUT --> OUT.scale).<br>→ See chapter "8.1.2" |
| The displayed set-point value SP for type 8693 does not match the input set-point value SP of the PLC. | Incorrect scaling of the set-point value for the analogue input for type 8693 or PLC.<br>→ Check whether the scaling of the SP input for type 8693 (menu --> P.CONTROL --> SETUP --> SP-SCALE) matches the scaling of the analogue SP signal from the PLC.<br>With type 8693, the internal set-point value is selected instead of the external set-point value.<br>→ Ensure that SP = external is selected for type 8693 (menu --> P.CONTROL --> SETUP --> SP-INPUT) |

*Table 7: Malfunction/Troubleshooting*

# 13. SPARE PARTS

**WARNING!**

**Risk of injury when opening the actuator!**

The actuator contains a spring under tension. If the actuator is opened, there is a risk of injury if the spring pops out!

- The actuator must not be opened.

**CAUTION!**

**Risk of injury and/or damage caused by the use of unsuitable parts!**

Incorrect accessories and unsuitable spare parts may cause injuries and damages to the system and the environment.

- Use only original accessories and original spare parts from Bürkert.

Due to the wide variety of type 8880 systems, the available spare parts must be requested for the respective system.

Questions can be directed to your local Bürkert sales department (see chapter “4.1. Contact addresses”).

# 14. DISASSEMBLY

## 14.1. Safety instructions

**WARNING!**

**Risk of injury from high pressure in the system.**

- Before working on the system, switch off the pressure and vent/drain the lines.

**Risk of injury from electric shock!**

- Before reaching into the system, switch off the power supply and secure against reactivation!
- Observe all applicable accident prevention and safety regulations for electrical devices!

**Risk of injury due to improper removal!**

- The device must only be disassembled by qualified and skilled staff with the appropriate tools!

**Risk of injury from unintentional activation and uncontrolled restart of the system.**

- Secure system against unintentional activation.

## 14.2. Disassembly of type 8880

→ Switch off the supply voltage and the entire media supply.

→ Disconnect electrical, fluidic and pneumatic connections.

→ Remove the system from the plant.

# 15. TRANSPORT, STORAGE, PACKAGING, DISPOSAL

**NOTE!**

**Damage due to transport!**

Inadequate packaging may result in damage during transport.

- The system must be transported with protection from moisture and dirt in shock-resistant packaging.
- Avoid exceeding or dropping below the permitted storage temperature.
- Protective caps fitted to electrical and pneumatic ports to prevent damage.

**Improper storage may result in damage to the system.**

- Store the system in a dry and dust-free place!
- Storage temperature –20…+65 °C

**Environmental damage caused by system components contaminated by media.**

- The system and packaging must be disposed of in an environmentally friendly manner!
- The applicable disposal regulations and environmental provisions must be observed.

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