OPERATING AND MAINTENANCE INSTRUCTIONS

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1 OPERATING AND MAINTENANCE INSTRUCTION

Globe Valve
Type 3241

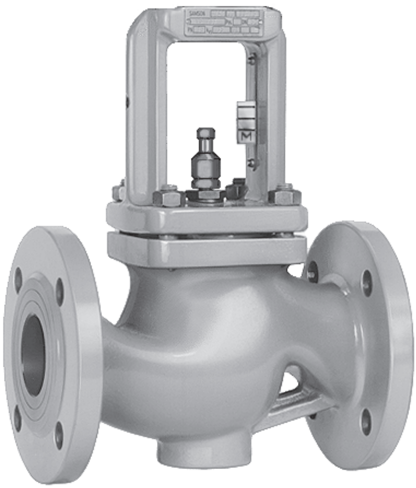

Fig. 1 · Type 3241 Globe Valve

Mounting and Operating Instructions

EB 8015-1 EN

Edition June 2004

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Note!
*Non-electrical control valves which do not have a valve body lined with an insulating material coating do not have their own potential ignition source according to the risk assessment in the rare incident of an operating fault, corresponding to EN 13463-1: 2001 paragraph 5.2, and therefore do **not** fall within the scope of the European Directive 94/9/EC.*
Refer to paragraph 6.3 of EN 60079-14:1977 VDE 0165 Part 1 concerning connection to equipotential bonding system.

General safety instructions

- *The control valve may only be mounted, started up or serviced by fully trained and qualified personnel, observing the accepted industry codes and practices. Make sure employees or third persons are not exposed to any danger. All safety instructions and warnings in these mounting and operating instructions, particularly those concerning assembly, start-up and maintenance, must be observed.*
- *The control valves fulfill the requirements of the European Pressure Equipment Directive 97/23/EC. Valves with a CE marking have a declaration of conformity that includes information about the applied conformity assessment procedure. The corresponding declaration of conformity can be viewed and downloaded on the Internet at http://www.samson.de.*
- *For appropriate operation, make sure that the control valve is only used in areas where the operating pressure and temperatures do not exceed the operating values which are based on the valve sizing data submitted in the order. The manufacturer does not assume any responsibility for damage caused by external forces or any other external influence! Any hazards which could be caused in the control valve by the process medium, operating pressure, signal pressure or by moving parts are to be prevented by means of the appropriate measures.*
- *Proper shipping and appropriate storage of the control valve are assumed.*

Caution!

- *For installation and maintenance work on the valve, make sure the relevant section of the pipeline is depressurized and, depending on the process medium, drained as well. If necessary, allow the control valve to cool down or warm up to reach ambient temperature prior to starting any work on the valve.*
- *Prior to performing any work on the valve, make sure the lines for the electrical or supply air as well as the control signal are disconnected or blocked to prevent any hazards that could be caused by moving parts.*

1 Design and principle of operation

The single-seated Type 3241 Globe Valve can be combined with different actuators to form either a pneumatic control valve or an electric control valve. Additionally, the valve can be fitted with a hand-operated actuator. Thanks to the modular design, the actuators can be exchanged, and the standard version of the valve can be supplemented to form a version with insulating section or metal bellows seal.

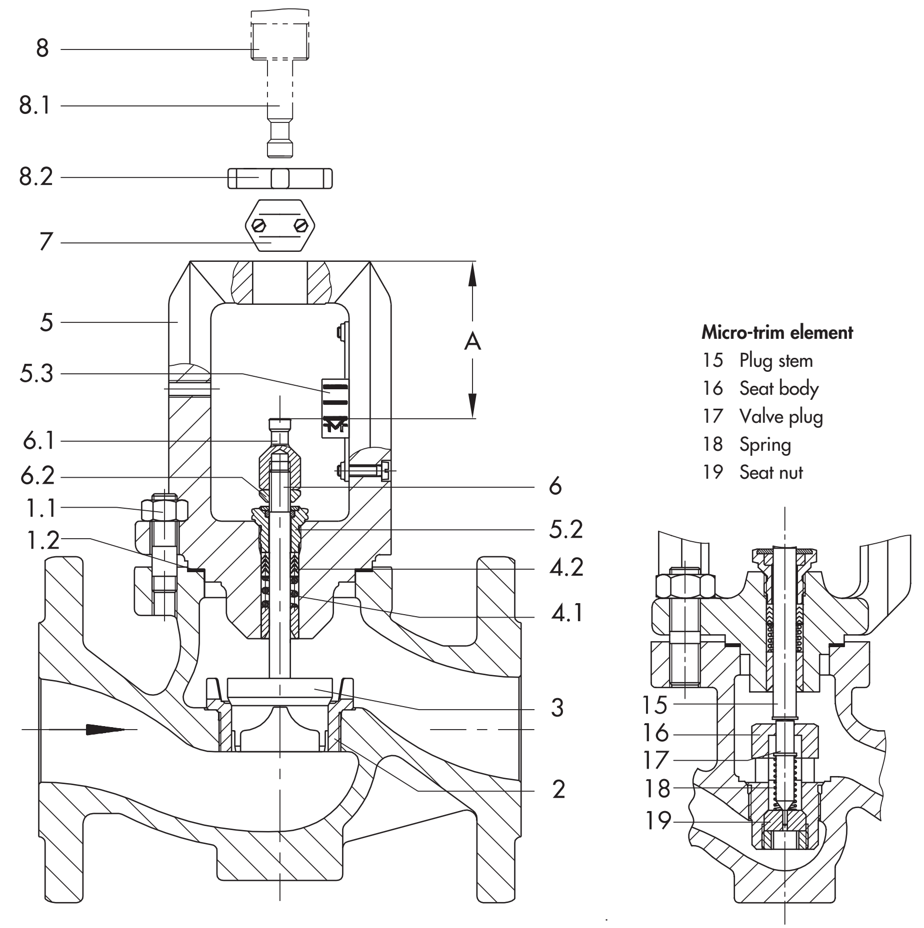


Fig. 2 · Sectional drawing of Type 3241 in nominal sizes DN 15 to 150

In the **micro-flow valve** version, a micro-trim element is installed in the valve body instead of the usual seat-plug assembly.
The process medium flows through the valve in the direction indicated by the arrow. The position of the plug (3) determines the flow through the valve seat (2). The position of the plug (3) is changed by the signal pressure acting on the diaphragm of the actuator (bench range). Plug (3) and actuator stem (8.1) are connected via the stem connector (7) and sealed by the spring-loaded ring packing (4.2).

Travel adjustment (with a valve closed)	
DN	Dimension A
15 to 80	75 ± 0.1
100 to 150	90 ± 0.1
200 and 250	165 (225)

1. Valve body
1.1 Nuts
1.2 Gasket
2 Seat
3 Plug
4.1 Spring
4.2 Packing
5 Valve bonnet
5.2 Threaded bushing
5.3 Travel indicator scale
6 Plug stem
6.1 Stem connector nut
6.2 Lock nut
6.3 Yoke (DN 200 and 250)
7 Stem connector
8 Actuator
8.1 Actuator stem
8.2 Nut

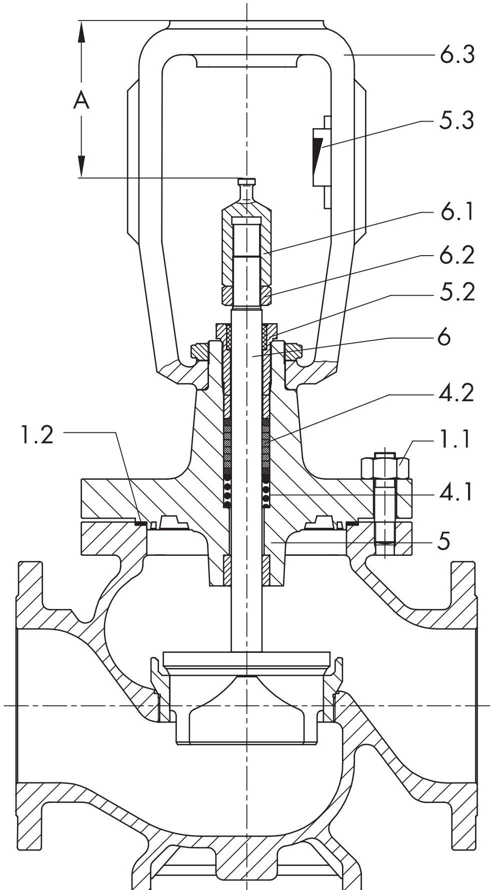


Fig. 3 · Sectional drawing of Type 3241 in nominal sizes DN 200 and 250

2 Assembling valve and actuator

Note!
Refer to the Mounting and Operating Instructions of the corresponding actuator for assembly.

2.1 Travel adjustment

When valve and actuator are shipped separately, dimension A, which extends from the top of the stem connector nut (6.1) to the top of the valve bonnet (yoke), is adjusted according to the table in Fig. 3.

Check this dimension on assembly and, if necessary, readjust it by turning the stem connector nut.

3 Installation

3.1 Mounting position

The valve can be mounted in any desired position. However, vertical installation with the actuator pointing upwards is preferable for valves in nominal size DN 100 or larger. Otherwise, difficulties during maintenance work can occur.
For valves with insulating section or metal bellows seal, or for actuators weighing more than 50 kg, mount a suitable support or suspension for the actuator.

⚠ ***Note!***
The valve must be installed with as little vibration as possible and free of stress.
Flush the pipeline thoroughly before installation.

Note!
Do not insulate control valves which must conform to ***NACE MR 0175****.*

3.2 Strainer, bypass

We recommend you to install a SAMSON Type 2 Strainer upstream of the valve body. We also recommend to install a shut-off valve both upstream of the strainer and downstream of the valve, as well as a bypass, so that you do not need to shut down the plant for maintenance.

3.3 Test connection

If there is a test connection (G 1/8) at the upper flange of a valve version with metal bellows seal (Fig. 6), you can check the tightness of the bellows there.
Particularly for liquids and vapors, we recommend you to install a suitable leak indicator at the test connection, such as a contact pressure gauge, an outlet into an open vessel or an inspection window.

4 Operation

As the operating instructions only apply when the valve is used in conjunction with an actuator, refer to the associated Mounting and Operating Instructions of the actuator mounted on the valve.

5 Maintenance – Replacing parts

The control valve is subject to natural wear, especially at the seat, plug and packing. Depending on the application, the valve needs to be checked regularly to prevent against possible failures.
If leakage occurs, this could be caused by a damaged packing or a defective metal bellows.

If the valve does not seal properly, the tight shut-off may be impeded by dirt or other impurities caught between the seat and plug, or by damaged seat joints.
Remove the parts, clean them thoroughly and replace them, if necessary.

Note!
Suitable seat and special tools as well as the appropriate tightening torques required for installation are listed in EB 029 EN (formerly WA 029 EN) which can be viewed on the Internet at http://www.samson.de/pdf_en/e00290en.pdf.

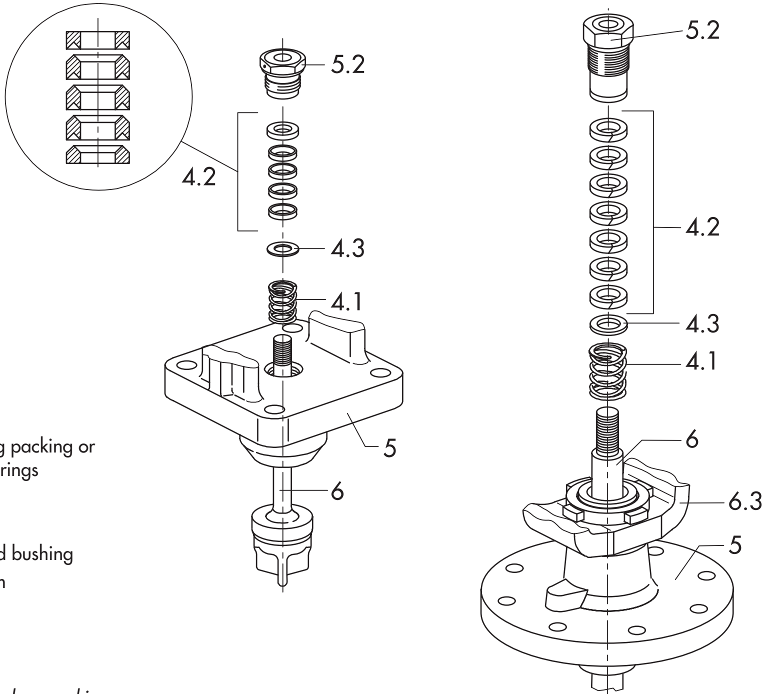
Note!
Before servicing or disassembling the control valve, depressurize the concerned section of the plant and drain it, if necessary, depending on the medium used.
Wait until the medium has cooled down, if necessary.
As valves are not free of cavities, there might still be residual medium in the valve.
This applies, in particular, for valve versions with insulating section and metal bellows seal.
We recommend removing the valve from the pipeline.

Caution!
On performing any work on the valve body, first shut off the electric or pneumatic auxiliary energy supply and block it as well as interrupt the control signals to prevent any hazards caused by moving parts.
Remove the actuator from the valve before carrying out any work on the valve body.

5.1 Standard valve version

5.1.1 Stuffing box packing

1. Remove the body nuts (1.1) as well as the valve bonnet (5) together with the plug stem and plug from the body.
2. Unscrew the stem connector nut and lock nut (6.1 and 6.2) from the plug stem.
3. Unscrew the threaded bushing (5.2) out of the stuffing box. Pull the plug stem together with the plug out of the valve bonnet.
4. Pull all stuffing box parts out of the packing chamber using a suitable tool. Replace damaged parts.
   Clean packing chamber thoroughly.
5. Remove the gasket (1.2) and carefully clean sealing surfaces in the valve body and on the bonnet.
6. Apply lubricant (order no. 8150-0111) to all the packing parts and the plug stem (6).
7. Slide the plug stem with plug into the valve bonnet.



4 Packing
4.1 Spring
4.2 PTFE ring packing or packing rings
4.3 Washer
5 Bonnet
5.2 Threaded bushing
6 Plug stem
6.3 Yoke

Fig. 4 · Stuffing box packing

8. Insert a new gasket (1.2) into the body. Carefully place the valve bonnet onto the valve body and secure with nuts (1.1).
9. Carefully slide the stuffing box parts over the plug stem into the packing chamber. Make sure to keep the proper order.
   Screw in the threaded bushing (5.2) and tighten.
10. Loosely screw the lock nut (6.2) and stem connector nut (6.1) onto the plug stem.
11. Adjust the travel as described in section 2.1 and mount the actuator.

5.1.2 Seat and/or plug

We recommend you to also replace the packing (4.2) when exchanging the seat and plug.
To exchange the packing, proceed as described in section 5.1.1.

Plug:

- Remove the old plug and replace it with a new plug with plug stem. It is possible to use the old plug again, provided it has been reworked properly. Apply lubricant (order no. 8150-0111) to the plug stem before installation.

Reworking the plug

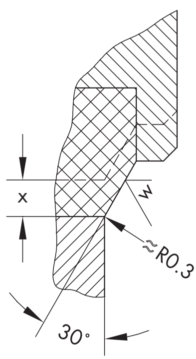
- Slight damage at the sealing edges of the plug can be eliminated by re-turning it on a lathe. Soft-sealing plugs can only be reworked until dimension x (Fig. 5) is reached, and if the seat bore exceeds 12 mm. For seat bores of 63 mm and larger, the entire sealing ring can be exchanged, if necessary (the plug parts are screwed together).

Seat:

- Unscrew the seat (2) using the appropriate seat wrench (see EB 029 EN).
  Apply lubricant (order no. 8150-0119) to the thread and sealing cone of the new seat (or possibly the old seat when it has been reworked or thoroughly cleaned) and screw it in.

Micro-flow valve version

In this version, the complete micro-trim element (Fig. 2) can be unscrewed from the valve body using a socket wrench (width across flats 27) and disassembled for cleaning.
If any parts are damaged, exchange the entire micro-trim element.



Seat bore	x [mm]
12	0.5
24...48	1.0
6...80	2.0
100...200	2.5

Fig. 5 · Plug with soft sealing

5.2 Valve with insulating section or metal bellows seal

5.2.1 Stuffing box packing

1. Remove the stem connector nut and lock nut (6.1 and 6.2) from the plug stem extension (6.3). Unscrew the threaded bushing (5.2) out of the stuffing box.
2. Remove nuts (5.4) and carefully lift the bonnet (5) over the plug stem extension.
3. Pull all stuffing box parts out of the packing chamber using a suitable tool. Replace damaged parts. Clean packing chamber thoroughly.
4. Remove the gasket (5.5) in the intermediate piece (12) and carefully clean the sealing faces.
5. Apply lubricant (order no. 8150-0111) to all the packing parts and the plug stem (6).
6. Insert a new gasket (5.5) in the intermediate piece. Carefully place the bonnet over the plug stem extension onto the bonnet and secure with nuts (5.4).
7. Carefully slide the stuffing box parts over the plug stem extension into the packing chamber. Make sure to keep the proper order. Screw in the threaded bushing (5.2) and tighten.
8. Loosely screw the lock nut (6.2) and stem connector nut (6.1) onto the plug stem.
9. Adjust the travel as described in section 2.1 and mount the actuator.

5.2.2 Plug

When exchanging the plug, check the packing (4.2) or, preferably, replace it as described in section 5.1.

DN 15 to DN 150: To unscrew the plug (6) from the plug stem extension (6.3), screw two nuts onto the protruding thread of the extension to hold the plug stem extension in place.

Caution!
To prevent damage to the version with the bellows seal (no bellows in the version with insulating section), make sure no torque is transmitted to the bellows, which is connected to the intermediate piece. We recommend you to use a clamping tool (see EB 029 EN).

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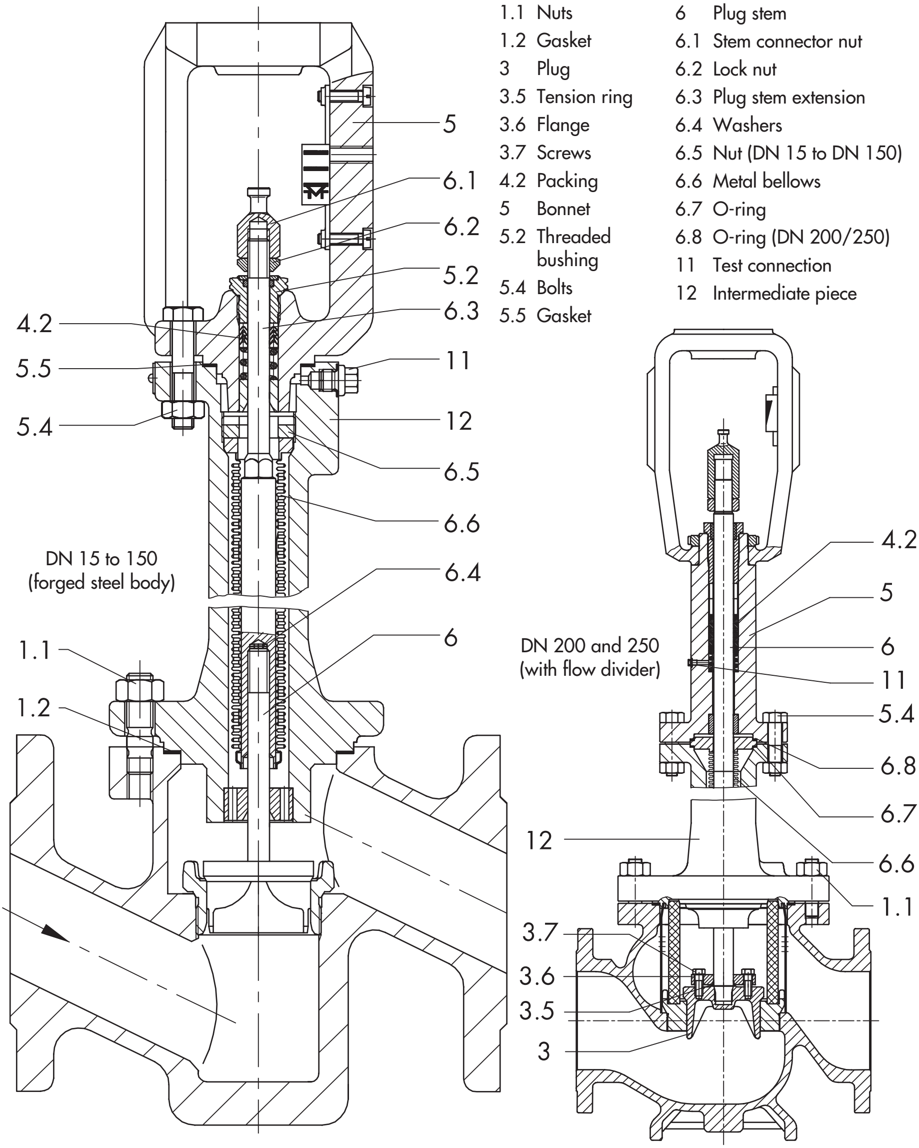
1. Remove the nuts (1.1).
2. Remove the intermediate piece (12) together with the plug stem extension, plug stem and plug from the valve body.
3. Remove gasket (1.2) and carefully clean the sealing faces in the valve body and on the intermediate piece.
4. Use an appropriate wrench to hold the nuts stationary, which are screwed onto the plug stem extension. Clamp the plug stem using a suitable tool and screw it out of the plug stem extension.
   Caution! Do not twist the plug stem extension with the welded-on bellows!
5. Apply lubricant (order no. 8150-0111) to the end of the plug stem (6) of the new or old, reworked plug (3).



1.1	Nuts	6	Plug stem
1.2	Gasket	6.1	Stem connector nut
3	Plug	6.2	Lock nut
3.5	Tension ring	6.3	Plug stem extension
3.6	Flange	6.4	Washers
3.7	Screws	6.5	Nut (DN 15 to DN 150)
4.2	Packing	6.6	Metal bellows
5	Bonnet	6.7	O-ring
5.2	Threaded bushing	6.8	O-ring (DN 200/250)
5.4	Bolts	11	Test connection
5.5	Gasket	12	Intermediate piece

Fig. 6 · Version with metal bellows and insulating section

Check whether the two washers (6.4) are still in the plug stem extension (6.3). Screw the plug stem firmly into the plug stem extension (6.3); tightening torque is 50 Nm for Ø 10 mm and 80 Nm for Ø 16 mm.

- To complete assembly, refer to section 5.2.5.

DN 200 and DN 250:

1. Remove the nuts (1.1).
2. Remove the intermediate piece (12) together with the plug stem extension, plug stem and plug from the valve body.
3. Remove gasket (1.2) and carefully clean the sealing faces in the valve body and on the intermediate piece.
4. Remove the hexagon head screws (3.7), tension ring (3.5) and flange (3.6).
5. Unscrew the plug from the plug stem. To do so, use a suitable tool to hold the plug stem in place, so that the metal bellows, which is welded onto the plug stem, cannot be twisted.
6. Screw a new plug with tension ring and flange to the plug stem.

- To complete assembly, refer to section 5.2.5.

In the version with insulating section, there are no parts 3.5, 3.6 and 3.7. Plug (3) and plug stem(6) form one piece.

5.2.3 Seat

Replace the seat (2) as described in section 5.1.2.

5.2.4 Metal bellows

DN 15 to DN 150:

1. Unscrew the plug (3) together with the plug stem (6) from the plug stem extension (6.3) as described for replacing the seat in section 5.2.2.
2. Unscrew the nut (6.5) using a SAMSON socket wrench (see EB 029 EN).
3. Pull the plug stem extension with the welded-on metal bellows (6.6) out of the intermediate section (12).
4. Clean the sealing faces on the intermediate piece.
5. Insert a new plug into the intermediate piece and screw down the nut (6.5).

⚠ ***Caution!***
Do not twist the metal bellows!

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6. Check whether both washers (6.4) are still in the plug stem extension (6.3). Apply lubricant (order no. 8150-0111) to the thread of the plug stem and firmly screw the plug stem into the plug stem extension (6.3) with a tightening torque of 50 Nm for a plug stem diameter of 10 mm and 80 Nm for a diameter of 16 mm.

DN 200 and DN 250:

1. Unscrew the plug (3) from the plug stem as described in section 5.2.2.
   Pull the plug stem (6) together with the metal bellows (6.6) upwards, out of the intermediate piece (12).

2. Replace the O-ring (6.7) and insert a new plug stem with metal bellows (6.6).
3. Screw on the plug and secure with the tension ring (3.5), flange (3.6) and screws (3.7).

5.2.5 Reassembly

1. Insert a new gasket (1.2) into the valve body. Place the intermediate piece (12) onto the valve body (1) and secure with nuts (1.1).
2. Insert a new gasket (5.5) into the intermediate piece. Place the valve bonnet (5) onto the intermediate piece and secure with nuts and bolts (5.4).
   Observe the tightening torques specified in EB 029 EN.
3. Tighten the threaded bushing (5.2).
4. Loosely screw the lock nut (6.2) and stem connector nut (6.1) onto the plug stem extension (6.3) or plug stem.
5. Adjust the travel as described in section 2.1 and mount the actuator.

5.3 Replacing the collar or seal

For version with pressure-balanced plug:

1. Unscrew the stem connector nut and lock nut (6.1 and 6.2) from the plug stem.
2. Remove the body nuts (1.1) and carefully lift off the valve bonnet (5) with plug stem (6).
3. Screw the threaded bushing (5.2) out of the stuffing box. Pull plug stem and plug (3) out of the bonnet.
4. Remove gasket (1.2) and carefully clean the sealing faces in the valve body and on the bonnet.

DN 40:

5. Pull the packing (4.2), washer (4.3) and spring (4.1) out of the packing chamber using an appropriate tool. Replace damaged parts.
6. Push out the bushing (3.2) and replace the collar (3.1).
   Clean the packing chamber thoroughly.
7. Apply lubricant (order no. 8150-0111) to the bushing (3.2) and push it in again.
8. Also apply lubricant to the packing parts, plug stem (6) and the contact faces of the collar (3.1).
9. Insert the plug stem and plug into the valve bonnet.

Completion of reassembly:

10. Insert a new gasket (1.2) into the valve body. Carefully place the valve bonnet on the valve body and secure with nuts (1.1). Observe the tightening torques specified in EB 029 EN.
11. Slide the stuffing box parts over the plug stem into the packing chamber. Make sure to keep the proper order.
12. Screw in the threaded bushing (5.2) and tighten.
13. Loosely screw the lock nut (6.2) and stem connector nut (6.1) onto the plug stem.
14. Adjust the travel as described in section 2.1 and mount the actuator.

DN 50 to DN 150:

5. Remove screw (3.4) with its locking device and washer (3.3). Replace collar (3.1) with a new one.
6. Insert washer (3.3). Thread down the screw (3.4) with its locking device.
7. Apply lubricant (order no. 8150-0111) to the packing parts, plug stem (6) and contact faces of collar (3.1).
8. Insert the plug stem and plug into the valve bonnet.

- Complete reassembly as described for DN 40, steps 10 to 14.

DN 200 and DN 250:

5. Remove the screw (3.4) with its locking device.
6. Lift off the ring (3.3) and replace collar or seal (3.1).
7. Insert ring (3.3).
   Thread down screw (3.4) and its locking device.
8. Apply lubricant (order no. 8150-0111) to the packing parts, plug stem (6) and contact faces of the collar (3.1).
9. Insert the plug stem and plug into the valve bonnet.

- Complete reassembly as described for DN 40, steps 10 to 14.

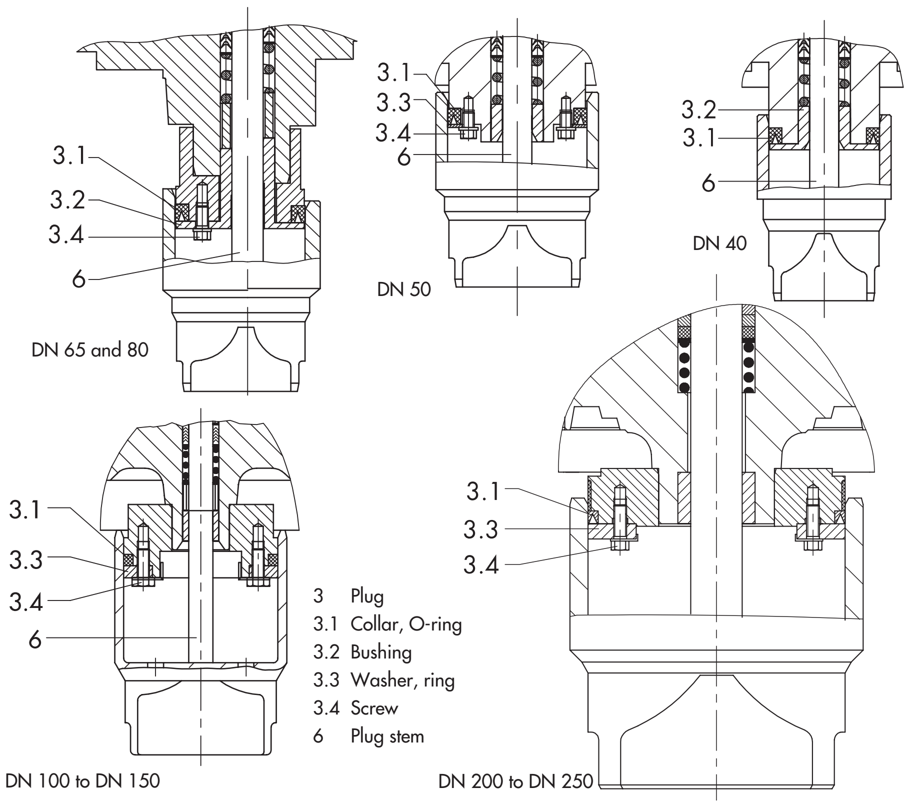


Fig. 7 · Version with metal bellows and insulating section

6 Material identifying marks

Guide bushing, seat and plug have the following identifying marks:

Guide bushing (groove on plane face)

- No groove: 1.4305
- Sharp recessed groove: 1.4571
- Flat recessed groove: Hastelloy

Seat
The material number according to DIN is either stamped or engraved on the seat.

- Stellited seats are marked by a stamped-on "st".

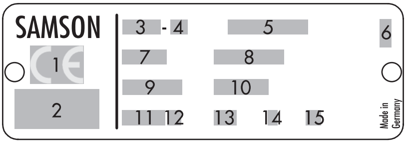
Plug
Groove below the plug stem thread:

- No groove: 1.4006
- Sharp recessed groove: 1.4571
- Two sharp recessed grooves: 1.4301
- Flat recessed groove: Hastelloy
- When other materials are used, either the material number or its designation is engraved on the plug.

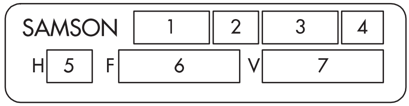
The **Kvs value and characteristic** are engraved on the plug.

- Stellited plugs are marked by an engraved "st".

7 Description of nameplates



1 CE marking or "Art. 3, Abs.3" (see article 3, § 3 of PED), where applicable
2 Identification no. of notified body, fluid group and category, where applicable
3 Type designation
4 Modification index of valve
5 Material
6 Year of manufacture
7 Nominal size: DIN: DN, ANSI: Size
8 Permissible excess pressure at room temperature DIN: PN, ANSI: CL
9 Order number with modification index
10 Position of item in order
11 Flow coefficient: DIN: **K**$_{vs}$, ANSI: **C**$_{v}$
12 Characteristic: % equal percentage, Lin linear, DIN: **A/Z** quick opening, ANSI: **O/C**
13 Sealing: **ME** metal, **ST** stellited, **Ni** nickel-plated **PT** soft sealing with PTFE, **PK** soft sealing with PEEK
14 Pressure-balanced: DIN: **D**, ANSI: **B**
15 **I** or **III** flow divider



1 Type designation
2 Modification index
3 Effective diaphragm area
4 Fail-safe action: FA Actuator stem extends FE Actuator stem retracts
5 Travel
6 Bench range (spring range)
7 Bench range with pretensioned springs

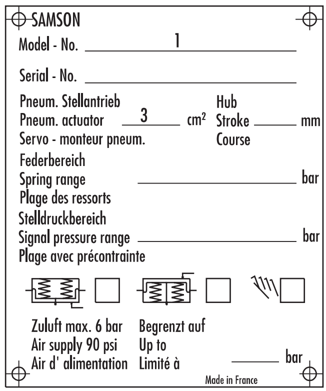


Fig. 8 · Valve nameplate (left) and actuator nameplates (right)

8 Customer inquiries

If you encounter any problems, please submit the following details:

- Order number
- Type, product number, nominal size and version of the valve
- Pressure and temperature of the process medium
- Flow rate in m^3/h
- Has a strainer been installed?
- Installation drawing

***Dimensions and weights** of the valve versions can be found in Data Sheet T 8015 EN.*

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S/Z 2004-06

Pneumatic Control Valves
Type 3251-1 and Type 3251-7

Fig. 1 · Type 3251-1 Control Valve

Mounting and Operating Instructions

EB 8051 EN

Edition October 2003

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Note!
Non-electrical control valves which do not have a valve body lined with an ***insulating material coating*** *do not have their own potential ignition source according to the risk assessment in the rare incident of an operating fault, corresponding to EN 13463-1: 2001 paragraph 5.2, and therefore do not fall within the scope of the European Directive 94/9/EC.*

General safety instructions

- *The control valve may only be mounted, started up or serviced by fully trained and qualified personnel, observing the accepted industry codes and practices. Make sure employees or third persons are not exposed to any danger.*
  All safety instructions and warnings in these instructions, particularly those concerning installation, start-up and maintenance, must be observed.
- *The control valve fulfills the requirements of the European Pressure Equipment Directive 97/23/EC. Valves with a CE marking have a declaration of conformity that includes information on the applied conformity assessment procedure. The declaration can be viewed and downloaded on the Internet at http://www.samson.de.*
- *For appropriate operation, make sure that the control valve is only used in areas where the operating pressure and temperatures do not exceed the operating values based on the valve sizing data submitted in the order. The manufacturer does not assume any responsibility for damage caused by external forces or any other external influence!*
  Any hazards which could be caused in the control valve by the process medium, operating pressure, signal pressure or by moving parts are to be prevented by means of the appropriate measures.
- *Proper shipping and appropriate storage are assumed.*

Caution!

- *For installation and maintenance work on the valve, make sure the relevant section of the pipeline is depressurized and, depending on the process medium used, drained as well. If necessary, allow the control valve to cool down or warm up to reach ambient temperature prior to starting any work on the valve.*
- *When working on the valve, make sure that the supply lines for the air supply as well as the control signal are disconnected to prevent any hazards that could be caused by moving parts.*
- *Special care is needed when the actuator springs are pretensioned. These actuators are labeled correspondingly and can also be identified by three long bolts at the bottom of the actuator. Prior to starting any work on the valve, you must relieve the compression from these pretensioned springs.*

1 Design and principle of operation

The Type 3251-1 and Type 3251-7 Pneumatic Control Valves consist of a single-seated Type 3251 Globe Valve and either the Type 3271 or Type 3277 Pneumatic Actuator.
The process medium flows through the valve in the direction indicated by the arrow. The position of the plug (3) determines the flow rate through the valve seat (2).
The plug (3) is moved by changing the signal pressure acting on the diaphragm of the actuator (8).
The plug stem (6) with the plug is connected to the actuator stem (8.1) over a stem connector (7) and sealed with spring-loaded PTFE V-ring packing (4.2) or adjustable HT packing.

Fail-safe position:

Depending on how the compressed springs (8.4) are arranged in the actuator, there are two different fail-safe positions:

Actuator stem extends:
When the signal pressure is reduced or the supply air fails, the springs move the actuator stem downwards, closing the valve.
The valve opens as the signal pressure increases and overcomes the force exerted by the actuator springs.

Actuator stem retracts:
When the signal pressure is reduced or the supply air fails, the springs move the actuator stem upwards, opening the valve.
The valve closes as the signal pressure increases and overcomes the force exerted by the actuator springs.

2 Assembling valve and actuator

A pneumatic actuator with an additional handwheel or an electric actuator can be mounted to the valve in place of the simple pneumatic actuator.
The standard pneumatic actuator can be replaced by a larger or smaller actuator, regardless of the nominal valve size.
If the travel range of the actuator is larger than that of the valve in a valve/actuator combination, the spring assembly in the actuator is preloaded by the manufacturer to make the travels match.

Each valve is equipped with the parts required for mounting its standard actuator.
If you intend using a different actuator, the matching mounting parts need to be ordered together with the actuator.
The necessary parts with their order numbers can be found in the overview sheet **1600-0501...0550** available on request. These additionally delivered parts are then used instead of the original parts.

2.1 Assembly and adjustment

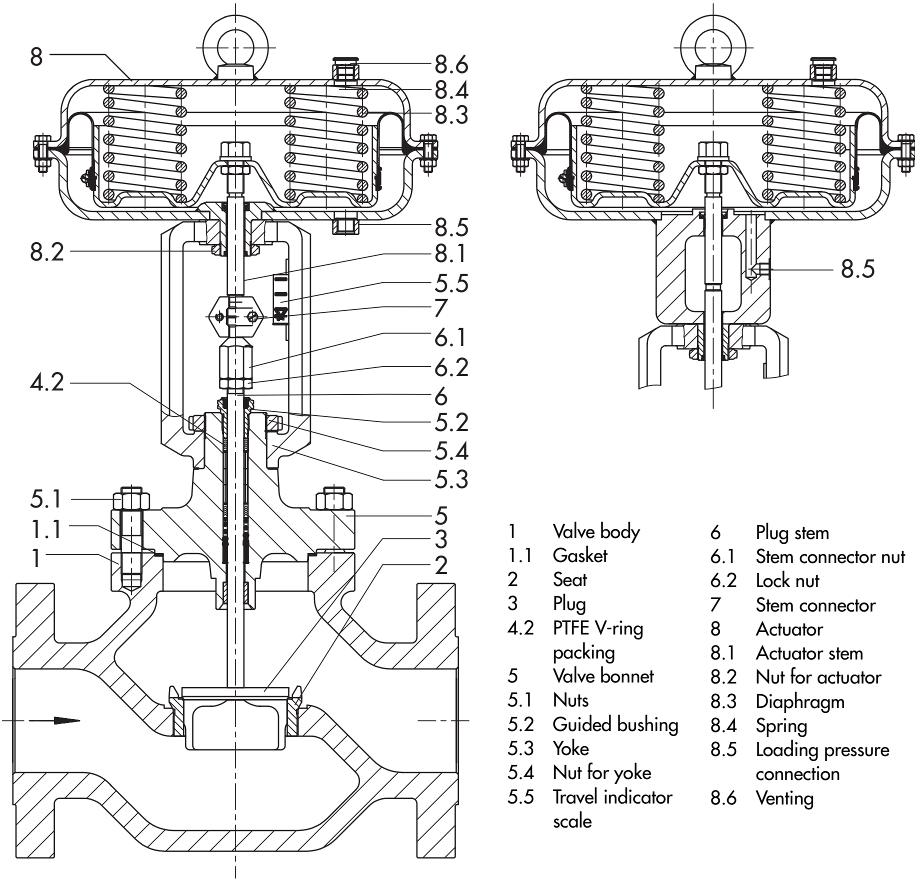
If the actuator has not already been mounted by the manufacturer on the valve or you intend replacing the original actuator with an actuator of a different sort or size, proceed as follows:

1. Loosen the lock nut (6.2) and stem connector nut (6.1) at the valve.
   Firmly press the plug and plug stem into the seat ring, then thread the stem connector nut and lock nut downwards.
2. Unscrew the coupling parts (7) of the stem connector and the ring nut (8.2) from the actuator.

Slide the ring nut over the plug stem of the valve.

3. Place the actuator on the yoke (5.3) and screw tight using the ring nut (8.2).
4. Read the bench range (or bench range with pretensioned springs) and the actuator's fail-safe action indicated on the nameplate of the actuator (e.g. 0.2 to 1 bar and "Actuator stem extends".

The lower bench range value (0.2 bar) corresponds to the lower range value of the signal pressure to be adjusted, the upper bench range value (1 bar) to the upper range value of signal pressure.



1	Valve body	6	Plug stem
1.1	Gasket	6.1	Stem connector nut
2	Seat	6.2	Lock nut
3	Plug	7	Stem connector
4.2	PTFE V-ring packing	8	Actuator
5	Valve bonnet	8.1	Actuator stem
5.1	Nuts	8.2	Nut for actuator
5.2	Guided bushing	8.3	Diaphragm
5.3	Yoke	8.4	Spring
5.4	Nut for yoke	8.5	Loading pressure connection
5.5	Travel indicator scale	8.6	Venting

Fig. 2 · Sectional drawings of Type 3251-1 and Type 3251-7 (right)

The fail-safe action "Actuator stem extends" or "Actuator stem retracts" is indicated by the abbreviation FA or FE on the nameplate of the Type 3271 Actuator and by a symbol on the Type 3277 Actuator.

5. For actuators with **"Actuator stem extends"**, apply a loading pressure corresponding to the lower signal pressure range (e.g. 0.2 bar) to the connection on the bottom diaphragm chamber.
   For actuators with "**Actuator stem retracts",** apply a loading pressure corresponding to the upper signal pressure range (e.g. 1 bar) to the connection on the top diaphragm chamber.
6. Turn the stem connector nut (6.1) by hand until it touches the actuator stem (8.1), then turn it another 1/4 turn and secure this position using the lock nut (6.2).
7. Attach the coupling parts (7) of the stem connector and screw them tight.
   Align the travel indicator scale (5.5) with the tip on the side of the stem connector.

Note about disassembling actuators
On removing an actuator mounted on a valve, and in particular, in a version with pretensioned springs, a loading pressure slightly higher than the lower bench range (see nameplate on the actuator) must be applied to the loading pressure connection before the ring nut (8.2) can be unscrewed.

2.2 Option of pretensioning for "Actuator stem extends"

To achieve a more powerful positioning force, the springs in the actuators can be pretensioned by up to 25 % of its travel or bench range during the valve adjustment procedure.
For example, the springs should be pretensioned by 0.1 bar for a bench range of 0.2 to 1 bar. This means the bench range is shifted by 0.1 bar to achieve a range from 0.3 to 1.1 bar (0.1 bar corresponds to pretensioning the springs by 12.5 %). On adjusting the valve, a signal pressure of 0.3 bar must now be set as the lower signal pressure range.
It is essential that the new bench range (e.g. 0.3 to 1.1 bar) is recorded on the nameplate as bench range with pretensioned springs.

2.3 Different rated travels of valve and actuator

Actuator version "Actuator stem extends"

Note!
Valves that have a smaller rated travel than that of the actuators must always use pretensioned spring ranges.

Example:
Valve DN 100 with a rated travel of 30 mm is to be mounted to an actuator 1400 cm^2 with a rated travel of 60 mm and a bench range from 0.4 to 2 bar.

1. Set the signal pressure required to preload the springs to 1.6 bar. This signal pressure value is above the signal press-

ure of 1.2 bar (range 1.2 to 2 bar) that corresponds to the mid-travel of the actuator (30 mm).

2. Thread the stem connector nut (6.1) until it touches the actuator stem.
3. Secure this position using the lock nut. Attach the stem connector as described in section 2.1.
4. Record the bench range (e.g. 1.6 to 2.4 bar) valid for the mounted valve on the nameplate of the actuator.

Actuator version "Actuator stem retracts"

Note!
The actuator springs in the version "Actuator stem retracts" cannot be pretensioned.

When a valve is mounted to a larger actuator (rated travel of the actuator is larger than that of the valve), only the first half of the actuator's bench range can be used.

Example:
Valve DN 100 with a rated travel of 30 mm and an actuator 1400 cm^2 with a rated travel of 60 mm and a bench range from 0.2 to 1 bar:

For mid-travel of the valve, a bench range from 0.2 to 0.6 bar can be used.

Note!
Actuators which have already been pretensioned by the manufacturer are labeled correspondingly. Additionally, they can also be identified by three long bolts on the bottom diaphragm case.

3 Installation

3.1 Mounting position

The control valve can be mounted in any position. However, valves in nominal sizes DN 100 and larger should preferably be mounted upright with the actuator pointing upwards. This makes maintenance work easier. Valves with an insulating section or bellows seal or actuators that weigh more than 50 kg should be fitted with suitable supports or, in the case of the actuator, suspended.

Important!
The valve must be installed with the least amount of vibrations possible and without any tension.
Clean out the pipeline thoroughly prior to installing the valve.
Note!
Control valves with insulating section or bellows seal may only be insulated up to the cover flange of the valve body for medium temperatures below 0 °C as well as temperatures above 220 °C.
*Valves that should meet the requirements of **NACE MR 0175** standard should not be insulated.*

3.2 Signal pressure line

For valves mounted to actuator versions "Actuator stem extends", connect the signal pressure to the loading pressure connection on the bottom diaphragm case and for valves mounted to actuator versions "Actuator stem retracts", connect the signal pressure to the connection on the top diaphragm case.

The lower loading pressure connection is located at the side of the yoke underneath the bottom diaphragm case in the Type 3277 Actuator.

3.3 Strainer, bypass

We recommend installing a strainer upstream of the valve.
If the plant should continue to operate during valve maintenance, install a shut-off valve both upstream of the strainer and downstream of the control valve as well a bypass.

3.4 Test connection

Versions with a metal bellows seal (Fig. 5) include a test connection (11.1) located on the top flange to check the bellows for any leakage. We recommend connecting a suitable leakage indicator (e.g. contact pressure gauge, drainage into an open vessel or sight glass).

4 Operation

(e.g. reversing the operating direction etc.)

Refer to the mounting and operating instructions of the pneumatic actuators

EB 8310 EN for Type 3271 and
EB 8311 EN for Type 3277.

5. Maintenance – Replacing parts

The control valve is subject to natural wear especially at the seat, plug and packing. Depending on the application conditions that prevail, the valve must be inspected at appropriately scheduled intervals to prevent any problems before they occur.
If any leaks occur to the atmosphere, the packing may be leaking.
If the valve does not seal properly, this may be because tight shut-off is prevented by dirt between the seat and plug or because the seating surface is damaged.
We recommend removing the parts, thoroughly cleaning them and replacing them, if necessary.

Important!
If you intend carrying out maintenance work on the valve, first relieve the corresponding plant section of pressure and, depending on the process medium, drain it as well.
Let the plant section cool down to reach ambient temperature, if necessary.
As the process medium cannot drain completely out of the valve, be aware that some of the process medium could still be in the valve. This is particularly the case for valve versions with bellows seals and insulating sections.
We recommend that you remove the valve from the pipeline.
On carrying out any work on the valve, first disconnect the signal pressure, remove the signal pressure line and remove the actuator from the valve.

Important!
Control valves fitted with a ceramic seat and plug must be handled with extreme care as they can easily break. The valve in this version cannot be remachined as described in section 5.1.2.

Note on SAMSON special tools
Suitable seat wrenches and special tools as well as the appropriate tightening torques can be found in EB 029 EN (formerly WA 29 EN). The instructions can be viewed on the Internet at http://www.samson.de/pdf_en/e00290en.pdf.

Removing the actuator:

1. Unscrew the ring nut (8.2) and take off the stem connector (7).
   For the version "Actuator stem extends", and in particular, in a version with pretensioned springs, apply a loading pressure slightly higher than the lower bench range (see nameplate on the actuator) to the loading pressure connection to allow the ring nut (8.2) to be unscrewed.
   After you have loosened the nut, disconnect the supply pressure again.
2. Remove the actuator from the valve yoke.

5.1 Replacing parts of standard valves

5.1.1 Packing

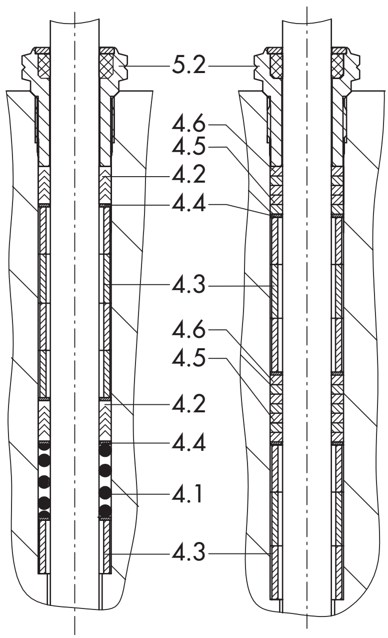
If the valve leaks at the packing, the packing (4.2) and seal elements (4.5 and 4.6) must be replaced as follows:

Disassembly

1. Unscrew the nuts (5.1) and lift the valve bonnet (5) together with the plug stem and plug off from the valve body.
2. Unscrew the stem connector nut (6.1) and lock nut (6.2) off the plug stem. Unthread the guided bushing (5.2) out of the packing.
3. Pull the plug together with the plug stem out of the valve bonnet.
4. Pull all the packing parts using a suitable tool out of the packing space. Replace any damaged parts with new ones.
   Carefully clean the packing space.

Assembly

1. Apply lubricant (order no. 8150-0111) to all parts as well as the plug stem (6). Do not use any lubricant for graphite packing!
2. Place the plug into the valve body and insert a new flat gasket (1.1).
3. Place the valve bonnet carefully over the plug stem onto the valve body and screw the nuts (5.1) tight.
4. Carefully slide the packing parts over the plug stem into the packing space. Make sure the packing parts are replaced in the right order. Note that the number of spacers (4.3) varies depending on the nominal size.
5. Thread in the guided bushing (5.2) and tighten. For high-temperature packing, tighten the guided bushing only slightly, even if it starts to leak, it should only be tightened slightly.



4.1 Spring
4.2 V-ring packing
4.3 Spacer(s)
4.4 Washer(s)
4.5 Carbon bushing(s)
4.6 Graphite, compressed
5.2 Guided bushing

Fig. 3 · Packing, standard (left) high-temperature (right)

6. Screw the lock nut (6.2) and stem connector nut (6.1) onto the plug stem without tightening them.
7. Attach the actuator as described in section 2.1 and set the lower and upper bench range.

5.1.2 Seats and/or plug

When replacing the seat or plug, we recommend replacing the packing (4.2 or 4.5 and 4.6) as well.

Seat:

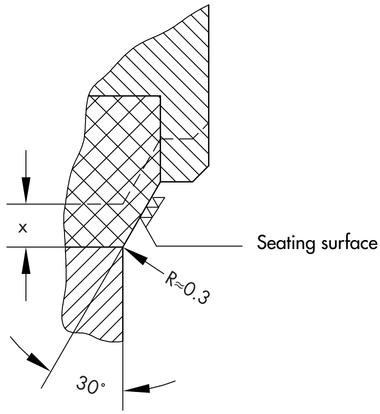
1. Unscrew the nuts (5.1) and lift the valve bonnet (5) together with the plug stem and plug off the valve body.
2. Unscrew the seat (2) using the appropriate seat wrench (see EB 029 EN).
3. Apply lubricant (order no. 8150-0119) to the thread and sealing cone of the new seat (or the old seat after it has been remachined or thoroughly cleaned) and screw it back in.
   The tightening torques for the seat are likewise listed in EB 029 EN.

Plug:

1. Unscrew the nuts (5.1) and lift the valve bonnet (5) together with the plug stem (6) and plug off the valve body (1).
2. Unscrew nuts (6.1, 6.2) and guided bushing (5.2).
3. Pull the plug out of the valve bonnet.
4. Change the plug and insert the new plug and plug stem (6).
   It may be possible to use the old plug again after it has been remachined. Apply lubricant (order no. 8150-0119) to the plug stem (6) before fitting it back into the valve.

Remachining the plug

The plug can be machined when the plug's seating surface is slightly damaged. Plugs with a soft sealing can only be machined up to the dimension x (Fig. 4).



Seat bore Ø	x (mm)
31 to 50	1
63 to 150	2

Fig. 4 · Remachining a plug with soft sealing

5.2 Replacing parts of valves with metal bellows seal

Caution!
To prevent damage in the valve with bellows seal (a valve with insulating section does not contain a bellows), make sure that no torque is transferred to the bellows.

5.2.1 Packing

Replace parts as described in section 5.1.1 for the standard valve. However, unthread the guided bushing (5.2), unscrew nuts (11.2) and separate the bonnet (11) from the intermediate piece (9).
Replace gasket (9.1) with a new one.

5.2.2 Metal bellows

The metal bellows (10) can only be replaced as an entire unit together with the plug stem. To do this, proceed as described in section 5.1.2 (Fig. 5).

5.2.3 Seats and/or plug

Replace parts as described in section 5.1.2 for the standard valve.
The plug stem can only be exchanged together with the metal bellows seal.
The plug can be removed from the plug stem: in valve size DN 15 to 40, the plug is attached by a nut and from valve size DN 50 and above, it is attached with a clamping disk.

- Prior to attaching the plug, apply lubricant (order no. 8150-0111) to the thread of the plug stem.

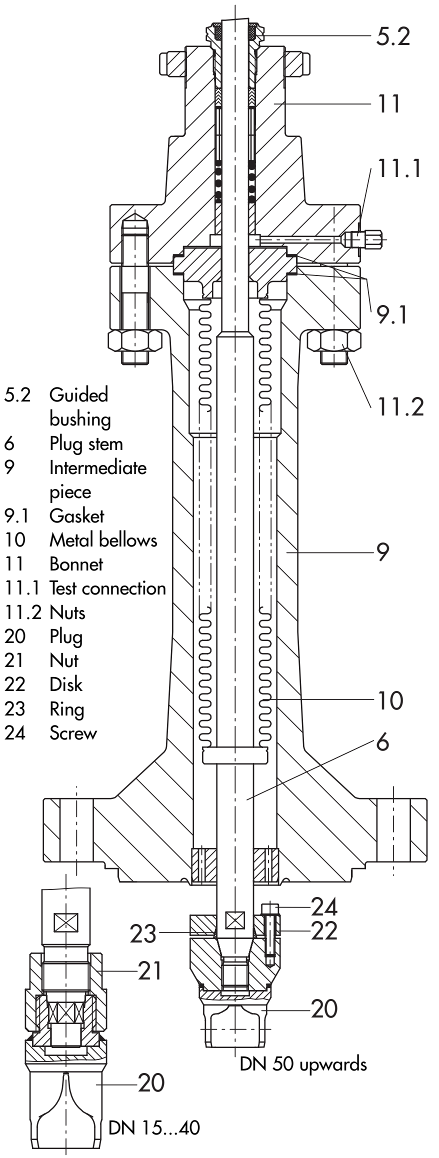


Fig. 5 · Bellows seal, shown for sizes DN 50 to 150

- In the version with the plug attached by a nut, screw on the nut (21) by hand on to the plug stem as far as it will go. Place the plug on the hexagonal neck of the plug stem. Place an open-end wrench on the flattened area of the plug stem and screw the nut onto the plug with a tightening torque of 40 Nm.

5.3 Replacing parts of valves with insulating section

Replace the packing as described in section 5.1.1 for the standard valve.

Replace the seat and plug as described in section 5.1.2 for the standard valve.

5.4 Disassembling the flow divider

For valves with flow dividers, the gasket (1.1) and shims (1.2) must be replaced with new ones every time the flow divider is removed.

The number of shims required and the dimension x must be determined when a new gasket (1.1) is used:

First measure dimension A, then dimension B.

Dimension x is calculated from A – B and must be filled out with shims (0.5 or 2 mm thick).
The maximum compression should be approximately 0.5 mm.

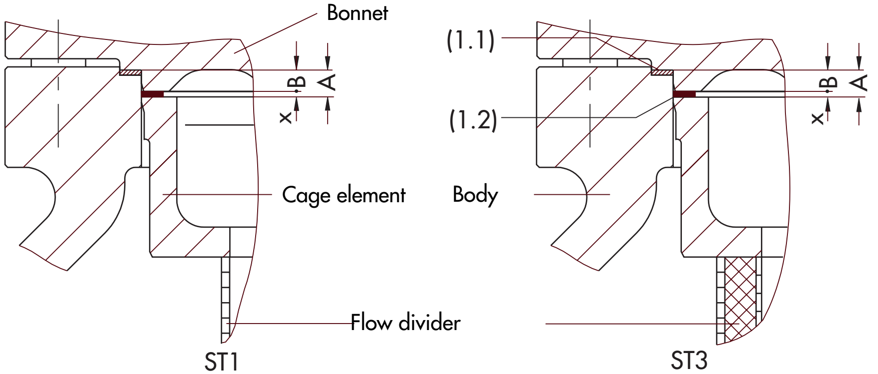
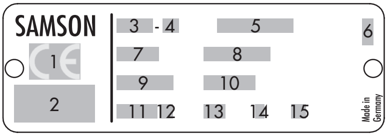


Fig. 6 · Installing a flow divider

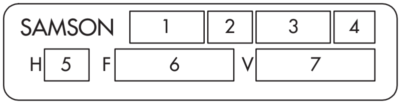
6 Description of nameplates

Valve nameplate



1 CE marking or "Art. 3, Abs. 3" (see article 3, § 3 of PED), where applicable
2 Ident. number of notified body, fluid group and category, where, applicable
3 Type designation
4 Modification index of valve
5 Material
6 Year of manufacture
7 Nominal size: DIN: DN, ANSI: Size
8 Perm. operating pressure at room temperature DIN: PN, ANSI: CL
9 Order number with modification index
10 Item position on order
11 Flow coefficient:
DIN: **K**VS value , ANSI: **Cv** value
12 Characteristic:
% equal percentage, **Lin** linear,
DIN: **A/Z**, ANSI: **O/C** for quick opening
13 Sealing:
ME metal, **ST** stellited, **Ni** nickel plated
PT soft sealing with PTFE,
PK soft sealing with PEEK
14 Pressure balancing: DIN: **D**, ANSI: **B**
15 **I** or **III** flow divider

Type 3271 Actuator nameplate



1 Type designation
2 Modification index
3 Effective diaphragm area
4 Fail-safe action:
FA Actuator stem extends
FE Actuator stem retracts
5 Travel
6 Bench range (spring range)
7 Bench range with pretensioned springs

Type 3277 Actuator nameplate

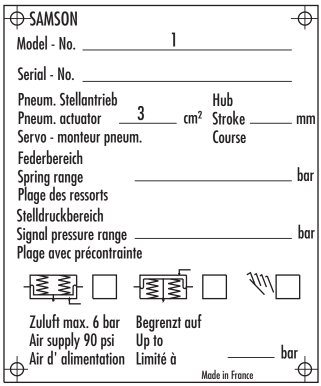


Fig. 7 · Nameplates

7 Customer inquiries

Please submit the following details:

- Order number
- Type, model number, nominal size and version of the valve
- Pressure and temperature of the process medium
- Flow rate in m^3/h
- Bench range (e.g. 0.2 to 1 bar) of the mounted actuator
- Has a strainer been installed?
- Installation drawing

Dimensions and weights
Refer to the Data Sheet T 8051 EN for dimensions and weights of the valve versions.

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Series 250
Pneumatic Control Valves
Type 3254-1 and Type 3254-7

SAMSON

Fig. 1 · Type 3254-1 Control Valve

Mounting and Operating Instructions

EB 8060 EN

Edition October 2003

Contents Page

Note!
Non-electrical control valves which do not have a valve body lined with an ***insulating material coating*** *do not have their own potential ignition source according to the risk assessment in the rare incident of an operating fault, corresponding to EN 13463-1: 2001 paragraph 5.2, and therefore do not fall within the scope of the European Directive 94/9/EC.*

General safety instructions

- *The control valve may only be mounted, started up or serviced by fully trained and qualified personnel, observing the accepted industry codes and practices. Make sure employees or third persons are not exposed to any danger.*
  All safety instructions and warnings in these instructions, particularly those concerning installation, start-up and maintenance, must be observed.
- *The control valves fulfill the requirements of the European Pressure Equipment Directive 97/23/EC. Valves with a CE marking have a declaration of conformity which includes information about the applied conformity assessment procedure. The declaration can be viewed and downloaded on the Internet at http://www.samson.de.*
- *For appropriate operation, make sure that the control valve is only used in areas where the operating pressure and temperatures do not exceed the operating values based on the valve sizing data submitted in the order.*
  The manufacturer does not assume any responsibility for damage caused by external forces or any other external influence!
  Any hazards which could be caused in the control valve by the process medium, operating pressure or by moving parts are to be prevented by means of the appropriate measures.
- *Proper shipping and appropriate storage are assumed.*

Caution!

- *For installation and maintenance work on the control valves, make sure the relevant section of the pipeline is depressurized and, depending on the process medium used, drained as well. If necessary, allow the valve to cool down or warm up to reach ambient temperature prior to starting any work on it.*
- *Before carrying out any work on the valve, make sure the supply air and control signal are disconnected or interrupted to prevent any hazards from occurring due to moving parts in the control valve.*
- *Special care is needed when the valve is fitted with an actuator with pretensioned springs. These actuators are labeled correspondingly and can also be identified by three long bolts at the bottom of the actuator. Prior to starting any work on the valve, you must relieve the compression from the pretensioned springs.*

1 Design and principle of operation

The Type 3254-1 and Type 3254-7 Pneumatic Control Valves consist of the single-seated Type 3254 Globe Valve and either the Type 3271 or Type 3277 Pneumatic Actuator.
The process medium flows through the valve in the direction indicated by the arrow. The position of the plug (3) is changed by the signal pressure acting on the diaphragm of the actuator (8).
The plug stem (6) and plug are connected with the actuator stem (8.1) by the stem connector (7). The plug stem is sealed by spring-loaded PTFE V-ring packing (4.2) or adjustable high-temperature packing.

Fail-safe action:

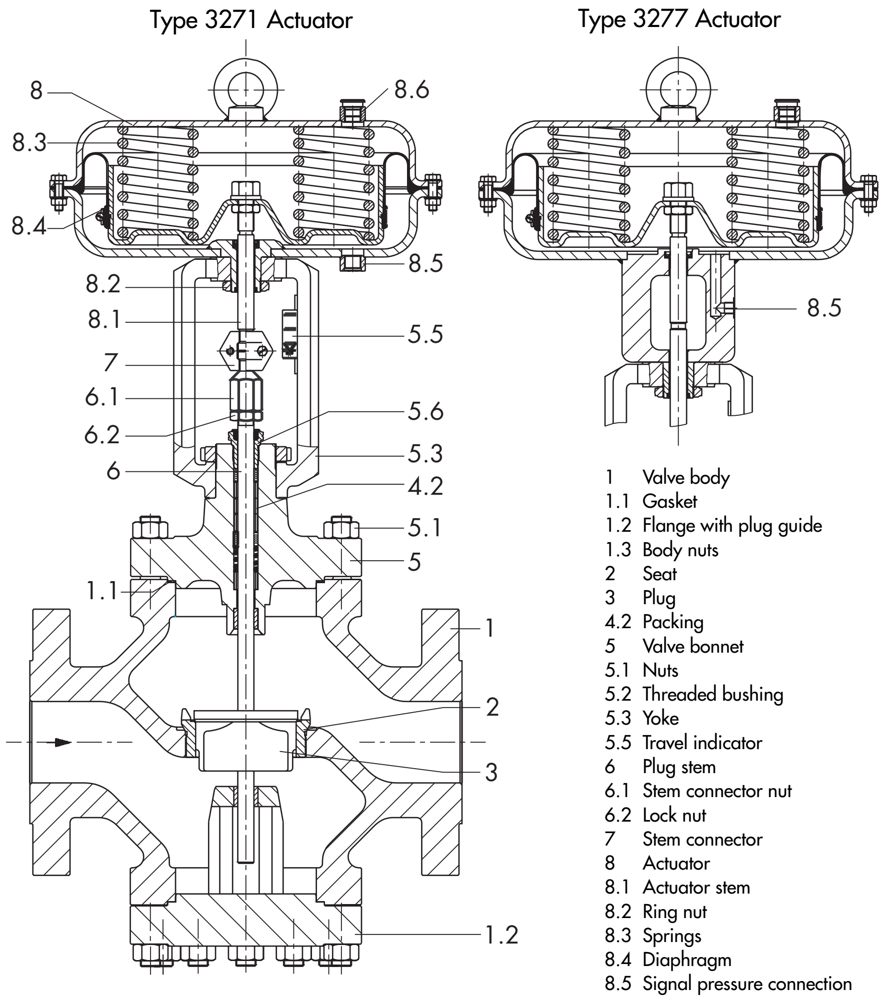
Depending on the arrangement of the compression springs (8.3) in the actuator, the control valve provides two different types of fail-safe action:

Actuator stem extends:

When the signal pressure is reduced or the air supply fails, the springs force the actuator stem to move downward and close the valve. When the signal pressure rises, the valve opens while acting against the force of the springs.

Actuator stem retracts:

When the signal pressure is reduced or the air supply fails, the springs force the actuator stem to move upward and open the valve. When the signal pressure rises, the valve closes while acting against the force of the springs.



1 Valve body
1.1 Gasket
1.2 Flange with plug guide
1.3 Body nuts
2 Seat
3 Plug
4.2 Packing
5 Valve bonnet
5.1 Nuts
5.2 Threaded bushing
5.3 Yoke
5.5 Travel indicator
6 Plug stem
6.1 Stem connector nut
6.2 Lock nut
7 Stem connector
8 Actuator
8.1 Actuator stem
8.2 Ring nut
8.3 Springs
8.4 Diaphragm
8.5 Signal pressure connection
8.6 Vent

Fig. 2 · Sectional drawing of Type 3254-1 (Type 3254-7)

2 Assembling valve – actuator

The simple pneumatic actuator can be exchanged for a pneumatic actuator with additional handwheel or an electric actuator. With all nominal sizes, the standard pneumatic actuator can be exchanged for an actuator of smaller or larger size.
When the travel range of the actuator is larger than that of the valve, the manufacturer pretensions the spring assembly of the actuator so that the travel ranges match.
Each valve is equipped with the accessories necessary for mounting the standard actuator. If a non-standard actuator is intended for use, you have to order the appropriate accessories together with the desired actuator.
The required parts and their order numbers can be found in the overview sheets 1600-0501 to 0550 you have to order. The original parts are then replaced by the additionally delivered parts.

2.1 Assembly and adjustment

If the valve and the actuator were not assembled by the manufacturer or if the original actuator of a valve is to be exchanged for an actuator of another type or size, proceeds as follows:

1. Loosen the lock nut (6.2) and the stem connector nut (6.1) on the valve.
   Press the plug and plug stem firmly into the seat ring, then thread the stem connector nut and the lock nut down.
2. Remove the stem connector clamps (7) and the ring nut (8.2) from the actuator.
   Slide the ring nut over the plug stem of the valve.
3. Place the actuator on the yoke (5.3) and secure with the ring nut (8.2).
4. Read the actuator’s bench range (or bench range with pretensioned springs) and fail-safe action from the nameplate (e.g. 0.2 to 1 bar and "Actuator stem extends").
   The lower bench range value (0.2 bar) to be adjusted corresponds to the initial value of the bench range, whereas the upper range value (1 bar) corresponds to the final value of the bench range.
   The fail-safe action "Actuator stem extends" or "Actuator stem retracts" is marked with the letters FA or FE, resp., on the Type 3271 Actuator, and with symbols on the Type 3277 Actuator.
5. For actuators with **Actuator stem extends**, apply a signal pressure that corresponds to the lower bench range value (e.g. 0.2 bar) to the lower diaphragm chamber connection.

For actuators with **Actuator stem retracts**, apply a signal pressure that corresponds to the upper bench range value (e.g. 1 bar) to the upper diaphragm chamber connection.

5. Turn the stem connector nut (6.1) by hand until it contacts the actuator stem (8.1). Make another 1/4 turn and secure this position with the lock nut (6.2).
6. Attach the stem connector clamps (7) and screw tight.
   Align the travel indicator scale (5.5) with the tip of the stem connector.

Note concerning removing actuators:
When removing an actuator from a valve, especially an actuator with pretensioned springs, the signal pressure connection must be pressurized first with a pressure that is slightly higher than the lower bench range value (see actuator nameplate) before the ring nut (8.2) can be loosened.

2.2 Option of pretensioning for "Actuator stem extends"

To increase the positioning force, you can pretension this type of actuator by up to 25 % of its travel or bench range during valve adjustment.
For example, pretensioning of 0.1 bar is desired for a bench range from 0.2 to 1 bar, the bench range is shifted by 0.1 bar to range from 0.3 to 1.1 bar (0.1 bar corresponds to a pretension of 12.5 %).
When adjusting the valve, the lower bench range value must now be set at 0.3 bar.
The new bench range of 0.3 to 1.1 bar must be recorded on the nameplate as bench range with pretensioned springs.

2.3 Different rated travels of valve and actuator

Valve with actuator "Actuator stem extends"

Note!
Actuators with pretensioned springs must always be used when the valve's rated travel is smaller than the rated travel of the actuator.

Example:
Valve size DN 100 with a rated travel of 30 mm and 1400 cm^2 actuator with a rated travel of 60 mm, bench range (spring range) 0.4 to 2 bar

1. Set the signal pressure required for pretensioning to 1.6 bar which is slightly higher than the signal pressure 1.2 bar (1.2 to 2 bar) that corresponds to the actuator's mid-travel (30 mm).

2. Thread on the stem connector nut (6.1) until it touches the actuator stem.
3. Secure this position with the lock nut and mount the stem connector as described in section 2.1.
4. Write the bench range of 1.6 to 2.4 bar valid for the mounted valve on the nameplate of the actuator.

Valve with actuator "Actuator stem retracts"

Note!
The springs of actuators with "Actuator stem retracts" cannot be pretensioned.

When a valve is combined with a larger actuator (rated actuator travel higher than rated valve travel), only the first half of the actuator's bench range can be used.

Example:
Valve size DN 100 with a rated travel of 30 mm and a 1400 cm^2 actuator with a rated travel of 60 mm, bench range 0.2 to 1 bar:
At half of the valve travel, the usable bench is between 0.2 and 0.6 bar.

Caution!
Actuators which have already been pretensioned by the manufacturer are labeled correspondingly.
Additionally, they can also be identified by three long bolts at the bottom actuator case.

3 Installation

3.1 Mounting position

The valve and actuator can be mounted in any position, however, for valves with DN 100 and larger, the valve should be installed horizontally with the actuator pointing upward to make maintenance easier.
In cases where the actuator weighs more than 50 kg or the control valves are fitted with an insulating section or bellows seal, the actuator needs to be supported or suspended.

Important!
The valve must be installed free of stress.
Flush the pipeline thoroughly prior to installing the valve.
Note!
Control valves with insulating section or bellows seal may only be insulated up to the cover flange of the valve body for medium temperatures below 0 °C as well as temperatures above 220 °C.
*Valves that should meet the requirements of **NACE MR 0175** standard should not be insulated.*

3.2 Signal pressure line

For valves with actuator "Actuator stem extends", connect the signal pressure line to the lower diaphragm case, and for valves with actuator "Actuator stem retracts" to the upper diaphragm case.
The Type 3277 Actuator has its lower connection beneath the lower diaphragm case on the side of the yoke.

3.3 Strainer, bypass

We recommend that you install a strainer upstream of the valve.
We also recommend that you install hand-operated shut-off valves both upstream of the strainer and downstream of the control valve so that you need not shut down the plant for maintenance routines. You should also install a bypass.

3.4 Test connection

Versions with metal bellows seal (Fig. 5) include a test connection (11.1) located at the upper flange. This allows the tightness of the bellows to be checked.
Especially for applications with liquids and vapors, you should install a suitable leakage indicator (e.g. contact pressure gauge, outlet into an open receptacle or sight-glass).

4 Operation

(e.g. reversing the operating direction, etc.) Please refer to the Mounting and Operating Instructions EB 8310 EN for the Type 3271 Pneumatic Actuator and
EB 8311 EN for the Type 3277 Actuator.

5 Maintenance – Replacing parts

The control valve is subject to normal wear, especially at the seat, plug and packing. Depending on the application conditions that prevail, the valve must be inspected at appropriately scheduled intervals to prevent any problems before they occur.
If any leakage occurs to the atmosphere, this may be because the packing is leaking.

If the valve does not seal properly, this may be because tight shut-off is prevented by dirt between the seat and plug or because the seating surface is damaged.
We recommend that you disassemble the parts, thoroughly clean them and replace them, if necessary.

⚠ ***Note!***
Before servicing or disassembling the control valve, first relieve the corresponding section of the plant of pressure and, depending on the process medium, drain it as well.
Let the plant section cool down to reach ambient temperature, if necessary.
As the process medium cannot drain completely out of the valve, be aware that some of the process medium could still be in the valve. This is particularly the case for valves with insulating sections.
We recommend that you remove the valve from the pipeline.
***Important!** On carrying out any work on the valve, first disconnect the signal pressure, remove the signal pressure line and remove the actuator from the valve.*

Note on SAMSON special tools
Suitable seat wrenches and special tools as well as the appropriate tightening torques can be found in EB 029 EN (formerly WA 29 EN). The instructions can be viewed on the Internet at http://www.samsson.de/pdf_en/e00290en.pdf.

Disassembling the actuator:

1. Then remove the stem connector (7) and unscrew the ring nut (8.2).
   For actuators "Actuator stem extends" and especially for actuators with pretensioned springs, apply a signal pressure that is higher than the lower bench range value (see nameplate) to the actuator.
2. Lift the actuator off the valve yoke.

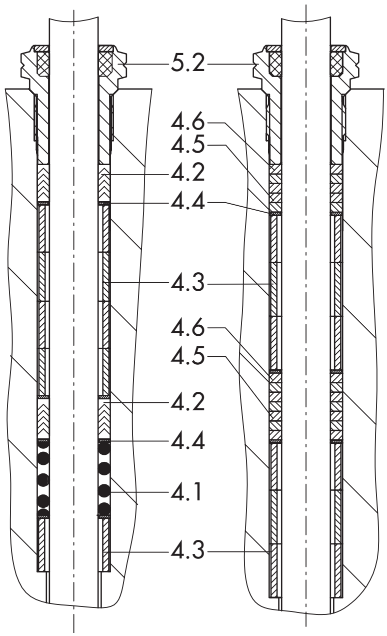
5.1 Replacing parts of standard valves

5.1.1 Packing

If the packing leaks, its packing parts (4.2) and sealing parts (4.5 and 4.6) must be replaced as described below:

Disassembly

1. Screw off the nuts (5.1) and lift the valve bonnet (5) together with the plug stem and plug off the body.
2. Unscrew the stem connector nut and the lock nut (6.1 and 6.2) from the plug stem. Unthread the threaded bushing (5.2) out of the stuffing box.
3. Pull the plug and plug stem out of the valve bonnet.
4. Take all the packing parts out of the packing chamber using a suitable tool.
   Replace damaged parts.
   Thoroughly clean the packing chamber.



4.1 Spring
4.2 V-ring packing(s)
4.3 Bushing(s)
4.4 Washer(s)
4.5 Carbon bushing(s)
4.6 Graphite, pressed
5.2 Threaded bushing

Fig. 3 · Packing, standard (left), high-temperature (right)

Assembly

1. Apply lubricant (order no. 8150-0111) to all parts as well as to the plug stem (6). Do not use lubricant for graphite packings!
2. Install the plug in the valve body and insert a new gasket (1.1).
3. Carefully slide the valve bonnet over the plug stem and place it on the valve body. Secure with nuts (5.1).
4. Carefully slide the packing parts over the plug stem into the packing chamber. Make sure you keep the proper order. Depending on the nominal size, the number of bushings (4.3) may vary.
5. Screw in the threaded bushing (5.2) and tighten.
   For high-temperature packings, tighten the threaded bushing only slightly.
   In case of leakage, also tighten only slightly.
6. Screw the lock nut (6.2) and the stem connector nut (6.1) on the plug stem without tightening them.
7. Mount the actuator as described in section 2.1 and adjust the lower and upper bench range.

5.1.2 Seats and/or plug

When replacing the seat or plug, you should also exchange the packings (4.2 or 4.5 and 4.6).

Seat:

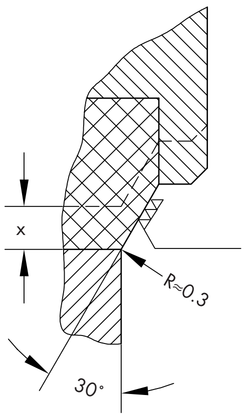
1. Remove the nuts (5.1) and lift the valve bonnet (5) together with the plug stem (6) and plug off the valve body (1).
2. Screw out the seat (2) using a suitable seat wrench (see EB 029 EN).
3. Apply lubricant (order no. 8150-0119) to the thread and the sealing cone of the new seat (or the old one after it has been cleaned or remachined) and screw it in.
   The tightening torques for the seats are also listed in EB 029 EN.

Plug:

1. Remove the nuts (5.1) and lift the valve bonnet (5) together with the plug stem (6) and plug off the valve body (1).
2. Unscrew the nuts (6.1, 6.2) and the threaded bushing (5.2).
3. Pull the plug out of the valve bonnet.
4. Replace the used plug for a new plug (3) and plug stem (6).
   It may be possible to use the old plug again after it has been remachined.
   Apply lubricant (order no. 8150-0119) to the plug stem (6) and insert it.

Remachining the plug

The plug can be machined when the plug's seating surface is slighly damaged. Plugs with a soft sealing can only be machined up to the dimension x (Fig. 4).



Seat bore Ø	x (mm)
31 to 50	1
63 to 150	2

Fig. 4 · Remachining a plug with soft sealing

5.2 Replacing parts of valves with metal bellows seal

5.2.1 Packing

Replace parts as described for standard valves in section 5.1.1.

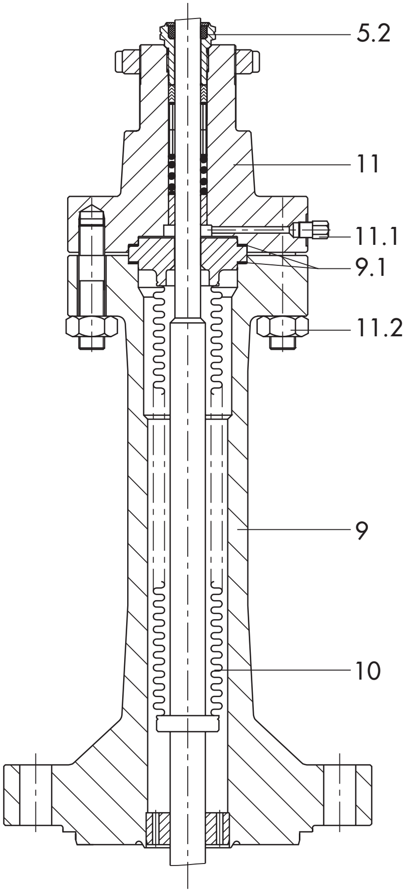


Fig. 5 · Valve with metal bellows seal

Legend to Fig. 5

9 Intermediate piece
9.1 Gasket
10 Metal bellows
10.1 Bellows flange
11 Bonnet
11.1 Test connection
11.2 Nut

However, observe the following difference: Remove the nuts (11.2) and separate the bonnet (11) from the intermediate piece (9). Replace the gasket (9.1).

Only when the packings are replaced, must the bonnet be separated from the intermediate piece!

5.2.2 Metal bellows

The metal bellows (10) can only be replaced as complete bellows seal together with the plug stem. To do this, proceed as described in section 5.1.2 (Fig. 5).

Caution!
No torque may be transmitted to the metal bellows during disassembly and reassembly of the bellows seal!

5.3 Replacing parts of valves with insulating section

Replace the packing as described for standard valves in section 5.1.1.

Replace the seat and plug as described for standard valves in section 5.1.2.

5.4 Disassembling the flow divider

For versions with flow divider, the flange gasket (1.1) and shims (1.2) must be replaced with new ones each time the flow divider is disassembled.
The number of shims and, hence, the dimension x must be determined when a new gasket is used:

First determine the dimension A, then the dimension B.

The dimension x results from the difference A – B and must be filled out with shims (0.5 mm or 2 mm thick).
The maximum compression should be approximately 0.5 mm.

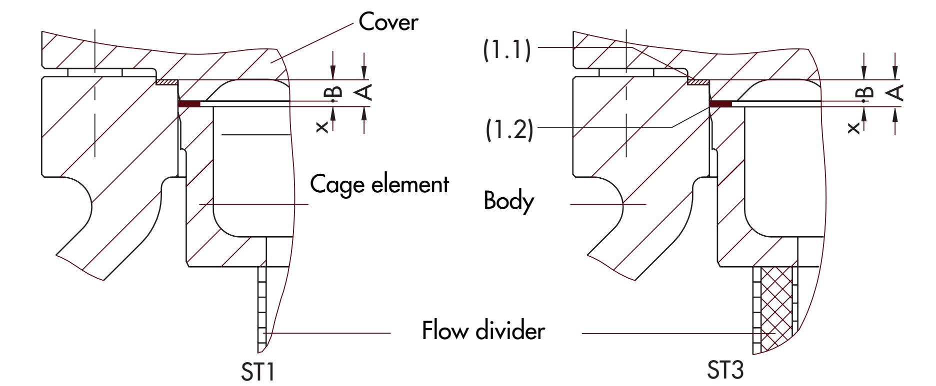
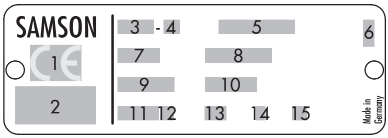


Fig. 6 · Installing the flow divider

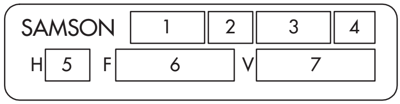
6 Description of nameplate

Valve nameplate



1 CE marking or "Art. 3, Abs. 3" (see article 3, § 3 of PED), where applicable
2 Ident. number of notified body, fluid group and category, where, applicable
3 Type designation
4 Modification index of valve
5 Material
6 Year of manufacture
7 Nominal size: DIN: DN, ANSI: Size
8 Perm. operating pressure at room temperature DIN: PN, ANSI: CL
9 Order number with modification index
10 Item position on order
11 Flow coefficient:
DIN: **K**VS value , ANSI: **Cv** value
12 Characteristic:
% equal percentage, **Lin** linear,
DIN: **A/Z**, ANSI: **O/C** for quick opening
13 Sealing:
ME metal, **ST** stellited, **Ni** nickel plated
PT soft sealing with PTFE,
PK soft sealing with PEEK
14 Pressure balancing: DIN: **D**, ANSI: **B**
15 **I** or **III** flow divider

Type 3271 Actuator nameplate



1 Type designation
2 Modification index
3 Effective diaphragm area
4 Fail-safe action:
FA Actuator stem extends
FE Actuator stem retracts
5 Travel
6 Bench range (spring range)
7 Bench range with pretensioned springs

Type 3277 Actuator nameplate

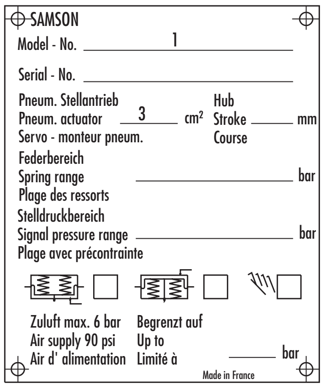


Fig. 7 · Nameplates

7 Customer inquiries

Should you have any questions regarding the control valve, please submit the following details:

- Order number
- Type, model number, nominal size and valve version
- Pressure and temperature of the process medium
- Flow rate in m^3/h
- Bench range (e.g. 0.2 to 1 bar) of the mounted actuator
- Has a strainer been installed?
- Installation drawing

Note!
Dimensions and weights of the different valve versions are listed in the Data Sheet T 8060 EN.

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Pneumatic Control Valves
Type 3256-1 and Type 3256-7

Fig. 1 · Type 3256-1 Control Valve

Mounting and Operating Instructions

EB 8065 EN

Edition October 2003

Contents Page

Note!
Non-electrical control valves which do not have a valve body lined with an ***insulating material coating*** *do not have their own potential ignition source according to the risk assessment in the rare incident of an operating fault, corresponding to EN 13463-1: 2001 paragraph 5.2, and therefore do not fall within the scope of the European Directive 94/9/EC.*

General safety instructions

- *The control valve may only be mounted, started up or serviced by fully trained and qualified personnel, observing the accepted industry codes and practices. Make sure employees or third persons are not exposed to any danger. All safety instructions and warnings in these instructions, particularly those concerning installation, start-up and maintenance, must be observed.*
- *The control valves fulfill the requirements of the European Pressure Equipment Directive 97/23/EC. Valves with a CE marking have a declaration of conformity which includes information about the applied conformity assessment procedure. The declaration can be viewed and downloaded on the Internet at http://www.samson.de.*
- *For appropriate operation, make sure that the control valve is only used in areas where the operating pressure and temperatures do not exceed the operating values based on the valve sizing data submitted in the order. The manufacturer does not assume any responsibility for damage caused by external forces or any other external influence! Any hazards which could be caused in the control valve by the process medium, operating pressure or by moving parts are to be prevented by means of the appropriate measures.*
- *Proper shipping and appropriate storage are assumed.*

Caution!

- *For installation and maintenance work on the control valves, make sure the relevant section of the pipeline is depressurized and, depending on the process medium used, drained as well. If necessary, allow the valve to cool down or warm up to reach ambient temperature prior to starting any work on it.*
- *Before carrying out any work on the valve, make sure the supply air and control signal are disconnected or interrupted to prevent any hazards from occurring due to moving parts in the control valve.*
- *Special care is needed when the valve is fitted with an actuator with pretensioned springs. These actuators are labeled correspondingly and can also be identified by three long bolts at the bottom of the actuator. Prior to starting any work on the valve, you must relieve the compression from the pretensioned springs.*

1. Design and principle of operation

The Type 3256-1 and Type 3256-7 Pneumatic Control Valves consist of a single-seated Type 3256 Angle Valve and either a Type 3271 or Type 3277 Pneumatic Actuator.
The process medium flows through the valve in the direction indicated by the arrow on the valve body. The position of the plug (3) is changed by the signal pressure acting on the diaphragm in the actuator (8).
The plug stem (6) and plug are connected with the actuator stem (8.1) via the stem connector (7). It is sealed by a spring-loaded PTFE V-ring packing (4.2) or by adjustable HT packings.

Fail-safe action:

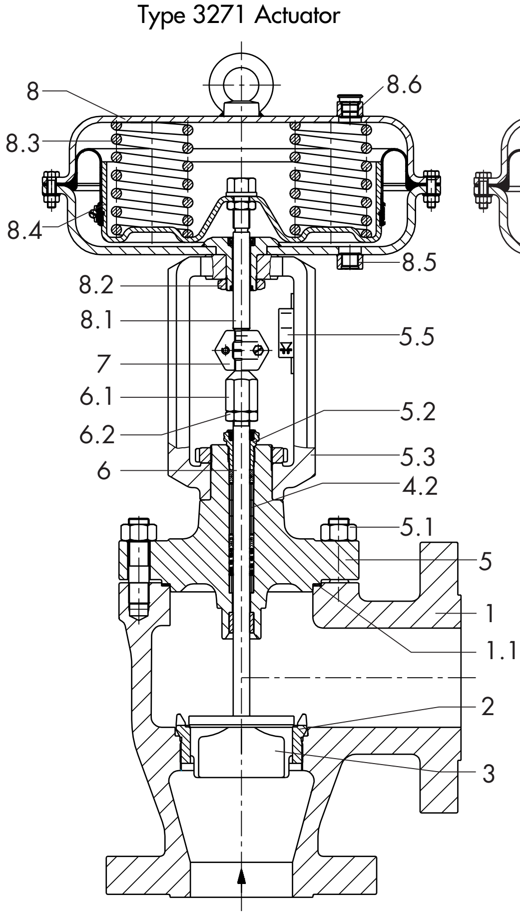
Depending on the arrangement of the compression springs (8.3) in the actuator, the control valve provides two different types of fail-safe actions:

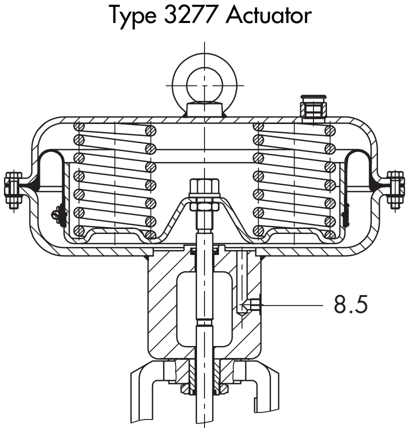
Actuator stem extends:

When the signal pressure is reduced or the supply air fails, the springs move the actuator stem downward, closing the valve. The valve opens when the signal pressure increases, acting against the spring force.

Actuator stem retracts:

When the signal pressure is reduced or the supply air fails, the springs move the actuator stem upwards, opening the valve. The valve is closed when the signal pressure increases, acting against the spring force.





1 Valve body
1.1 Gasket
2 Seat
3 Plug
4.2 Packing
5 Valve bonnet
5.1 Nuts
5.2 Threaded bushing
5.3 Yoke
5.5 Travel indicator
6 Plug stem
6.1 Stem connector nut
6.2 Lock nut
7 Stem connector
8 Actuator
8.1 Actuator stem
8.2 Ring nut
8.3 Springs
8.4 Diaphragm
8.5 Signal pressure connection
8.6 Vent

CAUTION!
The direction of flow changes in the valve version with ceramic wearing sleeve as follows:
The medium flows **against the plug in the closing direction!**
If not observed, this can cause damage to the valve.

Fig. 2 · Sectional drawing Type 3256-1 (Type 3256-7)

2. Assembling valve and actuator

Instead of the simple pneumatic actuator, a pneumatic actuator with additional handwheel, or an electric actuator can also be attached to the valve.
With all nominal sizes, the standard pneumatic actuator can be replaced with a smaller or larger actuator.
If the travel range of the actuator is larger than that of the valve, the springs in the actuator are pretensioned by the manufacturer so that the travel ranges match.
Each valve is equipped with the accessories required for mounting the standard actuator. If you plan to use a different actuator, the necessary mounting parts must be ordered together with the actuator.
For the necessary parts and their part numbers, refer to overview 1600-0501 to 0550 which is available on request. The original parts are then replaced with these additionally supplied parts.

2.1 Assembly and adjustment

If the valve and actuator have not been assembled by the manufacturer, or the original actuator is replaced with another type or size of actuator, proceed as follows:

1. Loosen the lock nut (6.2) and the stem connector nut (6.1) on the valve.
   Press plug and plug stem firmly into the seat ring, then thread stem connector nut and lock nut down.
2. Remove the stem connector clamps (7) and the ring nut (8.2) from the actuator. Slide the ring nut over the plug stem of the valve.
3. Place the actuator on the yoke (5.3) and secure with the ring nut (8.2).
4. Read the actuator's nameplate for the actuator's bench range (or bench range with pretensioned springs) and fail-safe action (e.g. 0.2 to 1 bar and "Actuator stem extends").
   The lower bench range value (0.2 bar) to be adjusted corresponds to the initial value of the bench range, whereas the upper range value (1 bar) corresponds to the final value of the bench range.
   The fail-safe action "Actuator stem extends" or "Actuator stem retracts" is marked with the letters FA or FE, resp., on the Type 3271 Actuator, and with symbols on the Type 3277 Actuator.
5. For actuators with **Actuator stem extends**, apply a signal pressure that corresponds to the lower bench range value (e.g. 0.2 bar) to the lower diaphragm chamber connection.

   For actuators with **Actuator stem retracts**, apply a signal pressure that corresponds to the upper bench range values (e.g. 1 bar) to the upper diaphragm chamber connection.

5. Turn the stem connector nut (6.1) by hand until it touches the actuator stem (8.1). Make another quarter of a turn and secure this position with the lock nut (6.2).
6. Attach the stem connector clamps (7) and screw tight.
   Align the travel indicator scale (5.5) with the tip of the stem connector.

Note concerning removing actuators:
When removing an actuator from a valve, especially an actuator with pretensioned springs, the signal pressure connection must be pressurized first with a pressure that is slightly higher than the lower bench range value (see actuator nameplate) before the ring nut (8.2) can be loosened.

2.2 Option of pretensioning for "Actuator stem extends"

To increase the positioning force, you can pretension this type of actuator by up to 25 % of its travel or bench range during valve adjustment.
If you require, for example, a pretension of 1 bar for a bench range of 0.2 to 1 bar, the bench range shifts by 0.1 bar to range up to 0.3 bar (0.1 bar corresponds to a pretensioning of 12.5 %).
When adjusting the valve, the lower bench range value must now be set at 0.3 bar.
The bench range of 0.3 to 1.1 bar must be recorded on the nameplate as bench range with pretensioning springs.

2.3 Different rated travels of valve and actuator

Valve with actuator "Actuator stem extends"

Note!
Actuators with pretensioned springs must always be used when the valve's rated travel is smaller than the rated travel of the actuator.

Example:
Valve size DN 100 with a rated travel of 30 mm and 1400 cm^2 actuator with a rated travel of 60 mm, bench range (spring range) 0.4 to 2 bar.

1. Set the signal pressure required for pretensioning to 1.6 bar which is slightly higher than the signal pressure of 1.2 bar (1.2 to 2 bar) that corresponds to the actuator's mid-travel (30 mm).

2. Thread on the stem connector nut (6.1) until it touches the actuator stem.
3. Secure this position with the lock nut and mount the stem connector as described in section 2.1.
4. Write the bench range of 1.6 to 2.4 bar valid for the mounted valve on the actuator's nameplate.

Valve with actuator "Actuator stem retracts"

Note!
The springs of actuators with "Actuator stem retracts" cannot be pretensioned.

If you combine a valve with a larger actuator (rated actuator travel higher than rated valve travel), only the first half of the actuator's bench range can be used.

Example:
Nominal valve size DN 100 with a rated travel of 30 mm and a 1400 cm^2 actuator with a rated travel of 60 mm, bench range 0.2 to 1 bar:
At half of the valve travel, the usable bench range is between 0.2 and 0.6 bar.

Caution!
Actuators which have already been pretensioned by the manufacturer are labeled correspondingly.
Additionally, they can also be identified by three long bolts at the bottom actuator case.

3. Installation

3.1 Mounting position

The valve and actuator can be mounted in any position, however, for valves with DN 100 and larger, the valve should be installed horizontally with the actuator pointing upward to make maintenance routines easier.
In cases where the actuator weighs more than 50 kg or the control valves are fitted with an insulating section or bellows seal, the actuator needs to be supported or suspended.

Important!
The valve must be installed free of stress.
Flush the pipeline thoroughly prior to installing the valve.
Note!
Control valves with insulating section or bellows seal may only be insulated up to the cover flange of the valve body for medium temperatures below 0 °C as well as temperatures above 220 °C.
*Valves that should meet the requirements of **NACE MR 0175** standard should not be insulated.*

3.2 Signal pressure line

For valves with actuator "Actuator stem extends", connect the signal pressure line to the lower diaphragm case, and for valves with actuator "Actuator stem retracts" to the upper diaphragm case.
With Type 3277 Actuator, the lower connection is located on the side of the yoke on the lower diaphragm case.

3.3 Strainer, bypass

We recommend that you install a strainer upstream of the control valve.
Ideally, hand-operated shut-off valves upstream of the strainer and downstream of the control valve as well as a bypass line should be installed so that the plant does not have to be shut down for maintenance routines.

3.4 Test connection

Versions with metal bellows (Fig. 5) are equipped with a test connection (11.1) at the upper flange. This allows the tightness of the bellows to be checked.
Especially for applications with liquids and vapors, you should install a suitable leakage indicator (e.g. contact pressure gauge, drain into an open vessel or sight-glass).

4. Operation

(e.g. reversing the operating direction, etc.) Please refer to the Mounting and Operating Instructions EB 8310 EN for the Type 3271 Pneumatic Actuator and EB 8311 EN for the Type 3277 Actuator.

5. Maintenance – Replacing parts

The control valve is subject to normal wear, especially at the seat, plug and packing. Depending on the application conditions that prevail, the valve must be inspected at appropriately scheduled intervals to prevent any problems before they occur.
If any leakage occurs to the atmosphere, this may be because the packing is leaking.

If the valve does not seal properly, this may be because tight shut-off is prevented by dirt between the seat and plug or because the seating surface is damaged.
We recommend that you disassemble the parts, thoroughly clean them and replace them, if necessary.

Note!
Before servicing or disassembling the control valve, first relieve the corresponding section of the plant of pressure and, depending on the process medium, drain it as well.
Let the plant section cool down to reach ambient temperature, if necessary.
As the process medium cannot drain completely out of the valve, be aware that some of the process medium could still be in the valve. This is particularly the case for valves with insulating sections.
We recommend that you remove the valve from the pipeline.
***Important!** On carrying out any work on the valve, first disconnect the signal pressure, remove the signal pressure line and remove the actuator from the valve.*

Note on SAMSON special tools
Suitable seat wrenches and special tools as well as the appropriate tightening torques can be found in EB 029 EN (formerly WA 29 EN). The instructions can be viewed on the Internet at http://www.samsson.de/pdf_en/e00290en.pdf.

Disassembling the actuator:

1. Then remove the stem connector (7) and unscrew the ring nut (8.2).
   For actuators "Actuator stem extends" and especially for actuators with pretensioned springs, apply a signal pressure that is higher than the lower bench range value (see nameplate) to the actuator.
2. Lift the actuator off the valve yoke.

5.1 Replacing parts of standard valves

5.1.1 Packing

If the packing (4) leaks, its V-ring packing parts (4.2) and sealing parts (4.5 and 4.6) must be replaced as described below:

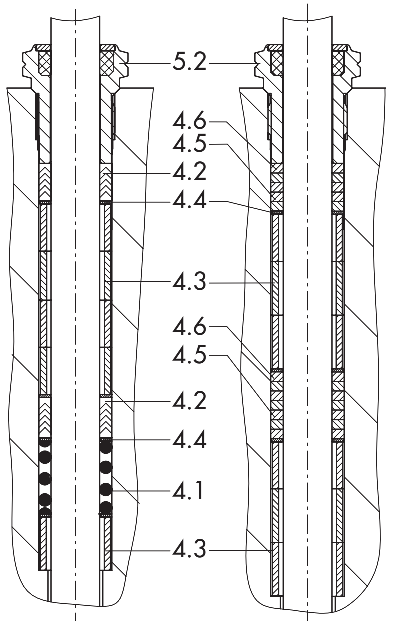
Disassembly

1. Screw off nuts (5.1) and lift the valve bonnet (5) including the plug stem and plug off the body.
2. Unscrew the stem connector nut and the lock nut (6.1 and 6.2) from the plug stem. Unthread the threaded bushing (5.2) out of the stuffing box.
3. Pull the plug and plug stem from the valve bonnet.
4. Take all the packing parts from the packing chamber using a suitable tool. Replace damaged parts.
   Thoroughly clean the packing chamber.

Assembly

1. Apply lubricant (order no. 8150-0111) to all parts as well as to the plug stem (6). Do not use lubricant for graphite packings.
2. Install plug in the valve body and insert a new gasket (1.1).
3. Carefully slide the valve bonnet over the plug stem and place it on the valve body. Secure with nuts (5.1).
4. Carefully slide the packing parts over the plug stem into the packing chamber. Make sure you keep the proper order. Depending on the nominal size, the number of bushings (4.3) may vary.

5. Screw in the threaded bushing (5.2) and tighten.
   For high-temperature packings, tighten the threaded bushing only slightly. In case of leakage, tighten only slightly as well.
6. Screw the lock nut (6.2) and the stem connector nut (6.1) on the plug stem without tightening them.



4.1 Spring
4.2 V-ring packing(s)
4.3 Bushing(s)
4.4 Washer(s)
4.5 Carbon bushing(s)
4.6 Graphite, pressed
5.2 Threaded bushing

Fig. 3 · Packing, standard (left) high-temperature (right)

7. Mount the actuator as described in section 2.1 and adjust the lower and upper bench range.

5.1.2 Seats and/or plug

When replacing the seat or plug, you should also replace the packings (4.2 or 4.5 and 4.6).

Seat:

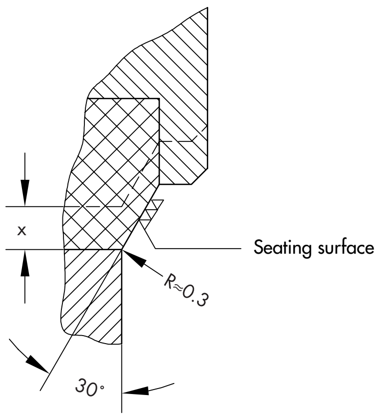
1. Remove the nuts (5.1) and lift the valve bonnet (5) including plug stem and plug off the valve body.
2. Unscrew seat (2) using a suitable seat wrench (see EB 029 EN).
3. Apply lubricant (order no. 8150-0119) to the thread and the sealing conus of the new seat (or the old one after it has been cleaned or reworked) and screw it in.
   The tightening torques for the seats are also listed in EB 029 EN.

Plug:

1. Remove the nuts (5.1) and lift the valve bonnet (5) including plug stem (6) and plug off the valve body (1).
2. Unscrew nuts (6.1, 6.2) and threaded bushing (5.2).
3. Pull the plug out of the valve bonnet.
4. Replace the used plug with a new plug (3) and plug stem (6).
   It may be possible to use the old plug again after it has been remachined.
   Apply lubricant (order no. 8150-0119) to the plug stem (6) before you insert it.

Remachining the plug

The plug can be machined when the plug's seating surface is slighly damaged. Plugs with a soft sealing can only be machined up to the dimension x (Fig. 4).



Seat bore Ø	x (mm)
31 to 50	1
63 to 150	2

Fig. 4 · Remachining a plug with soft sealing

Legend to Fig. 5
- 9 Intermediate piece
- 9.1 Gasket
- 10 Metal bellows
- 10.1 Bellows flange
- 11 Bonnet
- 11.1 Test connection
- 11.2 Nut

5.2 Replacing parts of valves with metal bellows seal

5.2.1 Packing

Replace parts as described for standard valves in section 5.1.1. However, observe the

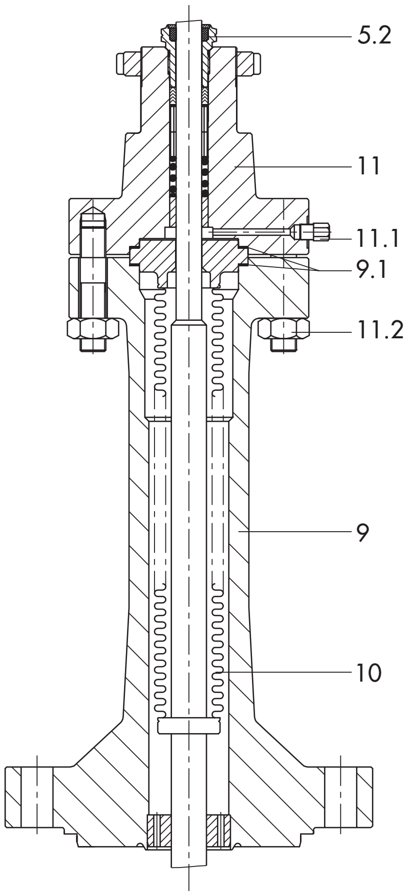


Fig. 5 · Valve with metal bellows seal

following difference: remove nuts (11.2) and separate the bonnet (11) from the intermediate piece (9). Replace gasket (9.1).
The bonnet **must not** be separated from the intermediate piece for any other purpose than the replacement of packings!

5.2.2 Metal bellows

The metal bellows (10) can only be replaced as complete bellows seal together with the plug stem. To do this, proceed as described in section 5.1.2 (Fig. 5).

Caution!
Torque must not be transmitted to the metal bellows during disassembly and reassembly of the bellows seal.

5.3 Replacing parts of valves with insulating section

Replace the packings as described for standard valves in section 5.1.1.

Replace the seat and plug as described for standard valves in section 5.1.2.

5.4 Disassembling the flow divider

For versions with flow divider, the flange gasket (1.1) and shims (1.2) must be replaced with new ones each time the flow divider is disassembled.
The number of shims and, hence, the dimension x must be determined when a new gasket is used:

First determine the dimension A, then the dimension B.

The dimension x results from the difference A – B and must be filled out with shims (0.5 mm or 2 mm thick).
The maximum compression should be approximately 0.5 mm.

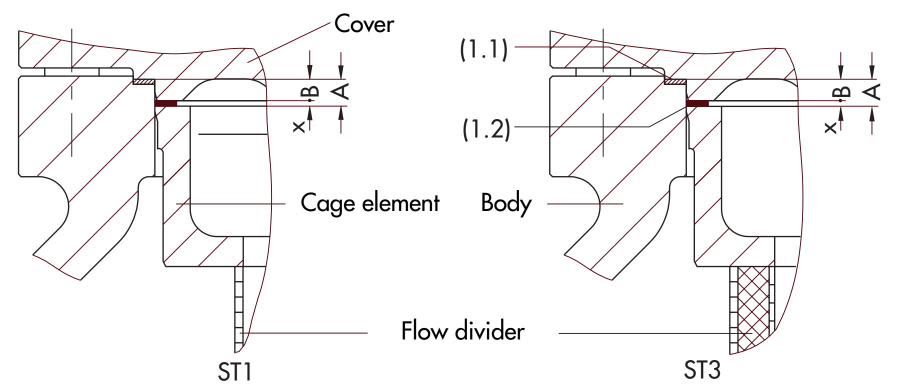
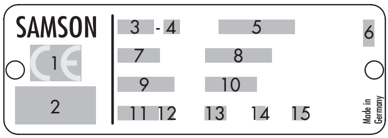


Fig. 6 · Installing the flow divider

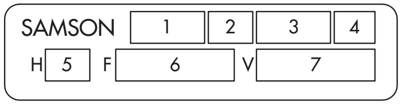
6. Description of nameplates

Valve nameplate



1 CE marking or "Art. 3, Abs. 3" (see article 3, § 3 of PED), where applicable
2 Ident. number of notified body, fluid group and category, where, applicable
3 Type designation
4 Modification index of valve
5 Material
6 Year of manufacture
7 Nominal size: DIN: DN, ANSI: Size
8 Perm. operating pressure at room temperature DIN: PN, ANSI: CL
9 Order number with modification index
10 Item position on order
11 Flow coefficient:
DIN: **K_{VS}** value , ANSI: **Cv** value
12 Characteristic:
% equal percentage, **Lin** linear,
DIN: **A/Z**, ANSI: **O/C** for quick opening
13 Sealing:
ME metal, **ST** stellited, **Ni** nickel plated
PT soft sealing with PTFE,
PK soft sealing with PEEK
14 Pressure balancing: DIN: **D**, ANSI: **B**
15 **I** or **III** flow divider

Type 3271 Actuator nameplate



1 Type designation
2 Modification index
3 Effective diaphragm area
4 Fail-safe action:
FA Actuator stem extends
FE Actuator stem retracts
5 Travel
6 Bench range (spring range)
7 Bench range with pretensioned springs

Type 3277 Actuator nameplate

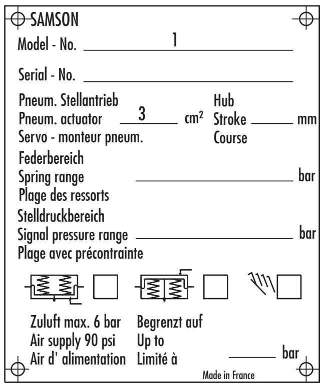


Fig. 7 · Nameplates

7. Customer inquiries

Should you have any questions regarding the control valve, please submit the following details:

- Order number
- Type, model number, nominal size and valve version
- Pressure and temperature of the process medium
- Flow rate in m^3/h
- Bench range (e.g. 0.2 to 1 bar) of the mounted actuator
- Has a strainer been installed?
- Installation drawing

Note!
For dimensions and weights of the different valve versions, refer to the Data Sheet T 8065 EN.

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Pneumatic Actuator
Type 3271

SAMSON

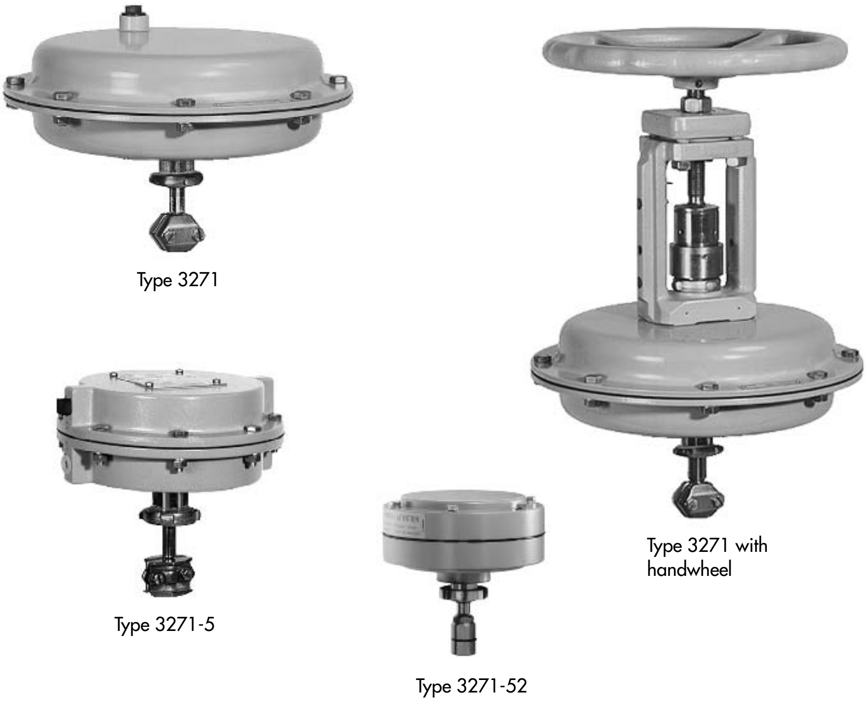


Fig. 1 · Type 3271 Actuator versions

Mounting and operating instructions

EB 8310 EN

Edition May 2002

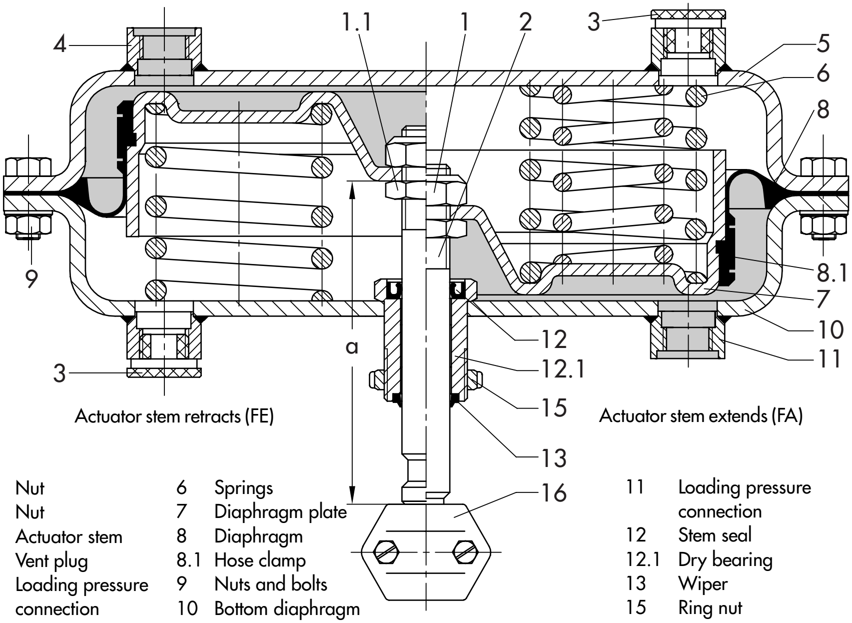
- *Assembly, start-up and operation of the device may only be performed by trained and experienced personnel familiar with this product.*
  According to these mounting and operating instructions, trained personnel is referred to individuals who are able to judge the work they are assigned to and recognize possible hazards due to their specialized training, their knowledge and experience as well as their knowledge of the relevant standards.
- *Any hazards which could be caused by the signal pressure and moving parts of the actuator are to be prevented by means of appropriate measures.*
- *Proper shipping and appropriate storage are assumed.*

1. Design and principle of operation

Type 3271 Actuators are primarily used for attachment to control valves of the Series 240, 250, 260 and 280.

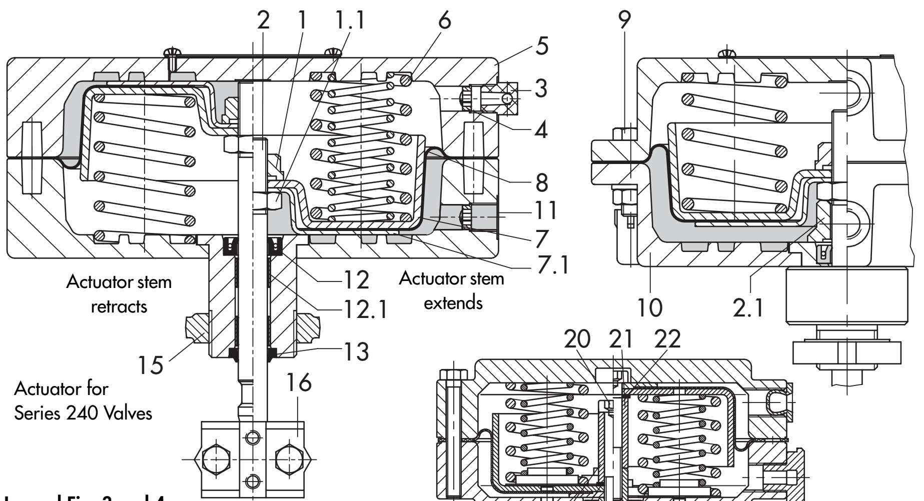
Type 3271-5 with a die-cast aluminum case and effective diaphragm areas of 60 and 120 cm^2, is mounted to Type 3510 and Series 240 Control Valves.
The Type 3271 Actuator is made up of two diaphragm cases, a rolling diaphragm and springs.
Actuators with **manual override** (Fig. 5) additionally have a handwheel mounted on the diaphragm case or mounted on the side of the valve yoke. The handwheel moves the actuator stem over a spindle.
The Type 3271 Actuator can be equipped in a special version with a mechanically adjustable travel stop (Fig. 6).

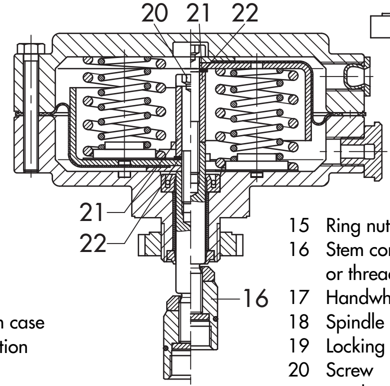
The signal pressure creates a force at the diaphragm surface which is balanced by the springs (6) arranged in the actuator.
The number of springs and their compression determine the bench range (signal pressure range) while taking the rated travel into account which is directly proportional to the signal pressure.
A maximum of 30 springs can be installed, partly fitted inside one another.



1	Nut	6	Springs	11	Loading pressure connection
1.1	Nut	7	Diaphragm plate	12	Stem seal
2	Actuator stem	8	Diaphragm	12.1	Dry bearing
3	Vent plug	8.1	Hose clamp	13	Wiper
4	Loading pressure connection	9	Nuts and bolts	15	Ring nut
5	Top diaphragm case	10	Bottom diaphragm case	16	Stem connector

Fig. 2 · Type 3271 Actuator





Legend Fig. 3 and 4

1	Nut	7	Diaphragm plate	15	Ring nut
1.1	Nut	7.1	Metal plate	16	Stem connector or threaded coupling
2	Actuator stem	8	Diaphragm	17	Handwheel
2.1	Nut	9	Nuts and bolts	18	Spindle
2.2	Bushing	10	Bottom diaphragm case	19	Locking mechanism
3	Vent plug	11	Air supply connection	20	Screw
3.1	Vent plug	11.1	Stem extends	21	Washer
4	Air supply connection	12	Shaft seal	22	Sleeve
4.1	Stem retracts	12.1	Dry bearing		
5	Top diaphragm case	13	Wiper		
6	Springs				

Fig. 3 · Type 3271-5 Actuator with 120 cm^2 (top) and Type 3271-52 Actuator with 60 cm^2 (bottom)

In an actuator with the fail-safe action "actuator stem extends FA", the loading pressure is connected to the loading pressure connection (11) to fill the bottom diaphragm chamber which causes the actuator stem to move upwards.
In an actuator with the fail-safe action "actuator stem retracts FE", the loading pressure is connected the loading pressure connection (4) to fill the top diaphragm chamber which causes the actuator stem to move downwards.
The stem connector or threaded coupling (16) connects the actuator stem (2) to the plug stem of the valve.

Fail-safe action

When the signal pressure fails, the fail-safe action of the actuator depends on whether the springs are installed in the top or bottom diaphragm chamber.

Actuator stem extends

When the signal pressure is reduced or its supply fails, the springs move the actuator stem downwards and close the attached valve. The valve opens when the signal pressure is increased enough to overcome the force exerted by the springs.

Actuator stem retracts

When the signal pressure is reduced or its supply fails, the springs move the actuator stem upwards and open the attached valve. The valve closes when the signal pressure is increased enough to overcome the force exerted by the springs.

The **tandem actuator** (Fig. 4) has two diaphragms connected to each other. The signal pressure produces an actuating force double to that of an actuator with just one diaphragm.

Actuators with an **additional manual override** (Fig. 5) have a handwheel that moves the actuator stem over a spindle after the locking mechanism (lock nut) has been disengaged.
A side-mounted handwheel moves the stem over a bevel or worm gear.

Note!
The pneumatic actuators are designed for a maximum supply pressure of 6 bar.
*To prevent the actuator from being damaged, do not let the supply pressure exceed the upper spring range value by more than 3 bar when the actuator is used for **flow-switching service** (on-off valve) with the fail-safe position "**actuator stem retracts**".*
Label actuators that have a reduced supply pressure with a sticker "max. supply pressure limited to ... bar".

Note!
Refer to the operating instructions of the corresponding valve for instructions about how to attach and remove the actuator from the valve.

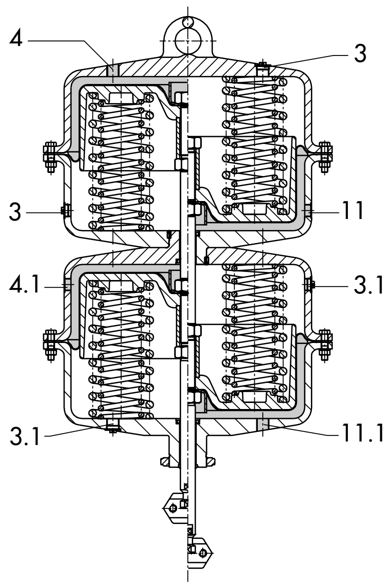


Fig. 4 · Tandem actuator

2. Operation

Note!
Only apply loading pressure to the diaphragm chamber that does not contain the springs.
It is important for a troublefree operation of the actuator that the vent plug (3) is not blocked.
Make sure in versions with a handwheel that the plug stem can move freely when the valve is being positioned by the pneumatic actuator by moving the handwheel into a neutral position (Fig. 5).

2.1 Reversing the operating direction (fail-safe action)

The operating direction, i.e. fail-safe action in pneumatic actuators can be changed. Prior to proceeding, you must remove the actuator from the valve.

The fail-safe action "actuator stem extends" or "actuator stem retracts" is specified on the nameplate with the initials **FA** and **FE** on Type 3271 and by a symbol on Type 3271-5.

Warning!
To disassemble an actuator with preloaded actuator springs (recognizable by the long bolts on the diaphragm chambers), always undo the short bolts first and then unthread the long bolts slowly and evenly until the actuator springs are fully decompressed.

2.1.1 Type 3271

Reversing the fail-safe action "actuator stem extends" to "actuator stem retracts" (Fig. 2)

1. Unthread the nuts and remove the bolts (9) from the diaphragm cases.
2. Lift off the top diaphragm case and remove the springs (6).
3. Pull the actuator stem (2) with diaphragm plate (7) and diaphragm (8) out of the bottom diaphragm case (10).
4. Unscrew nut (1), while holding the nut (1.1) stationary with a suitable tool.
   Caution: Proceed carefully to avoid damaging the seals of the actuator stem.

Caution!
Do not loosen the nut (1.1) on the actuator stem. It is painted over to protect it.
*If, however, it does become loose, it is essential that the dimension "**a**" from the top of the nut to the bottom of the actuator stem is kept as shown in Fig. 2 and table on the next page.*

5. Lift off the diaphragm plate with diaphragm and replace them in reverse order. Tighten nut (1).
6. Apply lubricant/sealant (order no. 8152-0043) to the actuator stem.
7. Place the diaphragm plate with diaphragm in the top diaphragm case. Insert the springs (6) and slide the lower diaphragm case over the actuator stem.
8. Screw tight the nuts and bolts of the diaphragm cases.
9. Remove vent plug (3) from top diaphragm case and screw into the loading pressure connection on the bottom diaphragm case.

The springs now press against the diaphragm plate from below and cause the actuator stem to retract.
The loading pressure is connected over the connection (4) to the top diaphragm chamber. The actuator stem starts to extend when the signal pressure overcomes the force of the springs.

10. Record the changed fail-safe action on the nameplate!

Actuator cm^2	Dimension "a" (Fig. 2)
120	100.5 mm, with threaded end 89 mm
240	98.25 mm
350	107.25 mm
700	125 mm for rated travel 15 (0.4 to1.2 bar), 144 mm for rated travel 30 and 40
1400	230 mm
2800	430 mm

Proceed in the same manner for the **Type 3271-5 Actuator**, but additionally install the metal plate (7.1). For the version intended for attachment to micro-flow valves, additionally install the bushing (2.1) for the mechanical travel stop.
In Type 3271-52 Actuator with 60 cm^2 unthread the screw (20) and then remove the washer (21) and sleeve (22).

Reversing the fail-safe action "actuator stem retracts" to "actuator stem extends" (Fig. 2)

1. Unthread the nuts and remove the bolts (9) and lift off the top diaphragm case (5).
2. Pull the diaphragm plate (7) and diaphragm with the actuator stem (2) out of the bottom diaphragm case (10). Remove the springs (6).
3. Unscrew nut (1), while holding the nut (1.1) stationary with a suitable tool. **Caution:** Proceed carefully to avoid damaging the seals of the actuator stem.
4. Remove the diaphragm plate with diaphragm and replace them in reverse order. Screw tight nut (1).
5. Coat the actuator stem with sealant/lubricant (order no. 8152-0043) and insert it into the bottom diaphragm chamber along with the diaphragm plate and diaphragm.
6. Insert springs (6) and place the top diaphragm case back on.
7. Screw tight the nuts and bolts of the diaphragm cases.
8. Remove the vent plug (3) from the bottom loading pressure connection and place it in the top connection.

The springs which are now pressed from the top against the diaphragm plate cause the actuator stem to extend. The signal pressure is connected via the connection (11) to the bottom diaphragm chamber. The actuator stem starts to retract when the signal pressure overcomes the force of the springs.

9. Record the changed fail-safe action on the nameplate!

Proceed in the same manner for the **Type 3271-5** Actuator, but additionally install the metal plate (7.1).
For an actuator intended for a micro-flow valve, install the bushing (2.1) for the travel stop.

For Type 3271-52 Actuator with 60 cm^2 undo the screw (20) and then remove the washer (21) and sleeve (22).

2.1.2 Actuator with handwheel

240, 350 and 700 cm^2 only (Fig. 5)

1. Undo lock nut (20) and relieve the springs (6) by turning the handwheel (17).
2. Loosen threaded pin (26) and unscrew coupling nut (25) from the coupling (22).
3. Knock out the clamping sleeve (23) and remove the ring (24).
4. Unthread the ring nut (28) and lift off the flange part (21).

Reversing the fail-safe action "actuator stem extends" to "actuator stem retracts"

- Proceed as described in chapter 2.1.1. However, use the word "spindle with nut (27)" in place of "nut (1)".

After reversing the operating direction:

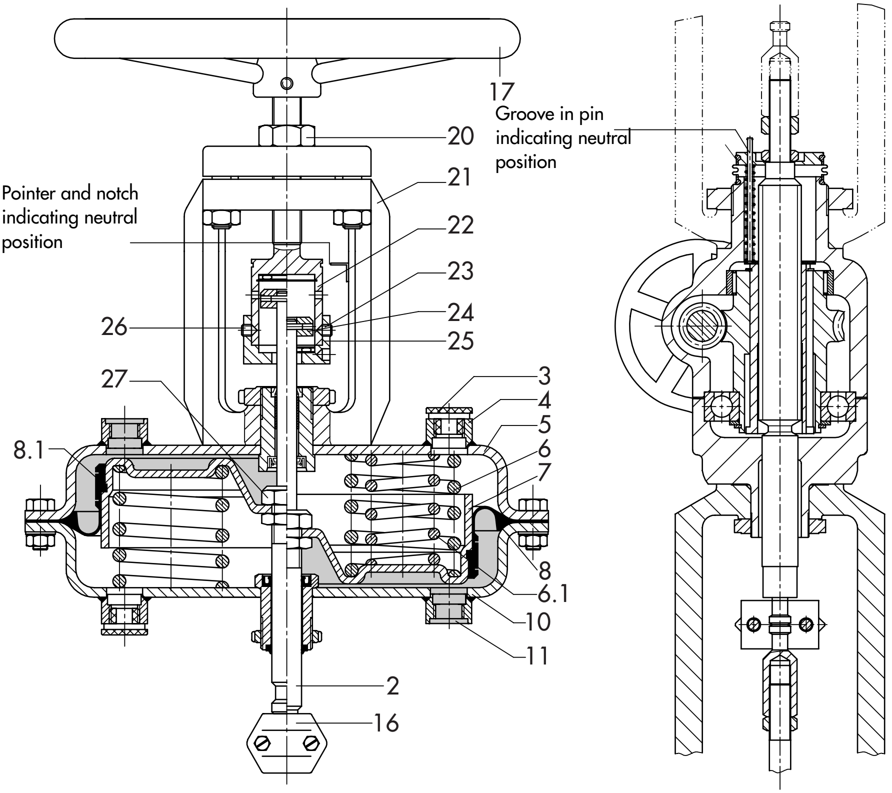
1. Place the flange part (21) and coupling nut (25). Then fasten the flange part (21) with the ring nut (28).
2. Attach the ring (24) with clamping sleeve (23).
3. Screw coupling nut (25) as far as it will go onto the coupling (22) and secure with threaded pins (26).

Reversing the fail-safe action "actuator stem retracts" to "actuator stem extends"

- Proceed as described in chapter 2.1.1. However, use the word "spindle with nut (27)" in place of "nut (1)".

After reversing the operating direction:

1. Place the flange part (21) and the coupling nut (25) and then secure flange part (21) with ring nut (28).
2. Attach the ring (24) with clamping sleeve (23).
3. Screw coupling nut (25) as far as it will go onto the coupling (22) and secure with threaded pins (26).



2	Actuator stem	16	Stem connector
3	Vent plug	17	Handwheel
4	Loading pressure connection	20	Lock nut
5	Top diaphragm case	21	Flange part
6	Springs	22	Coupling
6.1	Additional springs	23	Clamping sleeve
7	Diaphragm plate	24	Ring
8	Diaphragm	25	Coupling nut
8.1	Hose clamp	26	Threaded pin
10	Bottom diaphragm case	27	Spindle with nut
11	Loading pressure connection	28	Ring nut

Fig. 5 · Actuator with handwheel

2.2 Replacing the diaphragm and actuator stem seal

Diaphragm (Fig. 2)

1. Proceed as described in chapter 2.1 to take the diaphragm plate (7) with diaphragm (8) and actuator stem (2) out of the diaphragm case.
2. Remove the hose clamp (8.1) and pull it together with the diaphragm (8) off the diaphragm plate (7) (not necessary with Type 3271-5 as the diaphragm is held in place by the metal plate (7.1)).
3. Stretch the new diaphragm onto the diaphragm plate. Fit the hose clamp (8.1) evenly into the groove intended for it and tighten.
4. Reassemble actuator as described in chapter 2.1.

Actuator stem seal (Fig. 6)

1. Take the diaphragm plate (7) with the actuator stem (2) out of the diaphragm case as described in chapter 2.1.
2. Coat the new stem seal (12) with lubricant/sealant (order no. 8152-0043) and insert it.
3. If necessary, replace the dry bearing (12.1) and wiper (13) with new ones as well.
4. Reassemble the actuator as described in chapter 2.1.

2.3 Adjusting the travel stop

(Fig. 5, with Type 3271 in special version only)

The travel stop can be adjusted upwards or downwards to 50% of the travel.

Downward travel stop
(actuator stem extends)

1. Undo the lock nut (34) and unscrew the cap (33).
2. Undo the lock nut (31) and adjust the nut (32) to set required travel stop.
3. Tighten the lock nut (31) again.

Upward travel stop
(actuator stem retracts)

1. Undo the lock nut (34) and adjust the cap (33) to set the required travel stop.
2. Tighten the lock nut (34) again.

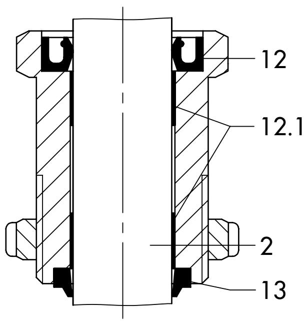


Fig. 6 · Actuator stem seal

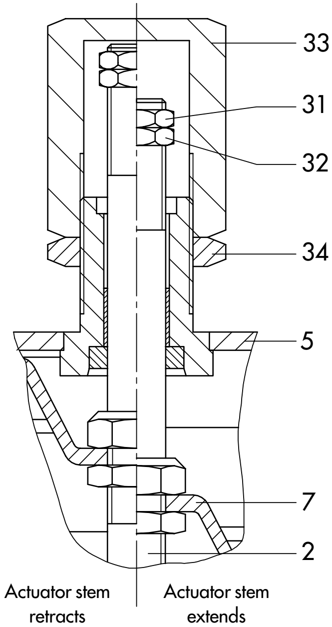
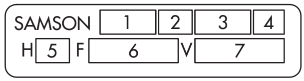


Fig. 7 · Travel stop

3. Description of nameplate



1 Type designation
2 Modification index
3 Effective diaphragm area
4 Fail-safe action:
FA Actuator stem extends
FE Actuator stem retracts
5 Travel
6 Bench range (spring range)
7 Bench range with preloaded springs

Fig. 8 · Nameplate of Type 3271 Actuator

4. Customer inquiries

Should you have any inquiries regarding the actuator, please submit the following details:

- Type and product number
- Effective diaphragm area
- Bench range (spring range) in bar
- Actuator version - fail-safe action

Dimensions
Refer to the Data Sheet T 8310 EN for dimensions and weights of the actuator versions.

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S/Z 2002-05

Pneumatic Actuator
Type 3277

Fig. 1 · Type 3277 Actuator

Fig. 2 · Type 3277-5 Actuator

Mounting and Operating Instructions

EB 8311 EN

Edition April 2002

1 Design and principle of operation

Type 3277 Pneumatic Actuators with an effective diaphragm area of 240, 350 or 700 cm^2 are primarily mounted to control valves from the Series 240, 250 and 280.

Type 3277-5 with a die-cast aluminum case and an effective diaphragm area of 120 cm^2, is mounted to Type 3510 and Series 240 Control Valves.

The actuator is made up of two diaphragm cases, a rolling diaphragm and springs. The lower diaphragm case is permanently fixed to the yoke which allows the direct attachment of either a pneumatic or electropneumatic positioner or a limit switch.

Actuators with **manual override** (Fig. 5) additionally have a handwheel mounted on the diaphragm case. The handwheel moves the actuator stem over a spindle after the locking mechanism (lock nut) has been disengaged. In addition, the actuator can be equipped in a special version with a mechanically adjustable travel stop.

The signal pressure creates a force at the diaphragm surface which is balanced by the springs (6) arranged in the actuator. The number of springs and their compression determine the bench range (signal pressure range) while taking the rated travel into account which is directly proportional to the signal pressure. A maximum of 30 springs can be installed, partly fitted inside one another.

The stem connector (16) connects the actuator stem (2) with the plug stem of the control valve.

- *Assembly, start-up and operation of the device may only be performed by trained and experienced personnel familiar with this product.*
  According to these mounting and operating instructions, trained personnel is referred to individuals who are able to judge the work they are assigned to and recognize possible hazards due to their specialized training, their knowledge and experience as well as their knowledge of the relevant standards.
- *Any hazards which could be caused by the signal pressure and moving parts of the actuator are to be prevented by means of appropriate measures.*
- *Proper shipping and appropriate storage are assumed.*

Fail-safe action

When the signal pressure fails, the fail-safe action of the actuator depends on whether the springs are installed in the top or bottom diaphragm chamber.

Actuator stem extends

When the signal pressure is reduced or its supply fails, the springs move the actuator stem downwards and close the attached valve. The valve opens when the signal pressure is increased enough to overcome the force exerted by the springs.

Actuator stem retracts

When the signal pressure is reduced or its supply fails, the springs move the actuator stem upwards and open the attached valve. The valve closes when the signal pressure is increased enough to overcome the force exerted by the springs.

1	Nut
1.1	Nut (with 350 and 700 cm^2 actuators only)
2	Actuator stem
3	Vent plug
4	Loading pressure connection
5	Top diaphragm case
6	Springs
6.1	Additional springs
7	Diaphragm plate
8	Diaphragm
9	Nuts and blots
10	Yoke with lower diaphragm case
11	Loading pressure connection
12	Stem seal
12.1	Dry bearing
13	Wiper
15	Ring nut
16	Stem connector

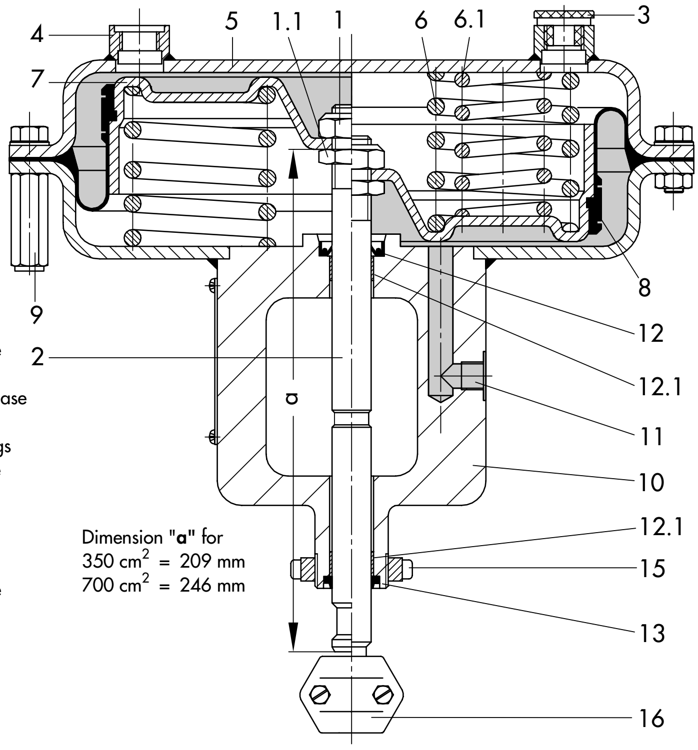


Fig. 3 · Type 3277 Actuator with 240, 350 and 700 cm^2 effective diaphragm areas

Loading pressure connection

Type 3277 Actuator (Fig. 3)
In the Type 3277 Actuator with the fail-safe action "actuator stem extends", the loading pressure is connected to the loading pressure connection (11) at the side of the yoke to fill the bottom diaphragm chamber which causes the actuator stem (2) to move upwards.
In an actuator with the fail-safe action "actuator stem retracts", the loading pressure is connected the loading pressure connection (4) to fill the top diaphragm chamber which causes the actuator stem to move downwards.

Type 3277-5 Actuator (Fig. 4)
In the Type 3277-5 Actuator, the loading pressure is connected to a borehole either at the left or right of the yoke. A **switchover plate** (14, accessories) directs the air to one of the diaphragm chambers, depending on the fail-safe action of the actuator ("actuator stem extends" or actuator stem retracts"), which is determined by how the plate is aligned with the mark (14.4).

- Turn the switchover plate to align the symbol (14.3) for the appropriate fail-safe action with the mark (14.4). See Fig. 4, bottom left. The operating direction (>>) or (<>) of the positioner determines whether the left or right attachment is to be used.

A **connecting plate** (accessories) is required instead of the switchover plate if the actuator is operated **without a positioner**. The loading pressure is directly connected to the loading pressure connection (14.8) of the connecting plate to fill the diaphragm chamber.

- Turn the connecting plate to align the symbol (14.3) for the appropriate fail-safe action "actuator stem extends" or "actuator stem retracts" with the mark (14.4). See Fig. 4, bottom right.
- Make sure that the flat gasket of the connecting plate is correctly inserted.
- The connecting plate has both NPT and G threaded bores. Seal the bore not required with a rubber gasket and square plug.

Accessories: The switchover plate or connecting plate must be ordered separately. Please note that actuators with modification index **01** e.g. 3277-531xxx20.**01** (old = **.00**) are equipped with new plates.
Old and new plates are not interchangeable.

		With index	Order no.
Switchover plate	**New**	**01**	**1400-6822**
	Old	00	1400-6819
Connecting plate	**New**	01	**1400-6823**
	Old G thread	00	1400-1620
	Old NPT thread	00	1400-6821

Note! *The pneumatic actuators are designed for a maximum supply pressure of 6 bar. To prevent the actuator from being damaged, do not let the supply pressure exceed the upper spring range value by more than 3 bar when the actuator is used for* ***flow-switching service*** *(on-off valve) with the fail-safe position "****actuator stem retracts****". Label actuators that have a reduced supply pressure with a sticker "max. supply pressure limited to ... bar".*
Note! *Refer to the operating instructions of the corresponding valve for instructions about how to attach and remove the actuator from the valve.*

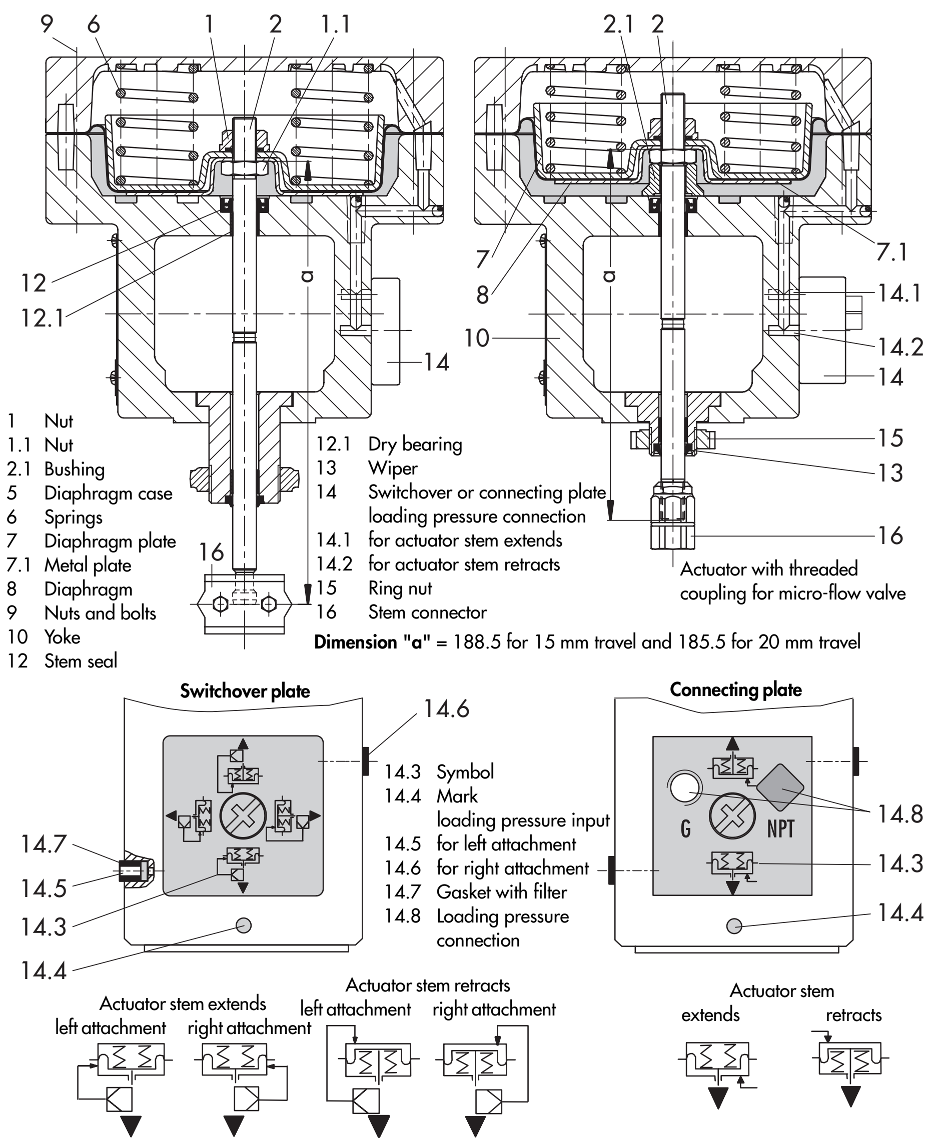


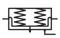
Fig. 4 · Type 3277-5 Actuator (120 cm^2)

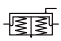
2 Operation

Note!
It is important for a troublefree operation of the actuator that the vent plug (3) is not blocked in the Type 3277 Actuator.
Make sure in versions with a handwheel that the plug stem can move freely when the valve is being positioned by the pneumatic actuator by moving the handwheel into a neutral position.

2.1 Reversing the operating direction (fail-safe action)

The operating direction and the fail-safe action in pneumatic actuators can be changed. Prior to proceeding, you must remove the actuator from the valve.
The fail-safe action is designated by a symbol on the nameplate.

 Actuator stem extends or

 Actuator stem retracts

Warning!
To disassemble an actuator with preloaded springs (recognizable by the long bolts on the diaphragm chambers), always undo the short bolts first and then unthread the long bolts slowly and evenly until the actuator springs are fully decompressed.

2.1.1 Standard actuator

Reversing the fail-safe action "actuator stem extends" to "actuator stem retracts"

Note!
The operating direction of actuators with 700 cm^2 (travel = 30 mm) and spring ranges - 0.2 to 1 bar, 0.4 to 2 bar and 0.6 to 3 bar - that are mounted to valves with 15 mm travel, can be only changed when the standard actuator stem is replaced by an actuator stem (order no. 0290-5266) that is 20 mm shorter.
These actuators are preloaded by approx. 50 % on mounting them to the valve due to the varying travels.
This means the bench range (spring range) of 0.2 to 1 bar results in a signal pressure range of 0.6 to 1 bar; 0.4 to 2 results in 1.2 to 2 bar and 0.6 to 3 results in 1.8 to 3 bar.
The signal pressure range is recorded on the nameplate when the actuators have been preloaded on mounting them to the valve.

1. Unthread the nuts and remove the bolts (9) from the diaphragm cases.
2. Lift off the top diaphragm case and remove the springs (6).
3. Pull the actuator stem (2) with diaphragm plate (7) and diaphragm (8) out of the yoke (10).
4. Unscrew nut (1), while holding the nut (1.1) stationary with a suitable tool or clamp the actuator stem.
   Caution: Proceed carefully to avoid damaging the seals of the actuator stem.

Caution!
*Do not loosen the nut (1.1) on the actuator stem of 350 and 700 cm^2 actuators. It is painted over to protect it. If, however, it does become loose, it is essential that the dimension "**a**" (Fig. 3 and 4) from the top of the nut to the bottom of the actuator stem is kept.*

5. Apply lubricant/sealant (order no. 8152-0043) to the sealing part of the actuator stem.
6. Turn the top diaphragm case (5) upside down and place in to it the actuator stem with diaphragm plate, diaphragm and metal plate (7.1 in Fig. 4), if one exists.
7. Insert the springs (6) and slide the yoke with the lower diaphragm case over the actuator stem.
8. Screw diaphragm cases back together. Remove vent plug (3) on Type 3277 Actuator.

Proceed in the same manner for the **Type 3277-5** Actuator intended for the microvalve, but additionally attach the bushing (2.1) for the mechanical travel stop.

The springs now press from below against the diaphragm plate and cause the actuator stem to retract (fail-safe action).
The actuator stem only starts to extend when the signal pressure overcomes the force of the springs.

9. Record the changed fail-safe action on the nameplate!

Reversing the fail-safe action "actuator stem retracts" to "actuator stem extends"

Note!
The operating direction of actuators with 700 cm^2 (travel = 30 mm) that are mounted to valves with 15 mm travel can only be changed when the actuator stem installed (length = 245 mm) is replaced by an actuator stem (order no. 0290-4727) that is 20 mm longer.

1. Unthread the nuts and remove the bolts (9) from the diaphragm cases. Lift off the top diaphragm case (5).
2. Pull the actuator stem with diaphragm plate, diaphragm and metal plate (7.1), if one exists, out of the yoke and the bottom diaphragm case (10).
3. Unscrew nut (1), while holding the nut (1.1) stationary with a suitable tool or clamp the actuator stem.
   Caution: Proceed carefully to avoid damaging the seals of the actuator stem.
4. Turn over diaphragm plate with diaphragm and screw back on the nut (1).
5. Apply lubricant/sealant (order no. 8152-0043) to the sealing part of the actuator stem.
6. Insert actuator stem with diaphragm plate, diaphragm and metal plate (7.1), if one exists, into the bottom diaphragm case with the yoke.
7. Insert springs (6) and place back on the top diaphragm chamber. Tighten using nuts, bolts and washers.
8. Screw a vent plug (3) in the top loading pressure connection in Type 3277 Actuator.

Proceed in the same manner for the **Type 3277-5** Actuator intended for the micro-valve, but additionally attach the bushing (2.1) for mechanical travel stop.

The springs now press from the top against the diaphragm plate and cause the actuator stem to extend (fail-safe action).
The actuator stem only starts to retract when the signal pressure overcomes the force of the springs.

9. Record the changed fail-safe action on the nameplate!

2.1.2 Actuator with handwheel

(Type 3277 only, see Fig. 5)

1. Undo lock nut (20) and relieve the springs (6) by turning the handwheel (17).
2. Loosen threaded pin (26) and unscrew coupling nut (25) from the coupling (22).
3. Knock out the clamping sleeve (23) and remove the ring (24).
4. Unthread the ring nut (15) and lift off the flange part (21) with coupling nut (25).

Reversing the fail-safe action "actuator stem extends" to "actuator stem retracts"

- Proceed as described in section 2.1.1. However, use the word "spindle with nut (27)" in place of "nut (1)".

After reversing the operating direction:

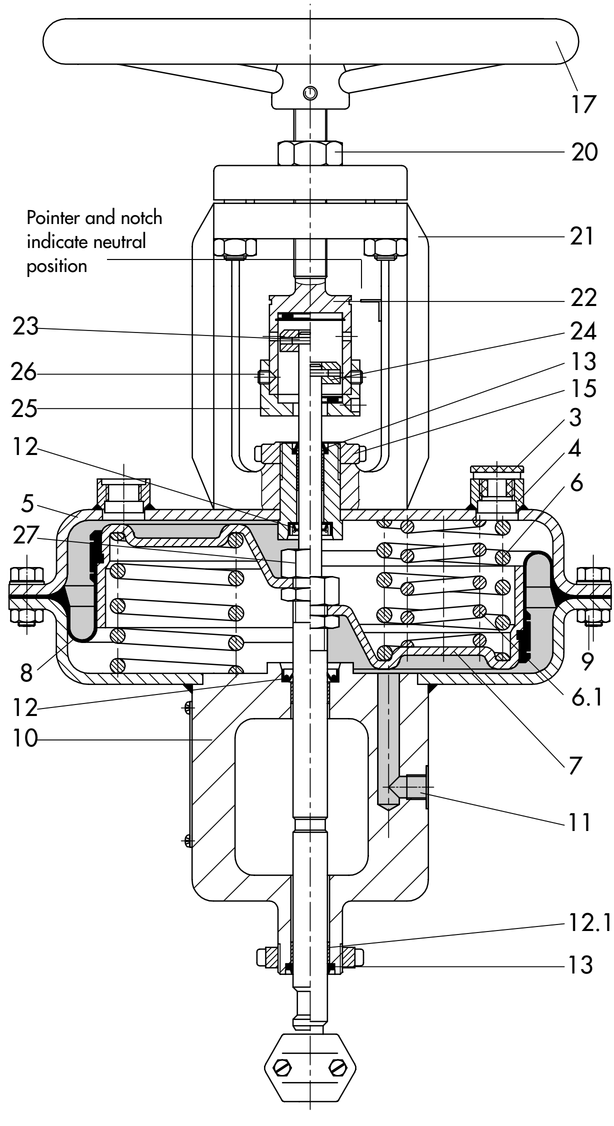
1. Replace the flange part (21) with ring nut (15) and coupling nut (25).
2. Tighten ring nut (15), then attach ring (24) with clamping sleeve.
3. Screw coupling nut (25) as far as it will go onto the coupling (22) and secure with threaded pins (26).

Reversing the fail-safe action "actuator stem retracts" to "actuator stem extends"

- Proceed as described in section 2.1.1. However, use the word "spindle with nut (27)" in place of "nut (1)".

After reversing the operating direction:

1. Place the flange part (21) with ring nut (15) and coupling nut (25) back again.
2. Tighten ring nut (15), then attach ring (24) with clamping sleeve.
3. Screw coupling nut (25) as far as it will go onto the coupling (22) and secure with threaded pins (26).



2 Actuator stem
3 Venting plug
4 Loading pressure connection
5 Top diaphragm case
6 Springs
6.1 Additional springs
7 Diaphragm plate
8 Diaphragm
9 Nuts, bolts
10 Bottom diaphragm case
11 Loading pressure connection
12 Stem seal
12.1 Dry bearing
13 Wiper
17 Handwheel
20 Lock nut
21 Flange part
22 Coupling
23 Clamping sleeve
24 Ring
25 Coupling nut
26 Threaded pin
27 Spindle with nut

Fig. 5 · Type 3277 Actuator with additional handwheel

2.2 Adjusting the travel stop

(with Type 3277 in special version only)

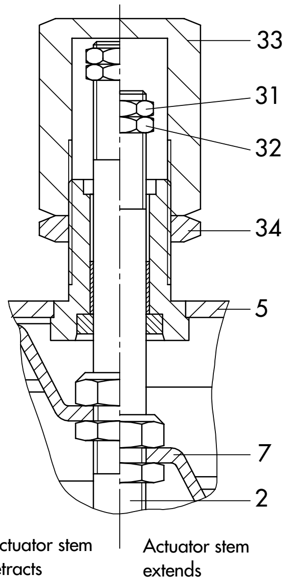
The travel stop can be adjusted upwards or downwards to 50% of the travel.

Downward travel stop
(actuator stem extends)

1. Undo the lock nut (34) and unscrew the cap (33).
2. Undo the lock nut (31) and adjust the nut (32) to set required travel stop.
3. Tighten the lock nut (31) again.

Upward travel stop
(actuator stem retracts)

1. Undo the lock nut (34) and adjust the cap (33) to set the required travel stop.
2. Tighten the lock nut (34) again.



2 Actuator stem
5 Top diaphragm case
7 Diaphragm plate
31 Lock nut
32 Nut
33 Cap
34 Lock nut

Fig. 6 · Travel stop

3 Replacing the diaphragm and actuator stem seal

3.1 Diaphragm

(Fig. 3)

1. Proceed as described in section 2.1 to take the diaphragm plate (7) with diaphragm (8) and actuator stem (2) out of the diaphragm case.
2. Remove the hose clamp and pull it together with the diaphragm (8) off the diaphragm plate (7) (not necessary with Type 3277-5 as the diaphragm is held in place by the metal plate (7.1)).
3. Stretch the new diaphragm onto the diaphragm plate. Insert the hose clamp evenly into the groove intended for it and tighten.
4. Reassemble actuator as described in section 2.1.

3.2 Replacing the seal

1. Take the diaphragm plate (7) with the actuator stem (2) out of the diaphragm case as described in section 3.1.
2. Coat the new shaft seal with lubricant/sealant (order no. 8152-0043) and insert it.
3. If necessary, replace the dry bearing (12.1) and wiper (13) with new ones as well.
4. Reassemble the actuator as described in section 2.1.

4 Customer inquiries

Please indicate the following:

- Type and product number
- Effective diaphragm area
- Bench range (signal pressure range) (in bar)
- Actuator version – operating direction

Dimensions
Refer to the Data Sheet T 8311 EN for dimensions and weights of the actuator versions.

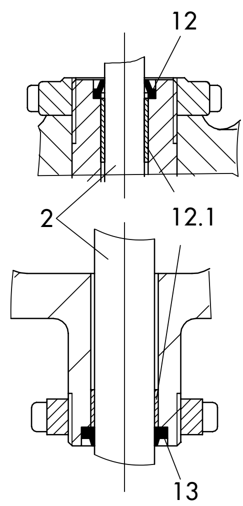


Fig. 7 · Actuator stem seal

SAMSON AG · MESS- UND REGELTECHNIK
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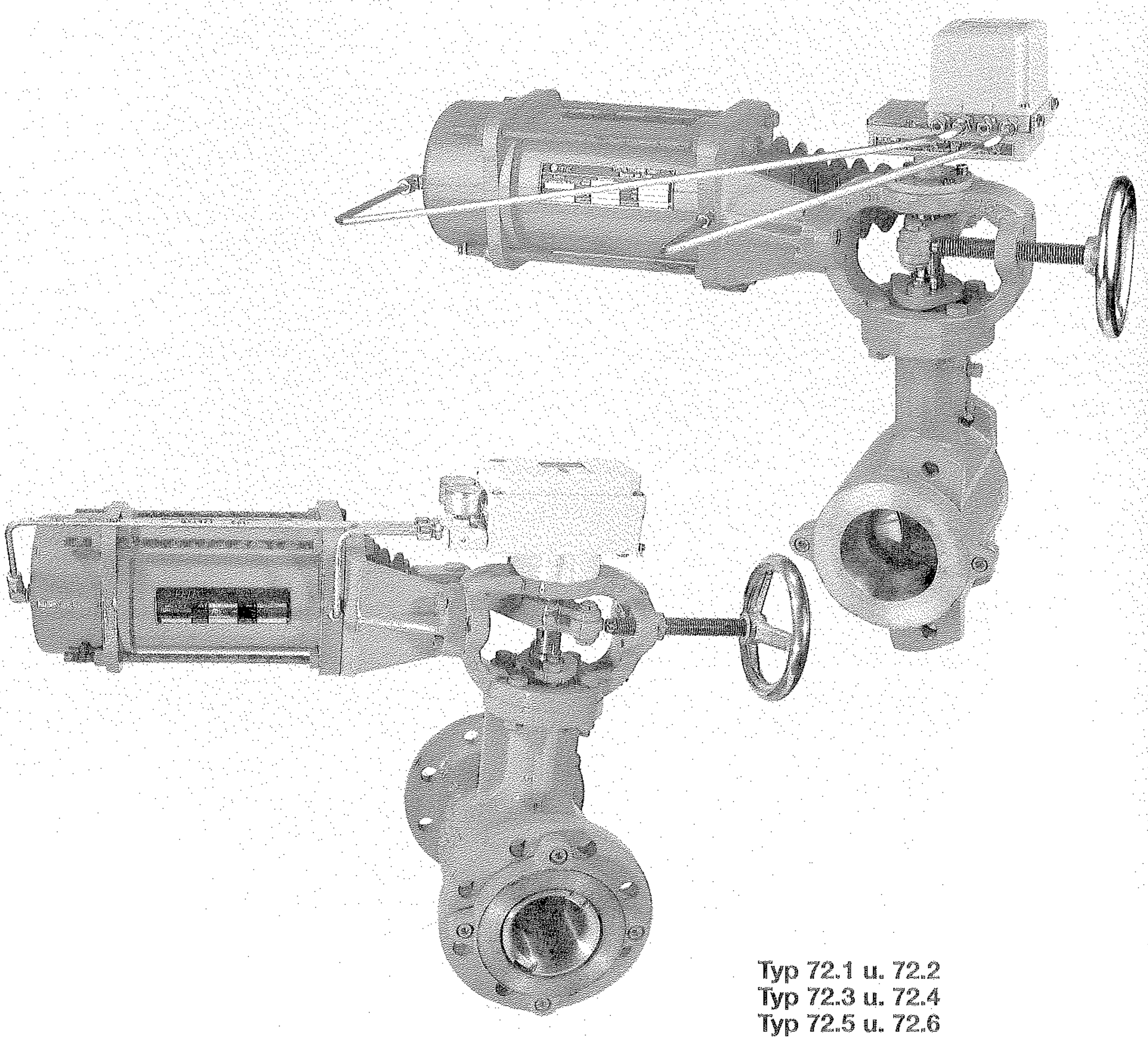
Phone: +49 69 4009-0 · Fax: +49 69 4009-1507
Internet: http://www.samson.de

S/Z 2004-05

VETEC
Ventiltechnik GmbH

Maxifluss-Stellventile



Typ 72.1 u. 72.2
Typ 72.3 u. 72.4
Typ 72.5 u. 72.6

Maxifluss-Stellventile

* Typ 72.1 * Typ 72.3 * Typ 72.5	mit Flanschanschluß, Baulänge nach DIN 3202 DN 25 – DN 400, PN 10/40 ANSI B 16.10, 150/300 lbs/RF
* Typ 72.2 * Typ 72.4 * Typ 72.6	in Sandwichbauweise DN 25 – DN 300, DIN 3202, PN 10/40, ANSI 150/300 lbs, zum Zwischenklemmen
* Typ 72.2	DVGW-typgeprüft nach DIN 3394, DN 25 – DN 200, PN 16/40, als Gasversorgungs- u. Sicherheits-Absperreinrichtung. TÜV-geprüfte Ausführung nach DIN 32725, DN 25 + DN 50 – als Sicherheitsabsperreinrichtung in Öl- und Flüssiggasfeuerungsanlagen.
* Typ 72.2 Digital	Rechnergesteuertes Digitalventil mit Schrittmotor und Steuerelektronik
* Zusatzausstattung	Heizmantel, Sonderspindeldurchführung, Schalldämpfer für geräuscharmen Betrieb, Getränkeindustrie-Ausführung.
* Antriebe	Pneum. Rollmembran-Antrieb Typ R 110 – R 250v. Handantrieb mit Schneckengetriebe. Pneum. Membran-Antrieb M 200/ M 300/M 450/M 700. Elektrischer Antrieb für Regel- und Auf-Zu-Betrieb. Elektro-hydraulische Antriebe
* Zubehör	Pneum. Stellungsregler mit Drehwinkelumformer, elektro/ pneum. Stellungsregler 0-20/ 4-20 mA, elektr. od. pneumat. Stellungsrückmelder, Luftdruckminderer, Grenzwertgeber, Magnetventile, Relais, usw.

Technische Änderungen vorbehalten

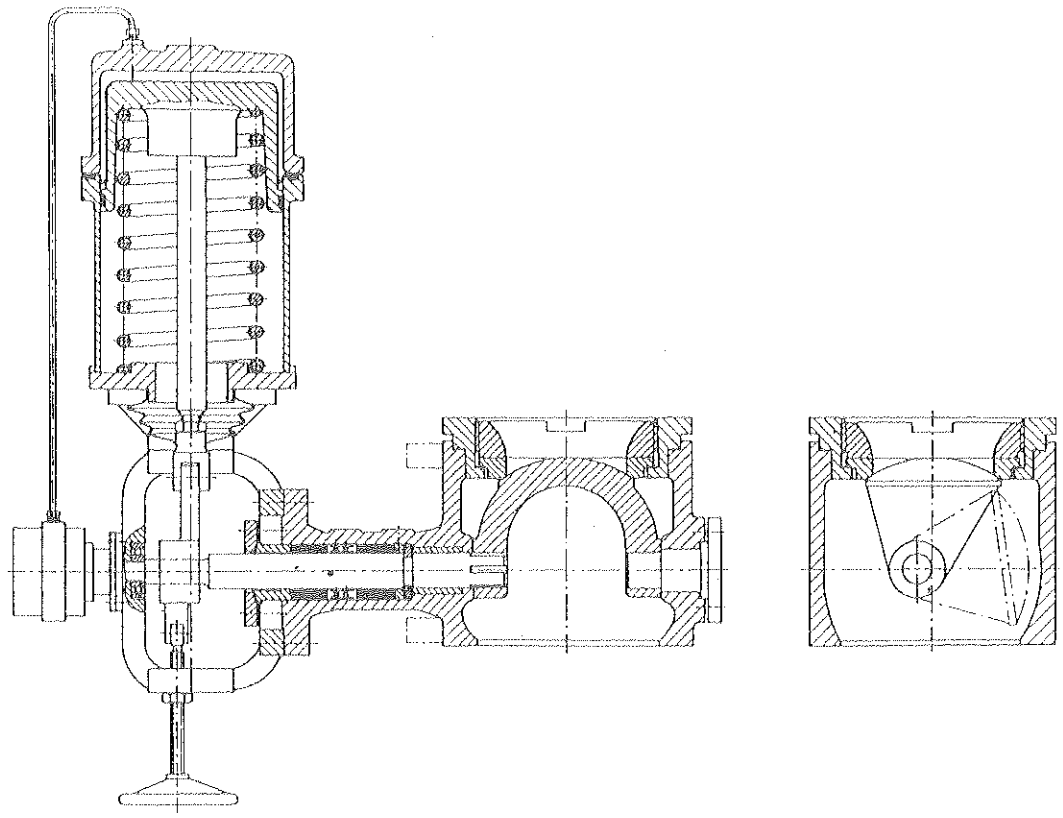
Maxifluss-Control-Valves

* Type 72.1 * Type 72.3 * Type 72.5	with flanges, face to face acc. to DIN 3202 DN 25 – DN 400, PN 10/40 ANSI B 16.10, 150/300 lbs/RF
* Type 72.2 * Type 72.4 * Type 72.6	flangeless DN 25 – DN 300, DIN 3202, PN 10/40, ANSI 150/300 lbs, for installation between pipe flanges
* Type 72.2	DVGW-type-certified acc. to DIN 3394, DN 25 – DN 200, PN 16/40, part 1, group A, certified acc. to DIN 32725 DN 25 + DN 50, for application as a safety shut off device with oil and liquid gas burners.
* Type 72.2 Digital	process-computer controlled digital valve with step motor and controlelectronic
* Additional equipment	steam jacket, special stem packing box, silencer for low noise operation, design for food industry
* Actuators	pneumatic rolling diaphragm actuator type R 110 – R 250v. Handwheel with worm gear. Pneumatic diaphragm actuator M 200/M 300/M 450/M 700. Electric actuator for control an on-off operation. Electro-hydraulic actuators
* Accessories	pneum. positioner for rotary operation, electro/pneum. positioner 0–20/4–20 mA, el. or pneum. position transmitter, air filter regulator, limit switches, boosters, etc.

subject so change

Maxifluss-Stellventile

Maxifluss-Control-Valves



Beschreibung

Das Maxifluss-Stellventil Baureihe 72 wurde unter dem Gesichtspunkt der universellen Anwendung konzipiert.

Die jeweils guten Eigenschaften der

Stellventile
Stellklappen und
Kugelhähne

wurden im Maxifluss-Stellventil vereinigt.

Mit keiner der genannten Armaturen lassen sich die mit dem Maxifluss-Stellventil erreichten Gesamteigenschaften erzielen.

Der hohe Kv-Wert sowie der Regelbereich von 200:1 ist für den Planer wie auch Benützer interessant.

Besonders hervorzuheben ist der große Durchfluß bei maximaler Sitzweite. Es besteht auch die Möglichkeit, kleinere Sitzweiten einzubauen.

Der hohe Regelbereich dieser Ventilbaureihe löst selbst schwierige Regelaufgaben.

Description

The Maxifluss-control-valve Type 72 has been developed for universal application.

The best characteristics of

Conventional control valves
Butterfly valves and
Ball valves

have been combined in the Maxifluss-control-valve.

None of these valve types can reach the characteristics of the Maxifluss-control-valve.

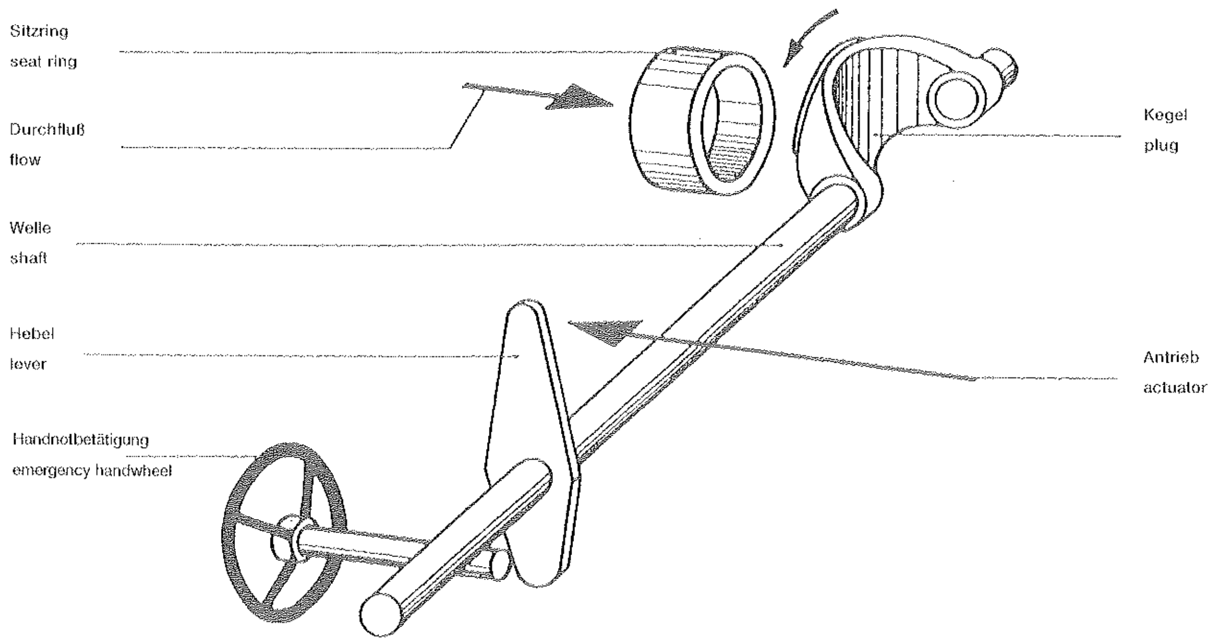
The high Cv value and rangeability of 200 : 1 is attractive to plant designers and users alike.

Important construction detail is the large flow at maximum seatring diameter. It is also possible to install reduced seatrings.

The rangeability of the Maxifluss-valve allows universal application.

Prinzip und Wirkungsweise

Principle of Operation

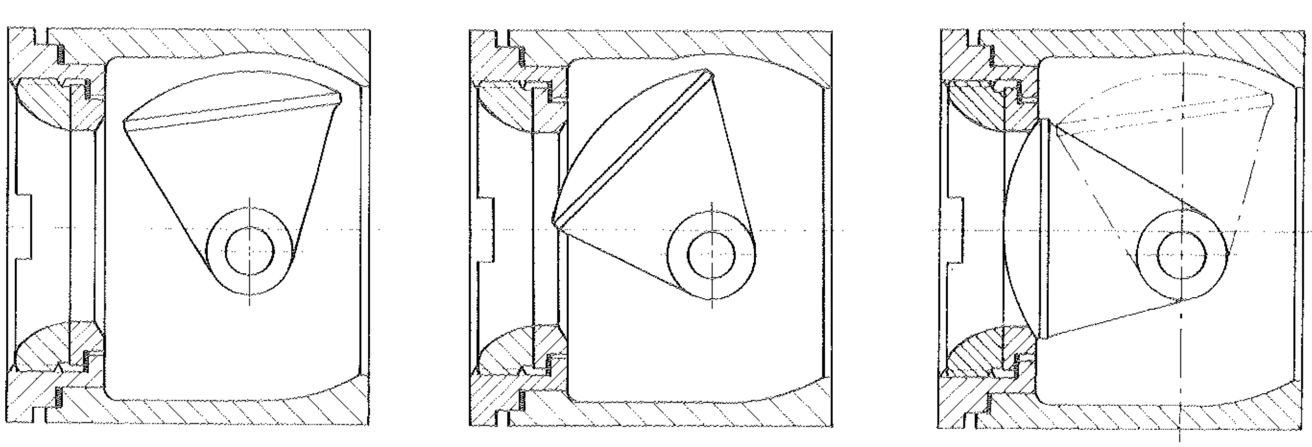


Der robust gestaltete Kegel hat die Form eines Kugelabschnittes und sitzt mit dem einen Schenkel ohne Spiel auf einer Vielkeilwelle, während sich der andere Schenkel auf einem gehärteten Lagerzapfen dreht.

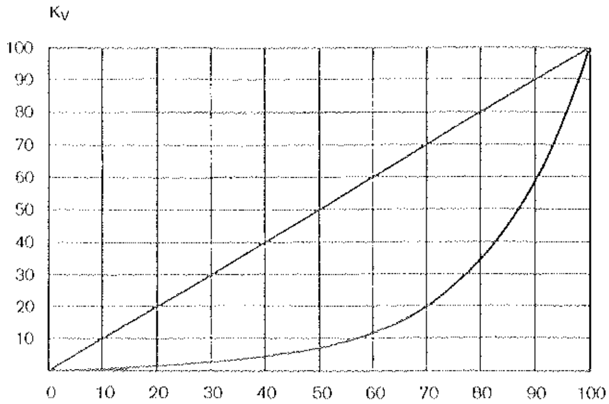
Die Lagerung der Welle ist exzentrisch angeordnet. Diese exzentrische Lagerung bewirkt bei einer Drehung der Kegelwelle von der Schließstellung in Öffnungsrichtung ein sofortiges Abheben des Kegels vom Sitz. Hierdurch wird eine Reibung zwischen Sitz und Kegel vermieden.

The rugged plug or segment ball ist connected to the shaft by means of a close fitting keyway. At the other end it is trunnion mounted.

The eccentric design of the plug and shaft causes the plug to lift away and clear the seat immediately as it starts to rotate. Friction between plug and seat is eliminated.



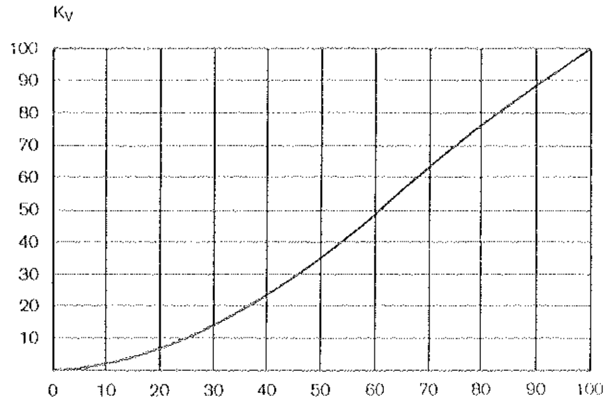
Durchflußcharakteristik



Eingangsignal in Prozent
Control signal in percent

umgeformte lin.- und log Kennlinie
transformed lin.- and log characteristic

Characteristic of flow



Öffnungswinkel in Prozent
Opening in percent

natürliche Kennlinie
inherent Characteristic of flow

Bei den Maxifluss-Stellventilen kann die natürliche Kennlinie mit Hilfe von Stellungsreglern und Kurvenscheiben in exakte lineare oder gleichprozentige oder jede beliebige Kennlinie umgeformt werden.

Die Kurvenscheibe mit der gewünschten Kennlinienform wird in den Stellungsregler, der direkt mit der Ventilwelle gekuppelt ist, eingebaut. Das Eingangssignal des pneumatischen Stellungsreglers beträgt 0,2 – 1,0 bar, bei dem elektro-pneum. Stellungsregler 0 – 20 mA oder 4 – 20 mA; die Zuluft max. 3 bar. Für jede Kennlinien-Charakteristik (linear oder gleichprozentig) ist eine Kurvenscheibe erforderlich. Bei Invertierung der Ventile, d.h. bei Umkehr der Ventile von Öffnungs- in Schließventile, ist ebenfalls eine Kurvenscheibe notwendig.

Die einzelnen Kurvenscheiben sind wie folgt gekennzeichnet:

Ö-log:	Luft öffnet	Charakteristik gleichprozentig
Ö-lin:	Luft öffnet	Charakteristik linear
S-log:	Luft schließt	Charakteristik gleichprozentig
S-lin:	Luft schließt	Charakteristik linear

Der Antrieb mit Kennlinienumformer und Stellungsregler ist vom Werk aus nach der Bestellspezifikation montiert und eingestellt.

Standard-Luftanschluß: G 1/4"

The inherent characteristic curve of the Maxifluss-control-valve can be transformed into a linear or logarithmic characteristic by means of positioner and cam-plate.

Standard cam-plates are available for logarithmic and linear characteristic, (air to open or air to close). Other cams are available on request.

The positioner can be supplied in a normal pneumatic version: input signal 3-15 psi/6-30 psi or split range as well as an electro-pneumatic design: input signal 0-20 mA/4-20 mA. Max. supply pressure to the actuator: 45 psi (3 bars). When the valve is changed from air to open to air to close or reverse, cam-plate should be changed accordingly.

The cam-plates are marked as follows:

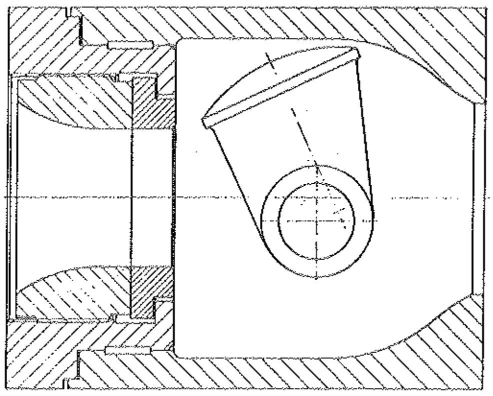
O log:	valve spring to close characteristic: equal percentage
O lin:	valve spring to close characteristic: linear
S log:	valve spring to open characteristic: equal percentage
S lin:	valve spring to open characteristic: linear

The actuator and positioner will be adjusted acc. to the customers specification.

Standard air connection: G 1/4"

Konstruktion

Design



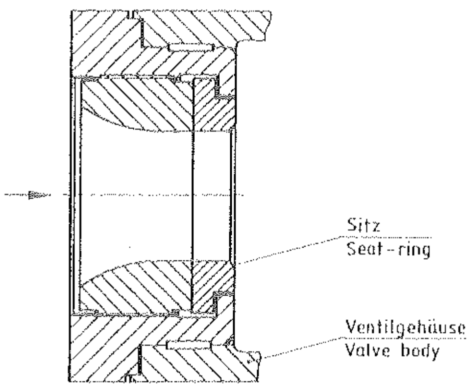
Durch die strömungsgünstige Gestaltung des Ventils wird eine hohe Durchflußkapazität erreicht.

Bei ganz geöffneter Armatur ist der Kegel völlig aus der Strömung geschwenkt.

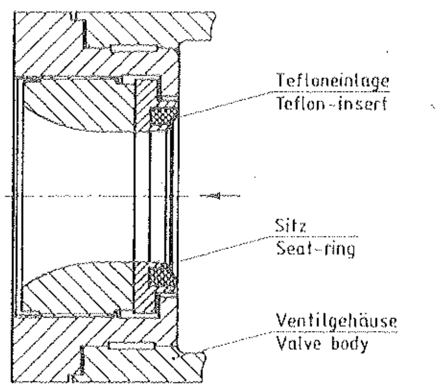
Da auch die Antriebswelle, auf welcher der Kegel mit dem einen Schenkel spielfrei sitzt, nicht in die Strömung hineinragt, kann das Durchflußmedium ungehindert, d.h. ohne jegliche Umlenkung die Armatur durchströmen.

The configuration of the valve guarantees a high flow capacity.

In the full open position the plug is completely removed from the flow stream, so the medium passes through the valve without obstruction, also the shaft is not in the flow-stream.



Metallsitz
metal seat



Weichsitz
soft seat insert

Die Maxifluss-Stellventile DN 25 (1") bis DN 400 (16") können auch mit reduzierten Sitzen geliefert werden, wobei nur der Sitz- und Gewindering auszutauschen ist, während der Kegel bis DN 250 (10") beibehalten werden kann. Bei DN 300 (12") und DN 400 (16") ist bei Faktor 0,6 und kleiner auch der Kegel zu tauschen. Für absolut dichtes Schließen können die Sitze mit Teflonweichdichtung geliefert werden, hierbei muß jedoch die Anströmung entgegengesetzt erfolgen.

Weitere Sitzgrößen auf Anfrage.

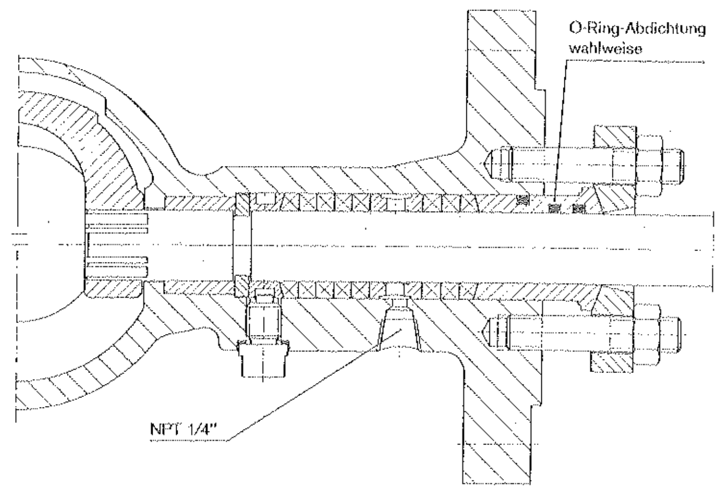
The Maxifluss-valves 1" – 16 " can be supplied with reduced trims -60% -40%.

The valve is also available with soft seat for 100% bubbletight shut off.

Optionally other trim sizes on request.

Konstruktion

Design

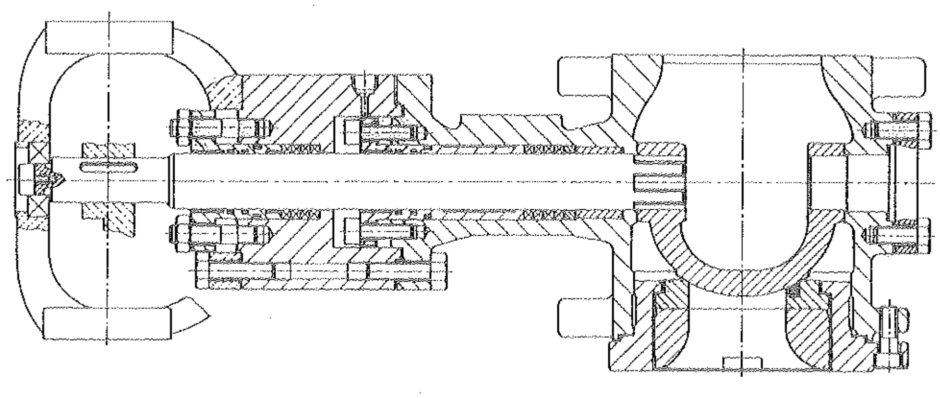


Als Abdichtung der Antriebswelle nach außen dient eine Stopfbuchspackung. Der Raum zwischen den beiden Packungen ist mit einem Anschluß NPT ¼" versehen und kann als Spülanschluß verwendet werden und/ oder mit einem Sperrmedium beaufschlagt werden.

Als absolute Dichtheit nach außen kann zusätzlich noch eine O-Ringabdichtung angebracht werden.

The stem is tightened with a stuffing box. Between the two packing ring sets a ¼" NPT connection allows purging or to apply a blocking fluid.

Additional O-rings for absolute tightness are optional.



Maxifluss-Stellventil
Baureihe 72 mit Doppelstopfbuchse

Maxifluss-control-valve
series 72 with double stuffing-box

Die Doppelstopfbuchse dient als Sicherheitsabdichtung bei kritischen Bedingungen, z.B. giftigen oder explosiven Stoffen, Thermoölen.

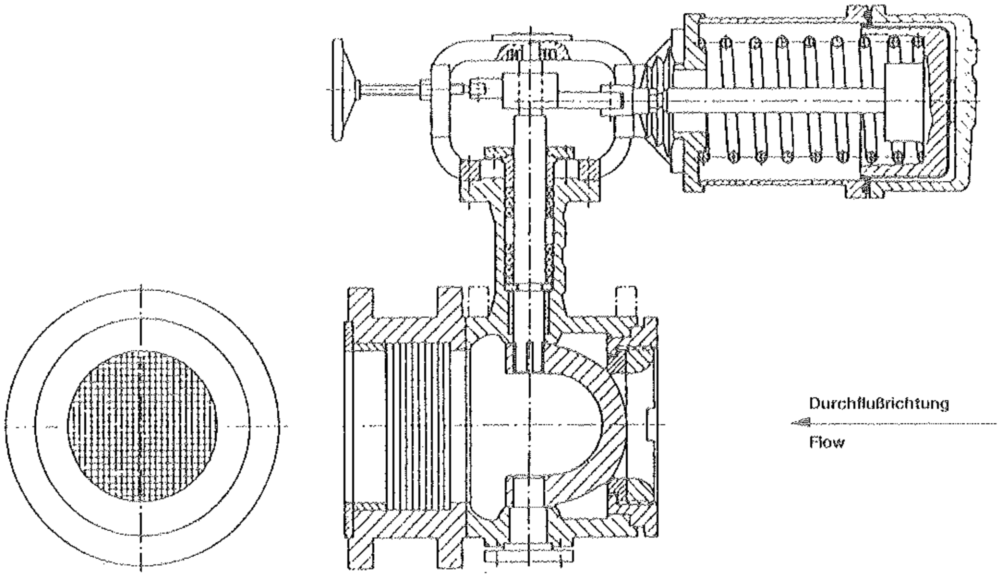
Der Anschluß ¼" NPT dient zur Gefahrenmeldung bei Leckage der inneren Stopfbuchse. (Anschluß zur Überwachung des Packungsraumes)

The double stuffing box guarantees a safety tightness under critical service conditions, i.e. poison or explosive fluids, thermo-oil etc.

The ¼ " NPT-connection allows a safety alarm, in case of leakage of the inner stuffing box.

Konstruktion

Design



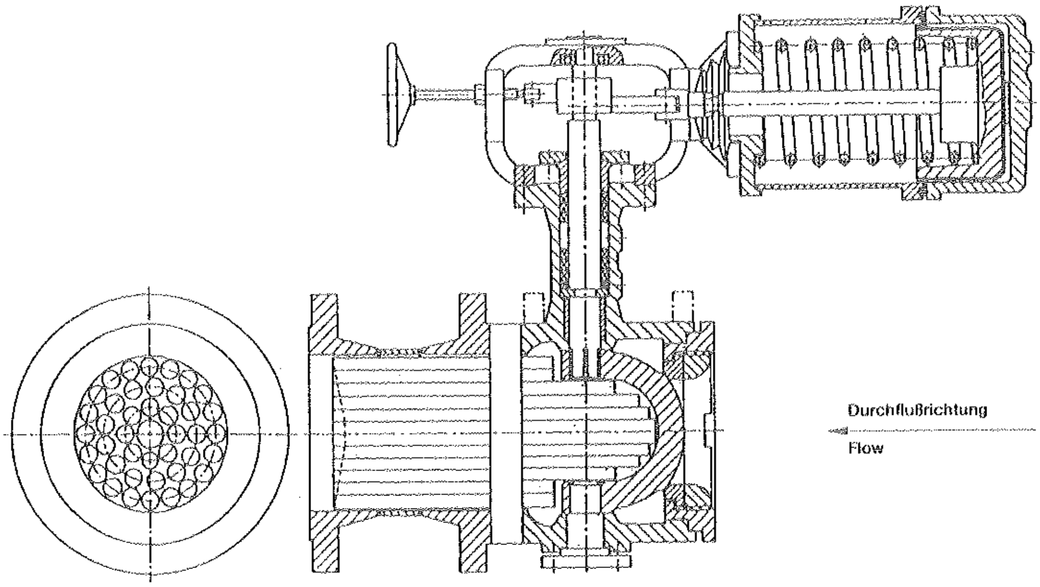
Bei der Regelung von Gasen oder Dampf können bei schwierigen Betriebsbedingungen hohe (SPL) (Schallpegel) entstehen.

Eine schalldämmende Zusatzeinrichtung zum Standard-Maxifluss-Ventil begrenzt den SPL auf ein annehmbares Maß. Der verfügbare Kvs-Wert wird durch das Schalldrosselpaket herabgesetzt. Siehe Kvs-Tabellen Seite 19.

Difficult service conditions with gas or steam flow control may result in high sound level (SPL).

A noise reducing set, installed with the Maxifluss-valve, limits the SPL to an acceptable level.

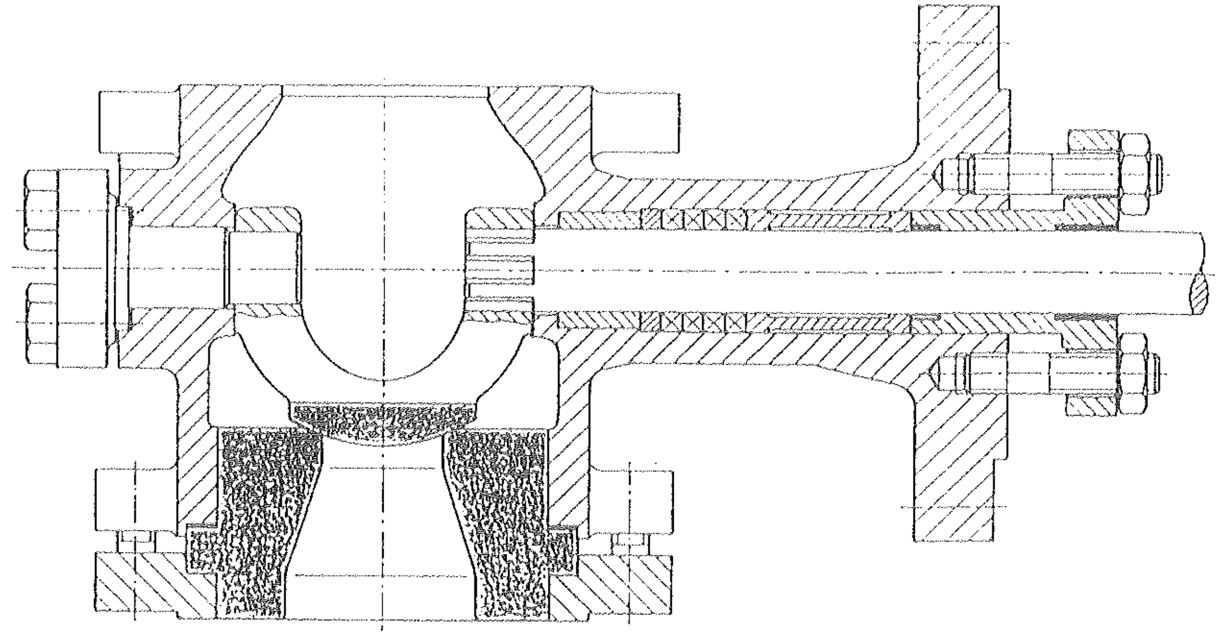
The available cv-value will be reduced. See table page 19.



Bei der Flüssigkeitsregelung im kritischen Bereich der Geräuschentwicklung wird die Strömung hinter dem Ventil durch einen Strömungsteiler geleitet und damit Turbulenzen und Kavitation entgegengewirkt. Hierbei ist ebenfalls eine Reduzierung des Kvs-Wertes zu beachten. Siehe Tabelle Seite 19.

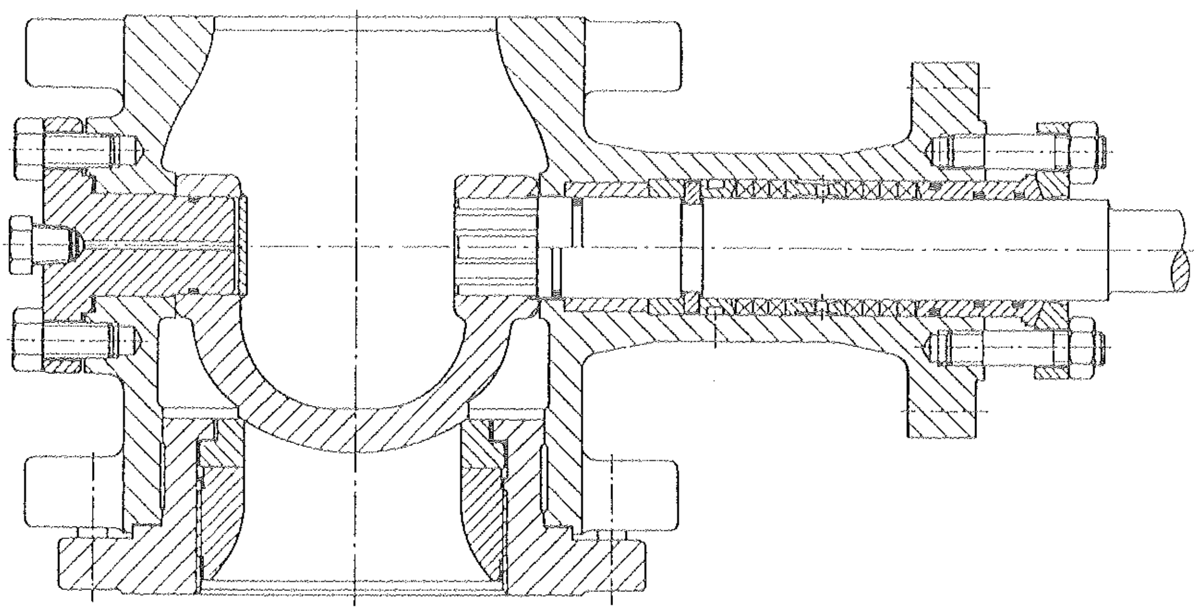
For liquid flow control at a critical range of SPL the downstream flow of the valve may be stream lined by a flow divider to reduce turbulence and cavitation. Note the reduced flow capacity. For cv-values see table page 19.

Konstruktion **Design**



Das Maxifluss-Ventil kann mit einem Keramikeinsatz geliefert werden. Damit werden bei freiem Strömungsquerschnitt die kritischen Durchflußbereiche abrieb- und korrosionsfest, wie dies z.B. beim Einsatz für Kalkmilch oder Feststoff-Suspensionen erforderlich ist.

The Maxifluss-valve can be supplied with a ceramic trim and seat. The free seat area becomes resistant to abrasion and corrosion. Typical applications are lime or suspenions of solid particles.



Als Sonderausführung für spezielle Anwendungen können O-Ringe an verschiedenen Stellen innerhalb des Ventils angebracht werden.

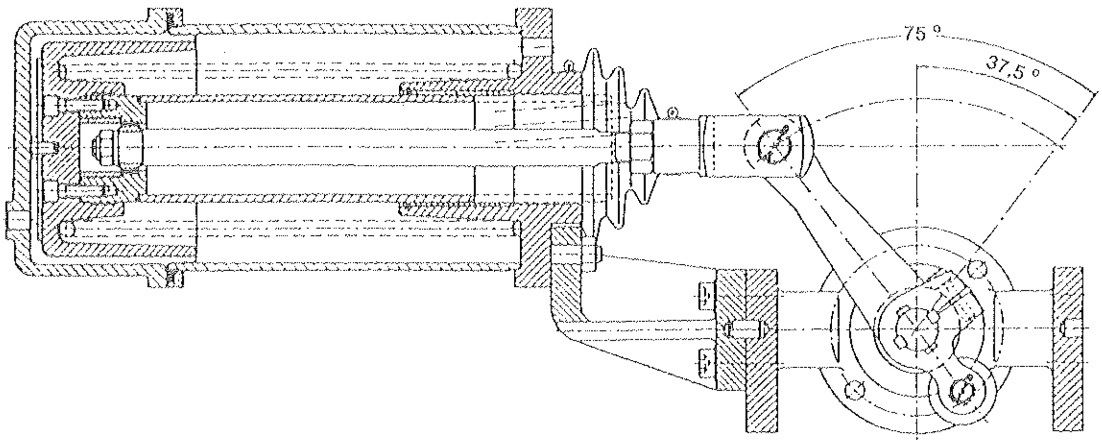
Das obige Bild zeigt einige Beispiele.

For special applications optional O-rings may be provided at several individual places inside the valve.

The drawing shows some examples.

Stellantriebe

Actuators



Antrieb R 150 – R 250
für Maxifluss-Ventil DN 80 – 300

Actuator R 150 – R 250
for Maxifluss-valve DN 80 – 300

Die Maxifluss-Ventile sind mit einfach wirkenden, pneumatischen Stellantrieben ausgestattet. Der Antrieb kann um jeweils 90° versetzt angebaut werden.

Die Wirkungsweise der Ventile kann auf der Baustelle mühelos und ohne Zusatzteile geändert werden.

Standardmäßig ist jeder Ventil-Nennweite eine bestimmte Antriebsgröße zugeordnet. Durch einige Zusatzteile kann auch die nächstgrößere Antriebstype angebaut werden.

Zusätzlich kann auch eine Handnotbetätigung mit angebaut werden, die außer der Ventilbetätigung auch als Mindestmengeneinstellung benützt werden kann.

Außer 4 Standardantrieben R 110, R 150 und R 200 stehen noch zwei weitere Antriebsgrößen R 250 und R 250v verstärkt zur Verfügung.

Die Stellantriebe sind mit Rollmembranen und innenliegenden Rückstellfedern ausgestattet. Die beweglich gelagerte Kolbenstange ist direkt mit dem Hebel, der auf der Ventilwelle sitzt, verbunden. Die Antriebe können alle mit 3 bar Luft beaufschlagt werden und sind standardmäßig so angebaut, daß sie parallel zur Rohrleitung liegen.

The Maxifluss-control-valves are equipped with single-acting pneumatic actuators. The actuator can be mounted at a time of 90 degrees shifted.

The function of the valves can be altered easily and without additional parts on the building site.

According to the standard range each nominal width is allocated to a determinated size of actuator. By means of some additional parts it is even possible to mount the next actuator in size.

The emergency handwheel (optional) may be used as a manual operator or as a limit stop for minimum flow adjustment.

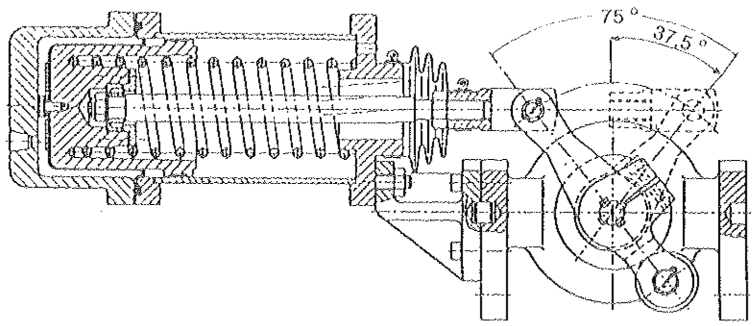
There are 4 standard actuators R 100, R 150, R 200 and 2 special heavy duty actuators R 250 and R 250 v.

The actuator is equipped with a diaphragm and an enclosed adjustable spring.

Maximum supply pressure: 45 psi – 3 bars.

Stellantriebe

Actuators

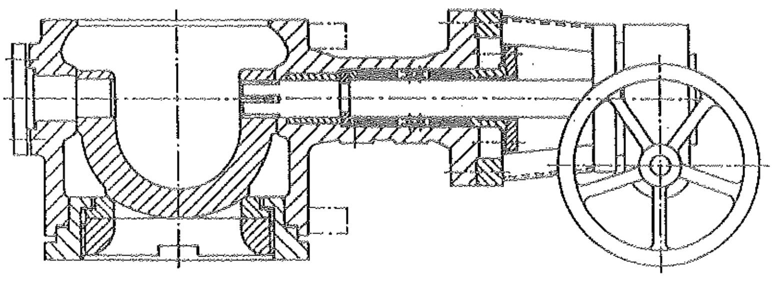


Antrieb R 110
für Maxifluss-Ventil DN 25 – 50

Actuator R 110
for Maxifluss-valve DN 25 – 50

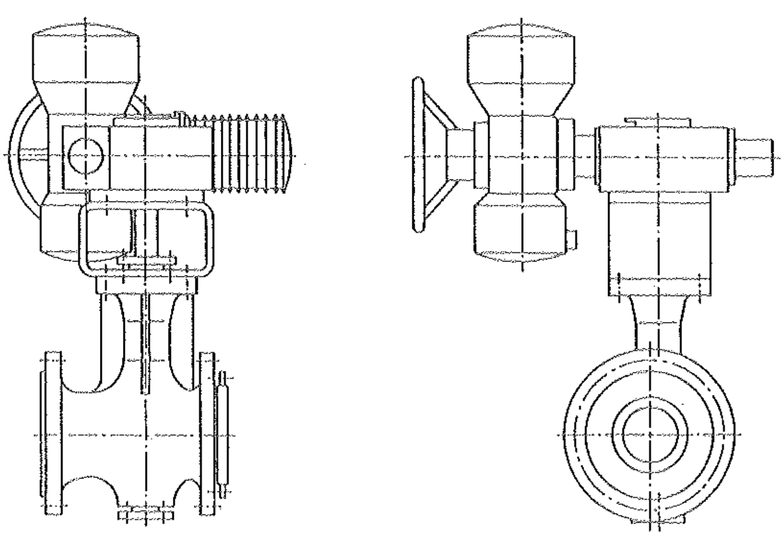
Ein Lagerbügel aus Kugelgraphitguß verbindet Antrieb und Ventil. An diesen Bügel kann auch gleichzeitig die Handnotbetätigung sowie der Stellungsregler oder andere Anbauteile angebaut werden. Ferner befindet sich in diesem Bügel ein Kugellager, in dem die Ventilwelle gelagert ist. Dieses Lager nimmt die Axialkräfte der Welle auf. Durch Lösen der Stopfbuchsbrille und Stopfbuchse läßt sich dank der guten Platzverhältnisse leicht die Packung auswechseln.

A solid cast iron yoke connects valve and actuator. Emergency handwheel, positioner or other accessories can be assembled with the yoke. An inserted ball bearing for the stem absorbs axial forces. The stuffing box allows easy access to replace the packing ring.



Handantrieb mit Schneckengetriebe

Handwheel with worm gear drive

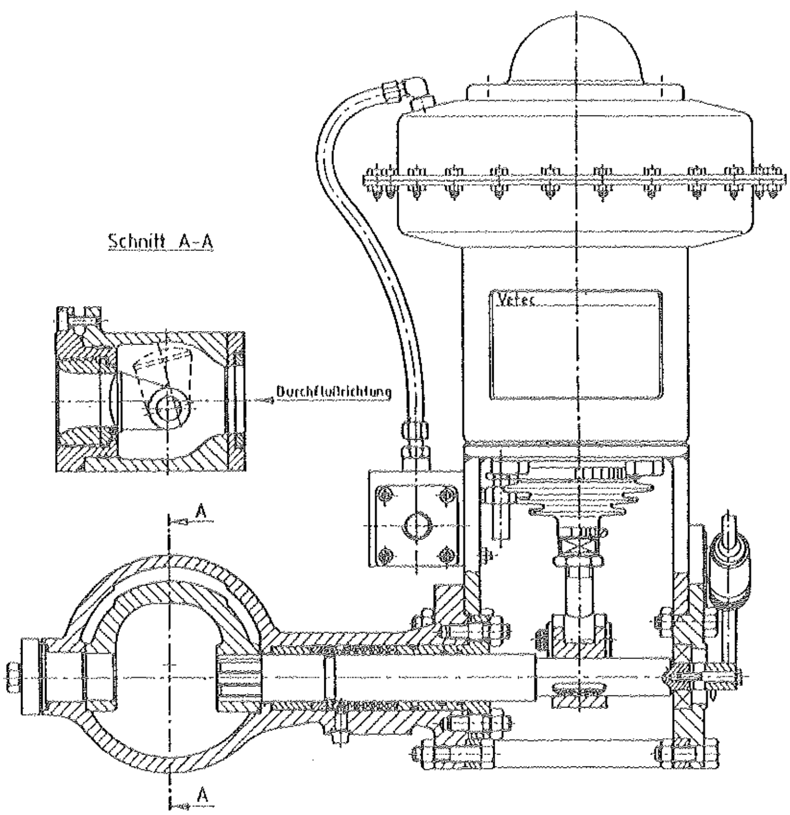


Elektro-Antrieb

Electric-Actuator

Spezielle Anwendung

Special Application



Das Maxifluss-Stellventil als Schnellschlußsicherheitsventil in DVGW-Ausführung mit pneumatischem Antrieb ist DVGW-typgeprüft nach DIN 3394, Blatt 1, und entspricht in der Dichtheit der Gruppe A.

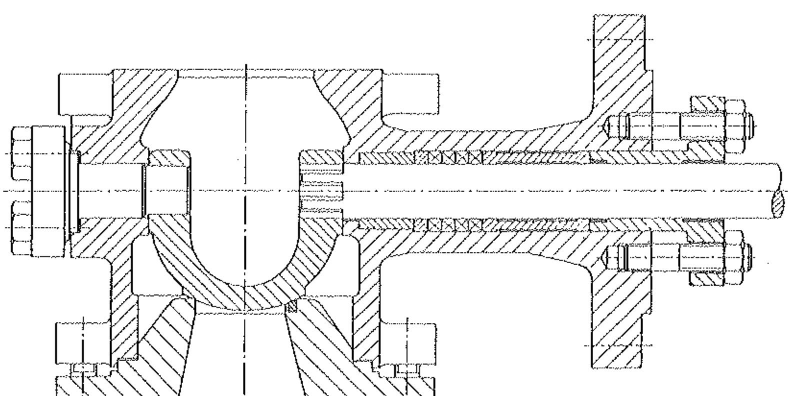
Entsprechend dieser Norm beträgt die Schließzeit mittels Federkraft kleiner als 1 Sekunde. Der Druckverlust in 5 Minuten ist kleiner 0,3 mbar/dm^3.

Jedes Stellgerät ist mit einem Schmutzfänger ausgerüstet.

The Maxifluss-control-valve – DVGW design with pneumatic actuator is DVGW-type-certified acc. to DIN 3394, sheet 1 class A.

This standard requires a spring to close shut down during less than 1 sec. for immediately tight cutting off the gasflow.

Each valve is delivered with a strainer.

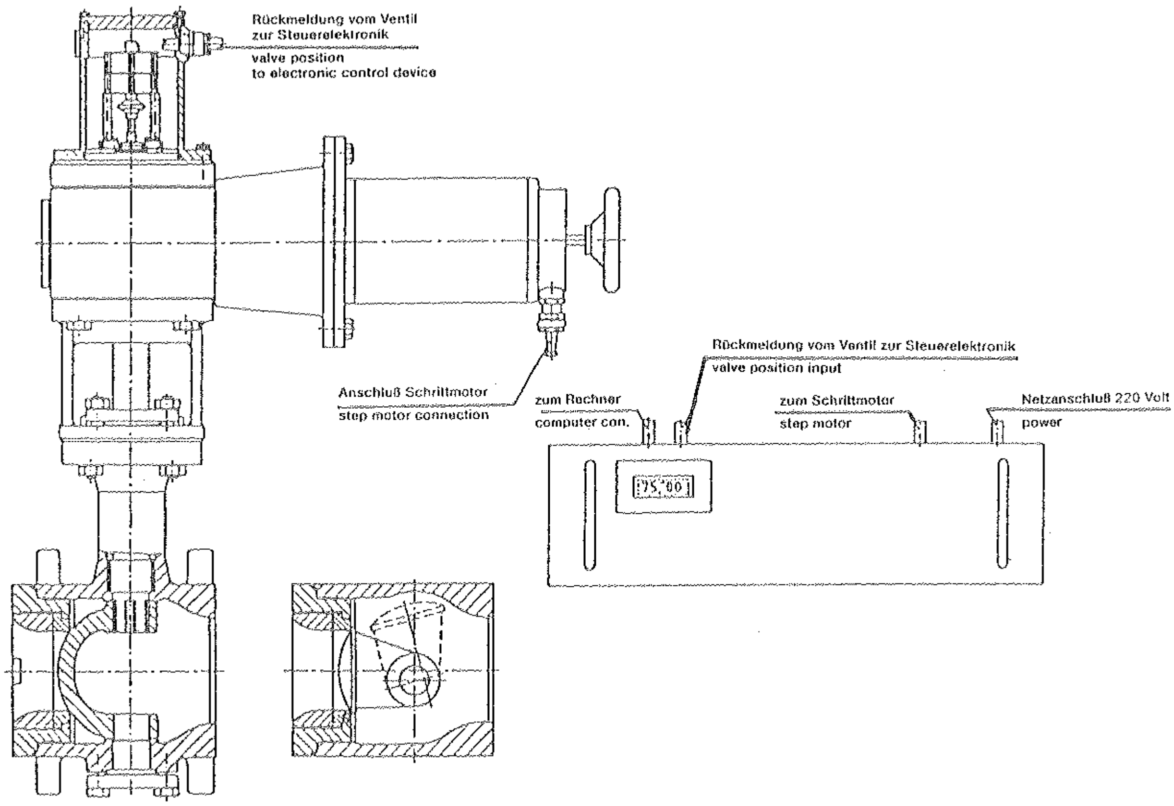


Konstruktion für faserhaltige Stoffe
(Papier- und Zellstoffindustrie)

Design for fiber containing fluids
(paper mills, cellulose industry)

Spezielle Anwendung

Special Application



Flächengewichtsstellventil für Papiermaschinen

Das VETEC-Flächengewichts-Stellventil besteht aus drei Grundeinheiten: dem Drehkegelventil, dem integrierten Schrittmotor mit Getriebe und der Steuerelektronik.

Besondere Eigenschaften:

* Großer Regelbereich – genaue Einstellung der Durchflußmenge.
* Spielfreie Übertragung – genaue Wiederholbarkeit
* Einfacher Einbau zwischen Rohrleitungsflansche
* Steuerelektronik und Prozeßrechner sind durch Optokoppler getrennt.
* Das Regelventil wurde für extrem genaue Regelung entwickelt.

Folgende Ansteuerungen sind möglich:

1. direkt über den Prozeßrechner,
2. über Zusatzgerät, Eingang 0-20 mA oder 4-20 mA, Ausgang Impulse für Steuerelektronik,
3. über Zusatzgerät mit Regleransteuerung

Dieses Spezial-Stellventil kann auch für alle anderen Regelaufgaben eingesetzt werden.

Basis weight control valve

The basis weight control valve consists of three units, the Maxifluss-control-valve, the step motor with integrated gear box and the electronic control device.

Special features:

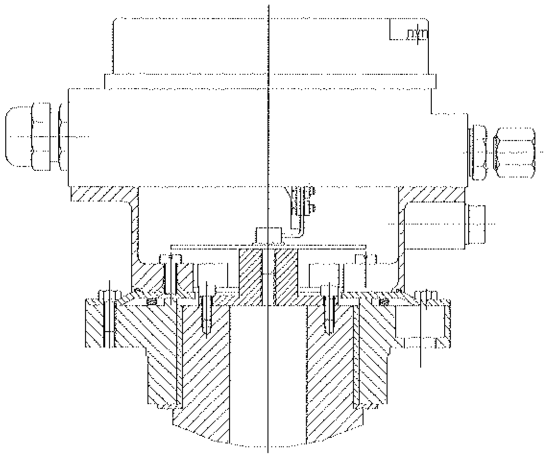
* wide rangeability – exact control of flow
* exact repeatability
* installation between pipe flanges
* control electronic and process controller separated by opto coupling
* rotary valve designed for exact control

Possible interfaces:

1. direct control by process controller
2. additional transmitter, input 0-20 mA or 4-20 mA, output digital impulses to electronic control device
3. additional unit with control interface

This special control-valve may also be used for all other control problems.

Stellungsregler

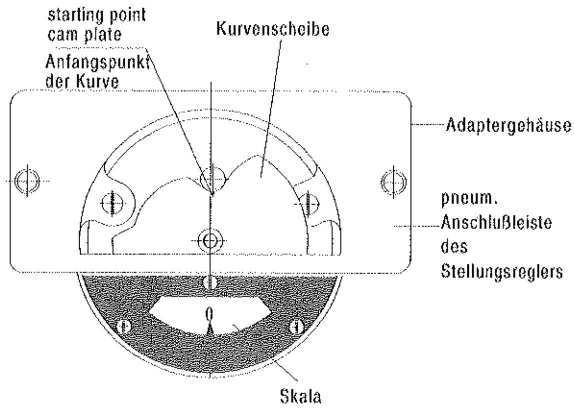


Pneumatischer Stellungsregler für Drehwinkel ohne Manometer/mit Manometer
Signal: 0,2 - 1 bar

Elektro-pneumatischer Stellungsregler für Drehwinkel
Signal: 0-20 mA/4-20 mA

Kennlinien: Kurvenscheiben für logarithmische und lineare Kennlinien.

Positioner

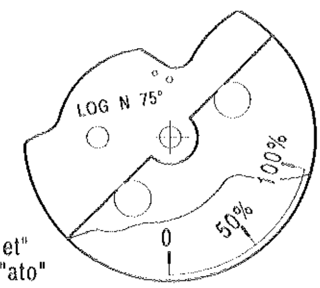


Pneumatic positioner for rotary valves without/with gauge
Signal : 3 - 15 psi/split range

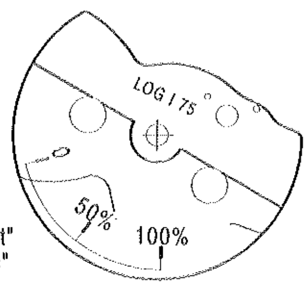
Electro-pneumatic positioner for rotary valves

Signal: 0-20 mA/4-20 mA

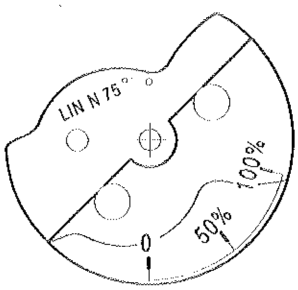
Characteristics: cams for logarithmic and linear characteristics



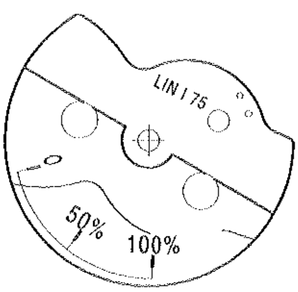
logarithmisch "öffnet"
equal-percentage "ato"



logarithmisch "schließt"
equal-percentage "atc"



linear "öffnet"
linear "ato"



linear "schließt"
linear "atc"

Zubehör	Accessories
Stellungsregler	Positioner
pneumatisch	pneumatic
elektro/pneumatisch	electro/pneumatic
Stellungsumformer	Position transmitter
pneumatisch	pneumatic
elektrisch	electric
Grenzwertgeber	Limit switch
induktiv	inductive
mechanisch	mechanic
Verblockrelais	Blocking relay
Leistungsverstärker	Booster relay
Zuluftstation	Air supply station
Magnetventile	Solenoid valve
Verrohrung	Tubing
Kupfer	copper
1.4571	SS 316
Abnahmezeugnisse	Test certificates

Technische Daten

Typ 72.1/3/5 Flanschausführung
Typ 72.2/4/6 Sandwichausführung

Nennweiten:	DN 25, 40, 50, 80, 100, 150, 200, 250, 300, 400
Gehäuse-Druckstufen	PN 40 ANSI 300
Anschlüsse:	Flansche mit Arbeitsleiste
72.1/3/5:	PN 10 DIN 2632 PN 16 DIN 2633 PN 25 DIN 2634 PN 40 DIN 2635 wahlweise mit Nut, mit Rücksprung
72.2/4/6:	flanschlos zum Einspannen zwischen Rohrleitungsflansche PN 10, 16, 25, 40 oder ANSI 150, 300 wahlweise mit Nut nach DIN 2512
Baulänge:	
72.1:	nach DIN 3202, Reihe F 1 Grundreihe 1 oder ANSI B 16.5 (außer DN 300 + 400)
72.2:	Kurzbaulänge zusätzlich Paßstück zur Ergänzung auf DIN oder ANSI-Baulänge lieferbar
wahlweise mit:	Heizmantel Schallreduzierung

Technical Data

Type 72.1/3/5 flanged valve
Type 72.2/4/6 flangeless valve

Size:	1", 1½", 2", 3", 4", 6", 8", 10", 12", 16"
Body Rating	PN 40 ANSI 300
Connections:	Flanges RF,
72.1	ANSI 150 B 16.5 ANSI 300 B 16.5
72.2/4/6	flangeless for installation between pipe flanges PN 10, 16, 25, 40 or ANSI 150, 300
Options:	RTJ, small groove, large groove
	Face to Face Dimension 72.1 acc. to DIN 3202 or ANSI B 16.5
72.2	„short length" additonal adaption to make up for DIN or ANSI – face to face on request
Options:	Heating for body Sound level reducing

Technische Daten

Technical Data

Werkstoffe

Materials

Gehäuse valve body			Sitz seat	Kegel plug	Welle shaft	Packung packing
1.0619	Stahlguss	carbon steel	1.4581	1.4581	1.4571	PTFE-Graphit
1.4581	Edelstahl	stainless steel	1.4581	1.4581	1.4571	PTFE-Graphit
1.4581	Edelstahl	stainless steel	Stellit 6	Stellit 6	1.4571	PTFE-Graphit
2.4686	Hastelloy C 4	Hastelloy C 4	2.4686	2.4686	2.4686	PTFE-Graphit
2.4686	Hastelloy C 4	Hastelloy C 4	Stellit 6	Stellit 6	2.4686	PTFE-Graphit
2.4686	Hastelloy C 4	Hastelloy C 4	Oxyd-Keramik	Stellit/Oxyd Keramik	2.4686	PTFE-Graphit

Sonderwerkstoffe auf Anfrage

Special material on request

wahlweise

Weichsitz aus PTFE

Sitzflächen stellitiert

Welle und Lagerbuchsen stellitiert

O-Ringe an verschiedenen Stellen innerhalb des Ventiles

Doppelstopfbuchse

öl- und fettfrei

optional

PTFE – soft seat

stellited seat surface

shaft and bushing bearings stellited

O-Ring at different places inside the valve

double stuffing box

free of oil and grease

Temperaturbereiche

Temperature ranges

1.0619	Stahlguss	carbon steel	- 10 .... + 400°C
1.4581	Edelstahl	stainless steel	- 60 .... + 400°C
2.4686	Hastelloy C4	Hastelloy C4	- 60 .... + 400°C
1.4308	TT-Stahl	low temperature steel	- 196 .... + 300°C
	PTFE-Weichsitz	PTFE-soft seat	- 40 .... + 160°C

Leckmenge

Standard $\leqq$ 0,05 % K_{VS}

metallisch eingeschliffen $\leqq$ 0,03 % K_{VS}

mit Teflon-Sitzeinlage = blasendicht

Leakage rate

Standard $\leqq$ 0,05 % K_{VS}

specical metal tight $\leqq$ 0,03 K_{VS}

with Teflon-seat = bubble tight shut off

siehe auch nächste Seite

see next page

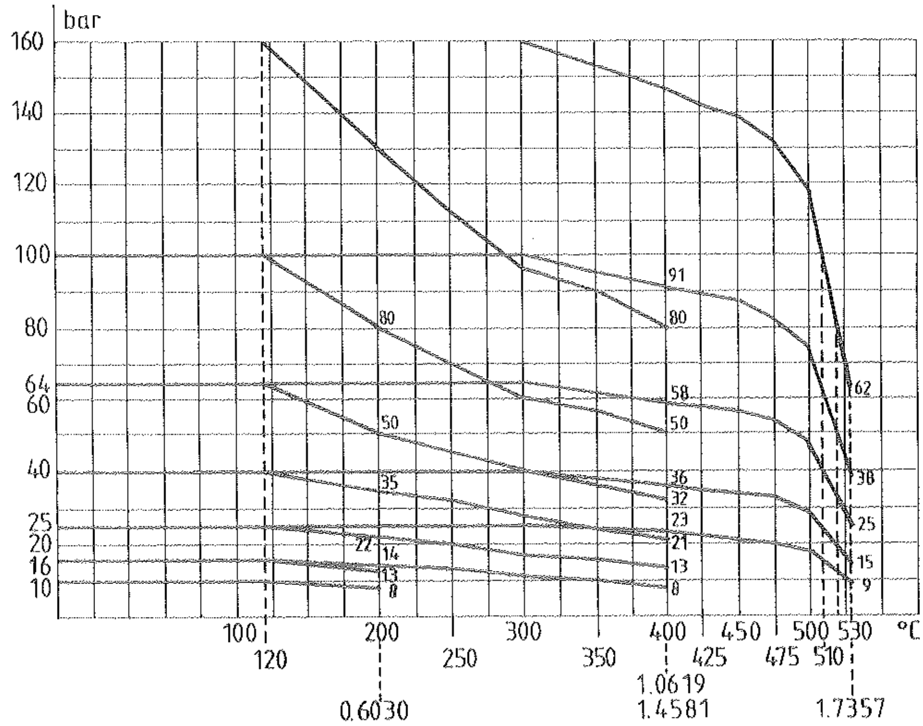
Druck-Temperatur-Verhalten

Attitude of Pressure-Temperature

Nenndruck
Nominal pressure

1.5638 GS – 10 Ni 14
1.6905 G – X7 Cr Ni Nb 1810

Bis zum jeweiligen Nenndruck belastbar
Permissible load up to nominal pressure

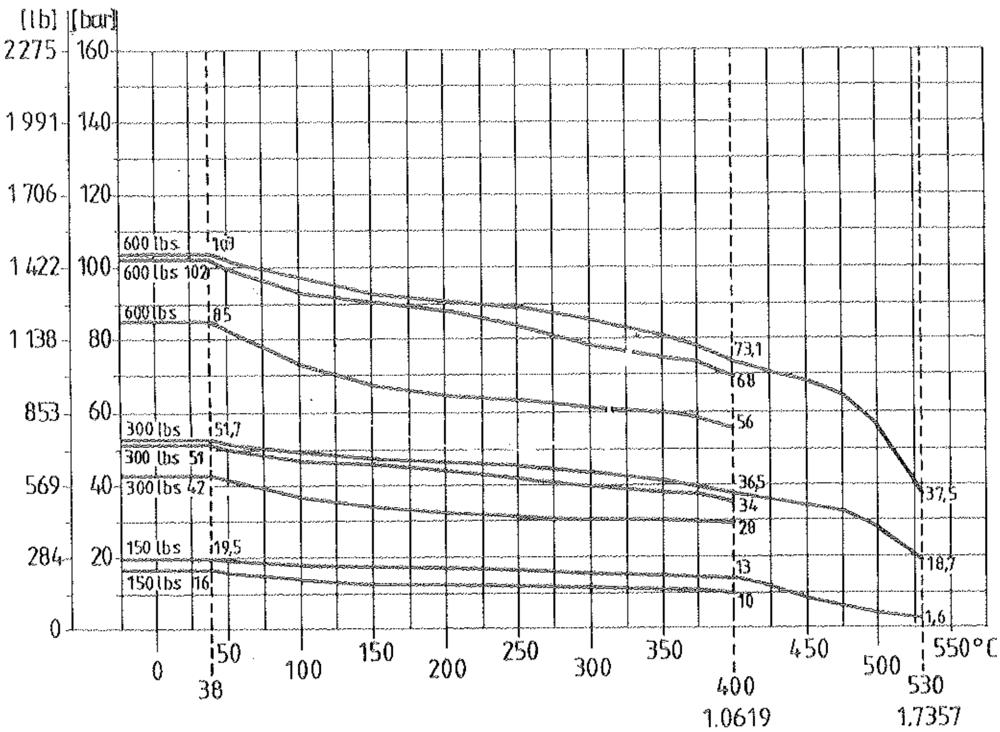


nach
acc. to DIN 2401

Zul. Betriebsdruck bar
Permissible
working pressure

Temperatur
Temperature

Nenndruck
Nominal pressure



nach
acc. to ANSI B 16.5

Zul. Betriebsdruck bar
Permissible
working pressure

Temperatur
Temperature

W.Nr. 1.0619 (GS – C 25) DIN 17245 ≙ ASTM A 216 – WCB
W.Nr. 1.4581 (G – X7 Cr Ni Mo Nb 1810) DIN 17445 ≙ ASTM A 351 – CF 8 M
W.Nr. 1.7357 (GS – 17 Cr Mo 55) DIN 17245 ≙ ASTM A 217 – WC 6

Technische Daten / Technical Data

Kv-Werte: / Kv- /Cv-Values

Tabelle über K_v- bzw. C_v-Werte / K_v/C_vTable

Nennweite	DN	25	40	50	80	100	150	200	250	300	400
Size		1"	1½"	2"	3"	4"	6"	8"	10"	12"	16"
100 %	K_vs	16	40	80	245	370	685	950	1925	2680	4200
	C_v	19	47	94	286	430	800	1110	2238	3116	4883
	ø	18	26	36	60	76	105	135	170	210	290
	z	0,25	0,25	0,2	0,15	0,15	0,15	0,15	0,15	0,15	0,15
red. 60 %	K_vs	10	24	48	147	220	410	570	1230	1640	2520
	C_v	12	28	56	171	256	477	663	1430	1907	2932
	ø	16	21,5	29,5	50	60	86	106	146	163	225
	z	0,3	0,3	0,25	0,2	0,2	0,2	0,15	0,15	0,15	0,15
red. 40 %	K_vs	6	16	33	105	150	275	380	770	1070	1680
	C_v	7	19	38	122	174	320	442	895	1244	1953
	ø	14	18,5	25,5	44	53	73	88	126	133	184
	z	0,35	0,35	0,3	0,25	0,25	0,25	0,15	0,15	0,15	0,15
Weichsitz soft seat											
100 %	K_vs	10	40	68	162	252	510	726	1450	2010	
	C_v	11,6	47	79	189	295	593	849	1686	2337	
red. 60 %	K_vs	6	21	41	135	164	270	460	990	1320	
	C_v	7	24	50	158	191	314	535	1151	1535	
red. 40 %	K_vs	4	15	28	105	121	182	300	620	860	
	C_v	4,6	17	33	123	141	212	349	721	1000	
schallreduziert low noise											
	ø		26	36	60	76	105	135	170	210	290
Flüssigkeit liquids	K_vs		18	38	115	180	395	542	1097	1528	2394
	C_v		21	44	135	210	460	633	1285	1790	2800
Gas + Dampf gases + steam	K_vs		7	14	47	80	147	236	415	681	1429
	C_v		8	16	55	93	171	275	483	792	1662
Zeta-Wert		2,45	2,55	1,55	1,1	1,2	1,75	2,45	1,68	1,8	
FL	100 %	0,80	0,80	0,80	0,75	0,75	0,75	0,70	0,70	0,70	0,70
	60 %	0,85	0,85	0,85	0,80	0,80	0,80	0,75	0,75	0,75	0,75
	40 %	0,90	0,90	0,90	0,85	0,85	0,85	0,80	0,80	0,80	0,80
XT	100 %	0,50	0,50	0,50	0,35	0,35	0,35	0,30	0,30	0,30	0,30
	60 %	0,60	0,60	0,60	0,50	0,50	0,50	0,35	0,35	0,35	0,35
	40 %	0,70	0,70	0,70	0,60	0,60	0,60	0,50	0,50	0,50	0,50

VETEC
Ventiltechnik GmbH

Technische Daten
Zulässige Differenzdrücke
Pneumatische Stellantriebe

Technical Data
Allowable differential pressure
Pneumatic Actuators

Antriebs-Typ	Hub mm	Fläche cm^2	Gewicht in kg
Actuator	Stroke mm	Surface cm^2	Weight kg
R 110	128	85	10,5
R 150	184	165	17,5
R 200	200	295	32,0
R 250	200	470	55,0
R 250 v	200	470	68,0

Maximal zulässiger Differenzdruck in bar bei geschlossenen Ventilen.
Max. allowable differential pressure for valve in closed position.

Wirkungsweise: Federkraft schließt, Medium öffnet
oder : Federkraft öffnet, Medium schließt

Function: spring to close, medium to open
or : spring to open, medium to close

DN	Antriebstype					
		R 110	R 150	R 200	R 250	R 250 v
25		40				
40		30	40			
50		15	40			
80			15	29	40	
100			8	15	24	
150				7	11	40
200				4	6	27
250				2	3	15
300				1	2	9
Feder spring	0,4 – 1,2 bar					1,3 – 2,4 bar

Wirkungsweise: Luft schließt, Medium öffnet
oder : Luft öffnet, Medium schließt

Function: air to close, medium to open
or : air to open, medium to close

DN	Antriebstype					
		R 110	R 150	R 200	R 250	R 250 v
25						
40		40				
50		40				
80			40			
100			40			
150				40	40	23
200				26	40	12
250				15	24	7
300				9	15	4

Werte gelten nicht bei Doppelstopfbuchse

Not valid with double stuffing box

Technische Daten

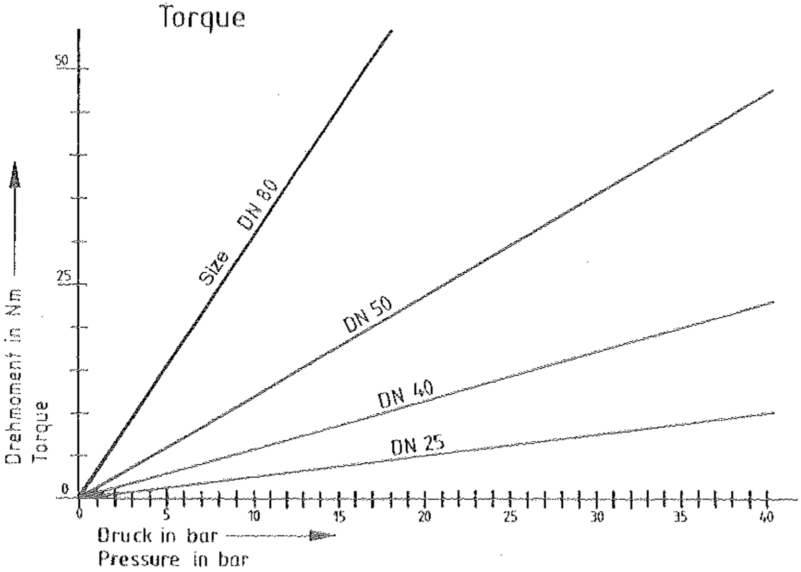
Technical Data

Maximal zulässiges Drehmoment $M_{t\,max.}$

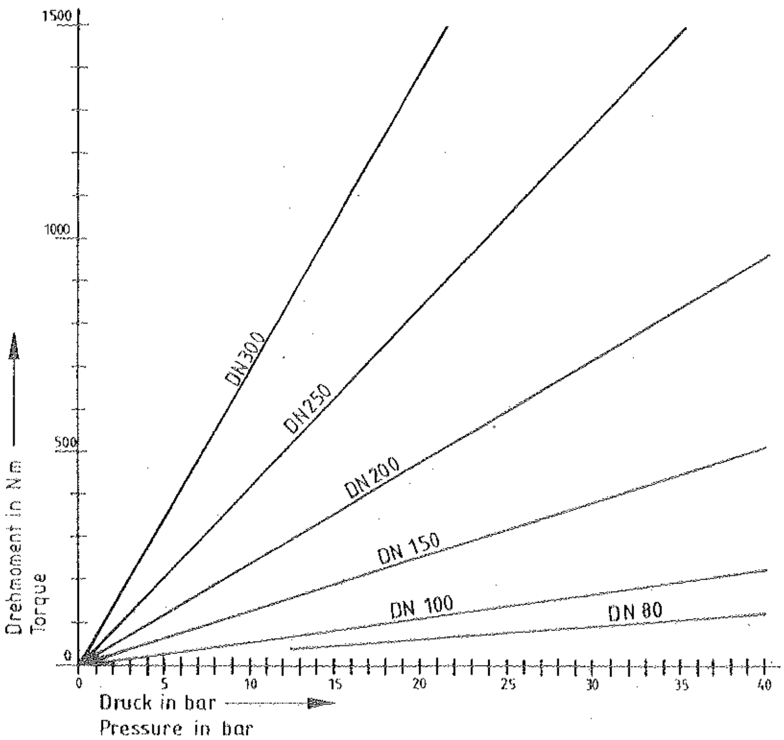
Maximum torque in Nm

DN	25	40	50	80	100	150	200	250	300
Mt max in Nm	60	130	130	335	335	1280	1280	1280	1280

Drehmoment als Funktion von Δ P
Torque



Maxifluss-Ventil DN 25 – 80



Maxifluss-Ventil DN 80 – 300

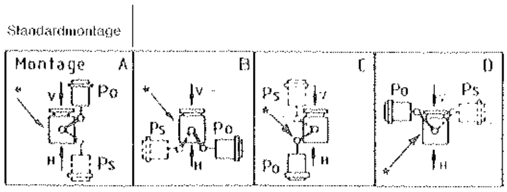
Technische Daten

Abmessungen Typ 72.2/4/6
mit pneumatischem Antrieb Typ R

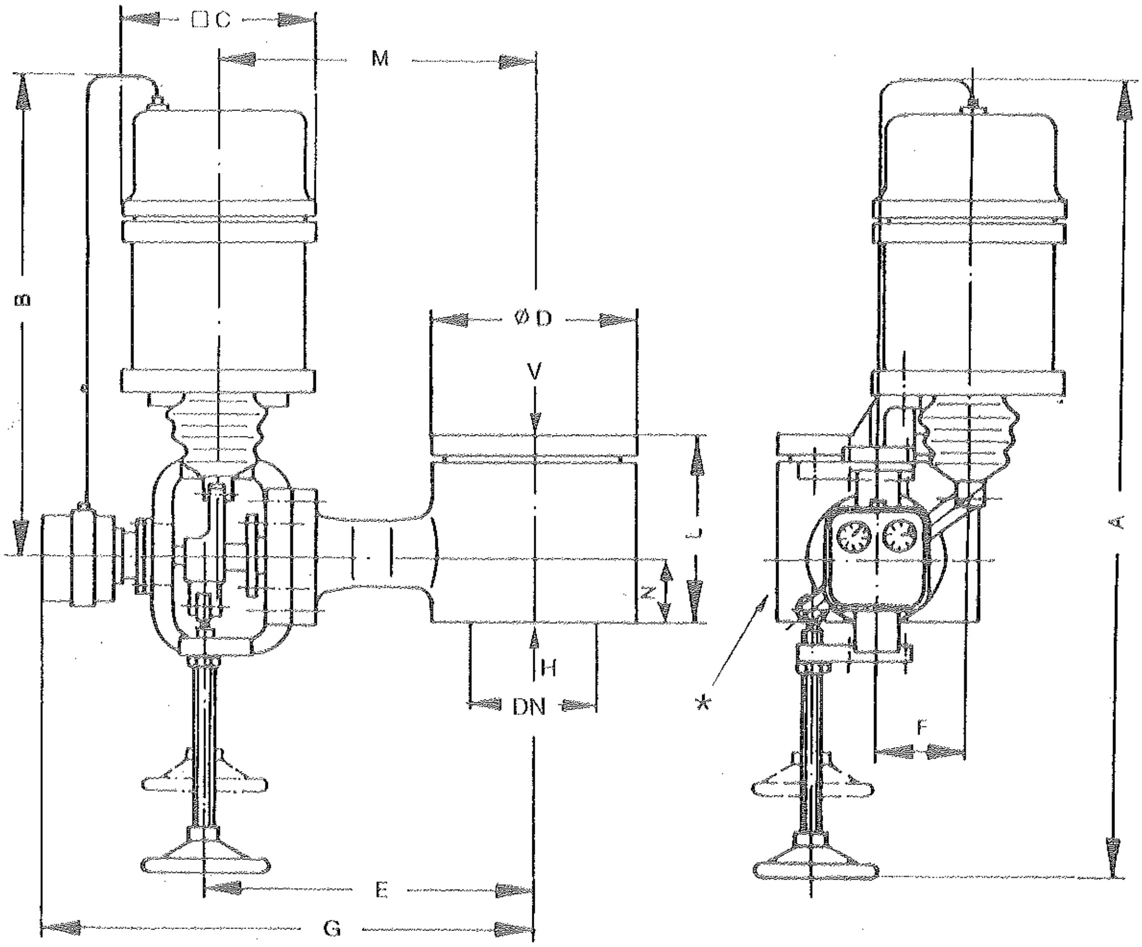
Technical Data

Dimensions Type 72.2/4/6
with pneumatic actuator Type R

Montagemöglichkeit des Antriebs



Po = Luft öffnet Ventil / air to open
Ps = Luft schließt Ventil / air to close
V = Normale Durchflußrichtung / normal flow
H = Durchflußrichtung, wenn Sitz mit Weichdichung / flow direction with soft seat
* = bei waagrechtem Einbau Ventilunterkante / for horizontal installation bottom side of valve



Antrieb	110			150		200				250				250 verst.			
DN	25	40	50	80	100	150	200	250	300	150	200	250	300	150	200	250	300
A	750	750	750	880	880	1090	1090	1090	1090	1150	1150	1150	1150	1230	1230	1230	1230
B	510	510	510	640	640	750	750	750	750	800	800	800	800	880	880	880	880
C	150	150	150	185	185	240	240	240	240	335	335	335	335	335	335	335	335
D	64	82	100	132	162	217	272	326	377	217	272	326	377	217	272	326	377
E	200	228	238	288	308	405	420	467	489	405	420	467	489	405	420	467	489
F	59	83	83	120	120	127	127	127	127	127	127	127	127	127	127	127	127
G	420	450	460	510	530	650	665	710	735	650	665	710	735	650	665	710	735
L	102	114	124	165	194	229	243	297	338	229	243	297	338	229	243	297	338
M	192	220	230	280	300	394	409	456	478	394	409	456	478	394	409	456	478
N	44	43	43	61	79	81	78	98	122	81	78	98	122	81	78	98	122
Gew. in kg	17	29	31	45	56	97	122	180	245	120	145	203	268	133	158	216	281

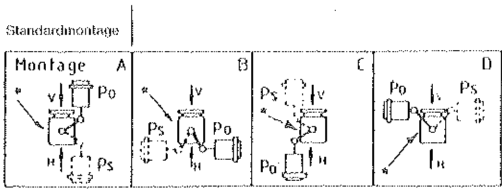
Technische Daten

Abmessungen Typ 72.1/3/5 nach DIN 3202 PN 10/40
mit pneumatischem Antrieb Typ R

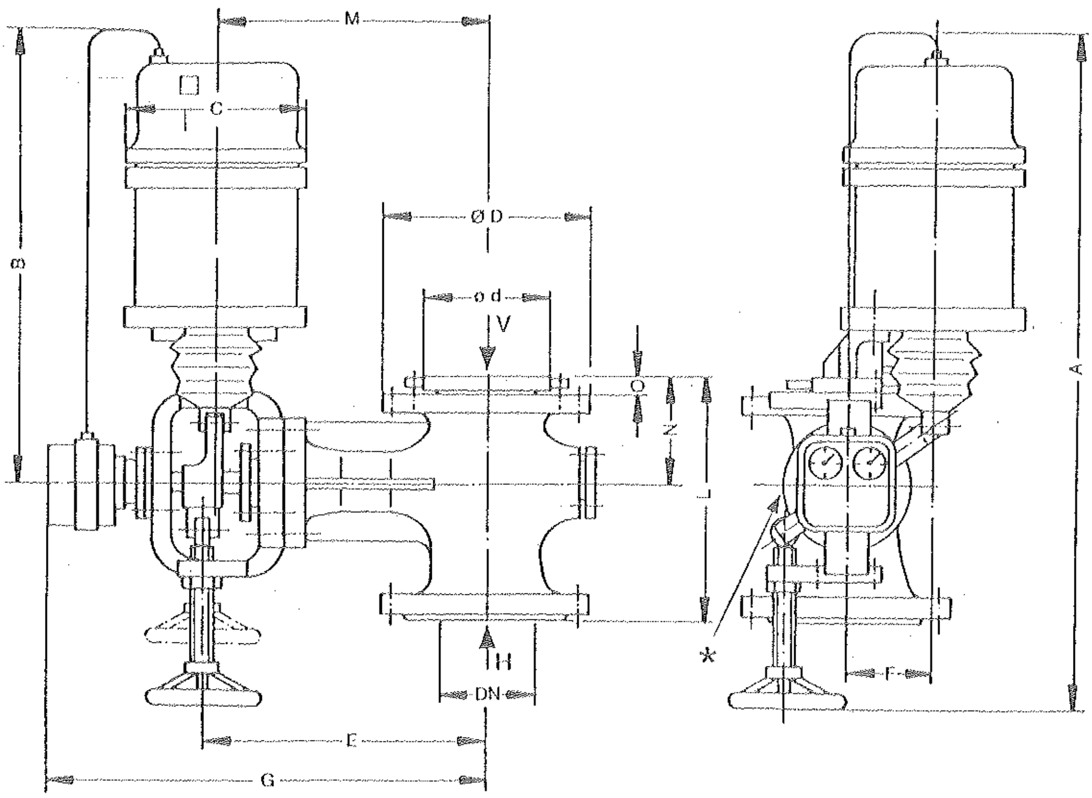
Technical Data

Dimensions Type 72.1/3/5
with pneumatic actuator Type R

Montagemöglichkeit des Antriebs



Po = Luft öffnet Ventil / air to open
Ps = Luft schließt Ventil / air to close
V = Normale Durchflußrichtung / normal flow
H = Durchflußrichtung, wenn Sitz mit Weichdichung / flow direction with soft seat
* = bei waagrechtem Einbau Ventilunterkante / for horizontal installation bottom side of valve



Antrieb	110			150		200				250				250 verst.			
DN	25	40	50	80	100	150	200	250	300	150	200	250	300	150	200	250	300
A	750	750	750	880	880	1090	1090	1090	1090	1150	1150	1150	1150	1230	1230	1230	1230
B	510	510	510	640	640	750	750	750	750	800	800	800	800	880	880	880	880
C	150	150	150	185	185	240	240	240	240	335	335	335	335	335	335	335	335
Ø D PN 10	115	150	165	200	220	285	340	395	445	285	340	395	445	285	340	395	445
Ø D PN 16	115	150	165	200	220	285	340	405	460	285	340	405	460	285	340	405	460
Ø D PN 25	115	150	165	200	235	300	360	425	485	300	360	425	485	300	360	425	485
Ø D PN 40	115	150	165	200	235	300	375	450	515	300	375	450	515	300	375	450	515
ø d	64	82	100	132	162	218	272	326	377	218	272	326	377	218	272	326	377
E	210	240	250	300	320	415	430	480	495	415	430	480	495	415	430	480	495
F	59	83	83	120	120	127	127	127	127	127	127	127	127	127	127	127	127
G	420	450	460	510	530	650	665	710	735	650	665	710	735	650	665	710	735
L	160	200	230	310	350	480	600	730	·	480	600	730	·	480	600	730	·
M	192	220	230	280	300	394	409	456	478	394	409	456	478	394	409	456	478
N	83	103	113	143	173	210	233	245	260	210	233	245	260	210	233	245	260
O	20	20	20	30	30	30	30	40	40	30	30	40	40	30	30	40	40
Gew. in kg	30	50	60	80	120	160	190	280	370	183	213	303	393	195	225	315	400

x DN 300 Baulänge 500 mm / DN 300 face-to-face dimension 500 mm
DN 400 in PN 10/16 Baulänge 600 mm / DN 400 PN 10/16 face-to-face dimension 600 mm

VETEC
Ventiltechnik GmbH

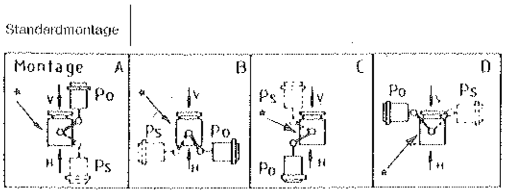
Technische Daten

Abmessungen Typ 72.1 nach ANSI 300 lbs/RF mit pneumatischem Stellantrieb Typ R

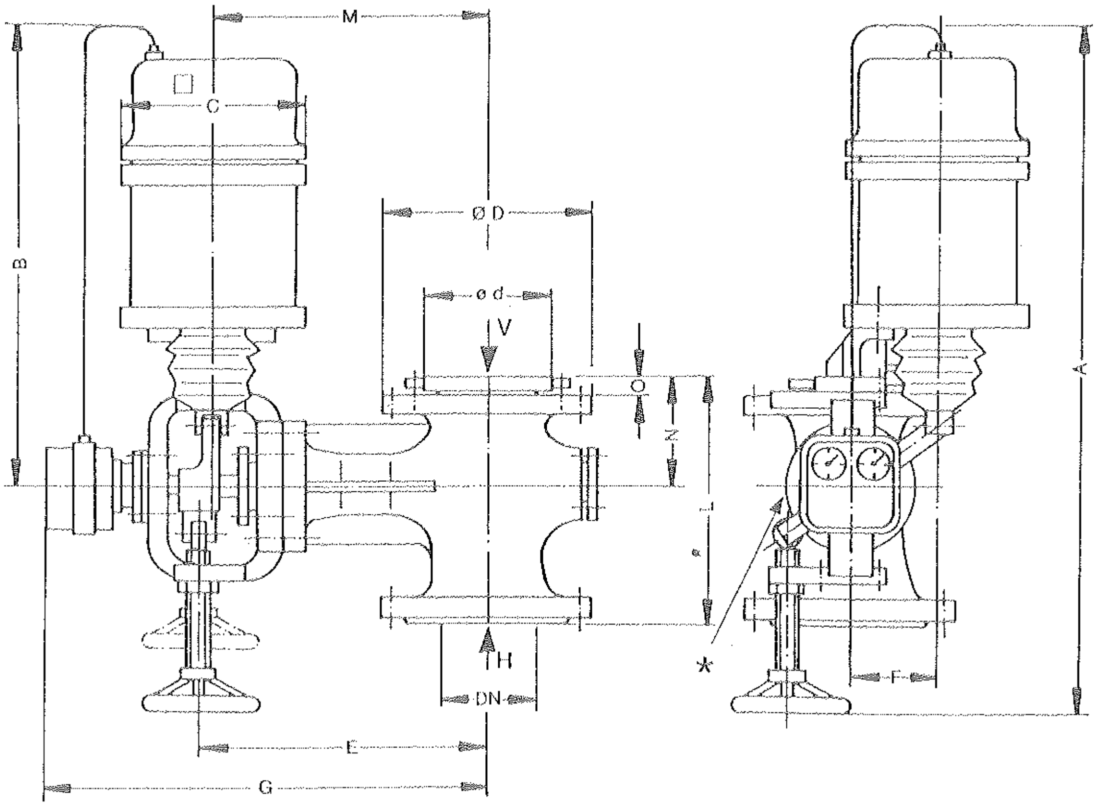
Technical Data

Dimensions Type 72.1, ANSI 300 lbs/RF with pneumatic actuator Type R

Montagemöglichkeit des Antriebs



Po = Luft öffnet Ventil / air to open
Ps = Luft schließt Ventil / air to close
V = Normale Durchflußrichtung / normal flow
H = Durchflußrichtung, wenn Sitz mit Weichdichung / flow direction with soft seat
* = bei waagrechtem Einbau Ventilunterkante / for horizontal installation bottom side of valve



Antrieb	110			150		200				250				250 verst.			
DN	1"	1 1/2"	2"	3"	4"	6"	8"	10"	12"	6"	8"	10"	12"	6"	8"	10"	12"
A	750	750	750	880	880	1090	1090	1090	1090	1150	1150	1150	1150	1230	1230	1230	1230
B	510	510	510	640	640	750	750	750	750	800	800	800	800	880	880	880	880
C	150	150	150	185	185	240	240	240	240	335	335	335	335	335	335	335	335
Ø D	123,8	155,6	165,1	209,6	254	317,5	381	444,5	520,7	317,5	381	444,5	520,7	317,5	381	444,5	520,7
ø d	51	73	92	127	157,2	216	270	324	381	216	270	324	381	216	270	324	381
E	210	240	250	300	320	415	430	480	495	415	430	480	495	415	430	480	495
F	59	83	83	120	120	127	127	127	127	127	127	127	127	127	127	127	127
G	420	450	460	510	530	650	665	710	735	650	665	710	735	650	665	710	735
L	196,9	235	266,7	317,5	368,3	473	568,3	708	500	473	568,3	708	500	473	568,3	708	500
M	192	220	230	280	300	394	409	456	478	394	409	456	478	394	409	456	478
N	83	103	113	143	173	210	233	245	260	210	233	245	260	210	233	245	260
O	20	20	20	30	30	30	30	40	40	30	30	40	40	30	30	40	40

* fehlende Maße für DN 16" auf Anfrage / size DN 16" on request

Technische Daten

**Abmessungen Typ 72.1 nach ANSI 150 lbs/RF
mit pneumatischem Stellantrieb Typ R**

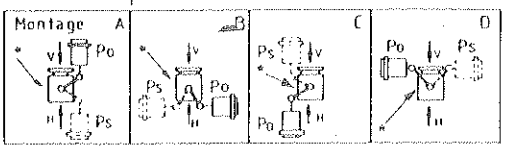
Technical Data

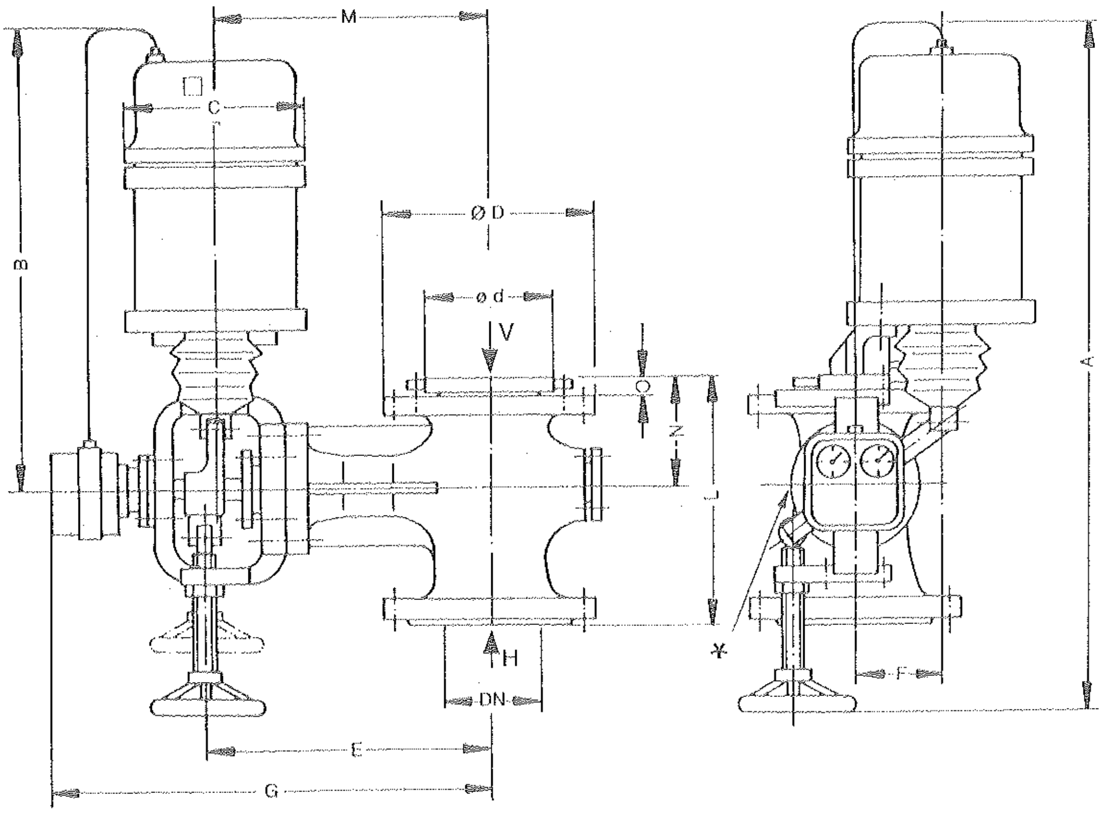
**Dimensions Type 72.1, ANSI 150 lbs/RF
with pneumatic actuator Type R**

Po = Luft öffnet Ventil / air to open
Ps = Luft schließt Ventil / air to close
V = Normale Durchflußrichtung / normal flow
H = Durchflußrichtung, wenn Sitz mit Weichdichung / flow direction with soft seat
* = bei waagrechtem Einbau Ventilunterkante / for horizontal installation bottom side of valve

Montagemöglichkeit des Antriebs

Standardmontage





Antrieb	110			150		200				250				250 verst.			
DN	1"	1½"	2"	3"	4"	6"	8"	10"	12"	6"	8"	10"	12"	6"	8"	10"	12"
A	750	750	750	880	880	1090	1090	1090	1090	1150	1150	1150	1150	1230	1230	1230	1230
B	510	510	510	640	640	750	750	750	750	800	800	800	800	880	880	880	880
C	150	150	150	185	185	240	240	240	240	335	335	335	335	335	335	335	335
Ø D	107,9	127	152,4	190,5	228,6	279,4	342,9	406,4	482,6	279,4	342,9	406,4	482,6	279,4	342,9	406,4	482,6
ø d	51	73	92,1	127	157,2	216	270	324	381	216	270	324	381	216	270	324	381
E	210	240	250	300	320	415	430	480	495	415	430	480	495	415	430	480	495
F	59	83	83	120	120	127	127	127	127	127	127	127	127	127	127	127	127
G	420	450	460	510	530	650	665	710	735	650	665	710	735	650	665	710	735
L	184,2	222,3	254	298,5	352,4	450,9	542,9	673,1	500	450,9	542,9	673,1	500	450,9	542,9	673,1	500
M	192	220	230	280	300	394	409	456	478	394	409	456	478	394	409	456	478
N	83	103	113	143	173	210	233	245	260	210	233	245	260	210	233	245	260
O	20	20	20	30	30	30	30	40	40	30	30	40	40	30	30	40	40

* fehlende Maße für DN 16" auf Anfrage / size DN 16" on request

Wartung

Einbauvorschrift und Wartung der Armaturen

Die Ventile einschl. Antrieb mit Stellungsregler und Kennlinienumformer sind vom Werk aus nach der Bestellspezifikation montiert und eingestellt.

Ist eine Handnotbetätigung angebaut, so ist vor Inbetriebnahme darauf zu achten, daß die Handradspindel nicht in den Schwenkbereich des Ventilhebels hineinragt. Außerdem muß die Handradspindel mit der Stellmutter gekontert sein.

Vor dem Einbau der Ventile sind sämtliche Anschlußleitungen von Schmutz, Fett, Öl und anderen Fremdkörpern zu säubern.

Bei der Montage ist darauf zu achten, daß der auf dem Armaturengehäuse angegebene Pfeil immer in Strömungsrichtung zeigt.

Umkehrung der Wirkungsweise bei Maxifluss-Stellventilen

Die Umkehrung der Wirkungsweise wird ohne Zusatzteile, durch den Stellantrieb erreicht. Soll ein Öffnungs-Ventil (Luft öffnet) in ein Schließ-Ventil (Luft schließt) umgebaut werden, so ist wie folgt zu verfahren:

1. Antrieb entlüften und Luftleitungen entfernen.
2. Kurvenscheibe im Stellungsregler ausbauen.
3. Antriebshebel und Kolbenstange durch Herausnehmen des Verbindungsbolzens entkuppeln.
4. Handnotbetätigung (falls vorhanden) aus Laterne herausschrauben.
5. Antrieb von Laterne abnehmen und auf die gegenüberliegende Seite montieren, Schlauchklemme lösen, Schutzbalg zurückschieben und Kontermutter lösen, damit sich der Gabelkopf drehen läßt.
6. Antrieb mit Luft beaufschlagen, bis Kolbenstange ganz ausgefahren ist.
7. Kolbenstange ca. 1 mm einfahren, Hebel mit Welle und Kegel von Hand in Zustellung drücken.

Maintenance

Installation and maintenance of the valve

The Maxifluss-control-valves are tested and arranged according to the customers specification.

If a emergency handwheel is installed, take care before starting, that the handwheel spindle does not project into the swinging range of valve-lever. The handwheel spindle must be locked with the lock nut.

Before installation, all connection tubes of the valve have to be cleaned of dirt, grease, oil and other impurities.

Apart from the flanged types, the „sandwich" models are clamped between the pipe flanges by means of tie rods. Take care that the arrow fixed on the body always shows in the direction of flow.

Reversing action of the valve

Reversing the Maxifluss-control-valve is possible without additional equipment, by rotating the actuator through 180° and remounting, the valve action is reversed.

To change a spring to close valve into a spring to open valve, proceed as follows:

1) Disconnect air supply connections.

2) Remove camplate from positioner.

3) Disconnect actuator lever from shaft.

4) Remove emergency handwheel (if fitted).

5) Remove actuator from bracket and remount at the opposite side of the bracket. Remove boot-clamp, move boot backwards and loose counter nut of actuator stem spindle.

6) Put air-pressure on the actuator for maximum travel of the actuator stem.

7) Reduce air-pressure to reduce maximum stroke by $\frac{1}{6}$" (1 mm). Bring plug by means of shaft lever in »closed« position.

Wartung

8. Gabelkopf aus Kolbenstange ein- oder ausschrauben, bis die Durchgangslöcher von Gabelkopf und Hebel übereinstimmen, damit Verbindungsbolzen eingesteckt werden kann, Kontermutter anziehen, Schutzbalg befestigen. Wenn Ventil in Zustellung ist, darf der Kolben des Antriebes also noch 1 mm vom Anschlag entfernt sein, damit eine gewisse Schließkraft gewährleistet ist.
9. Antrieb entlüften.
10. Luftleitungen wieder anbringen.
11. Kurvenscheibe mit der Markierung S-log oder S-lin (je nach Wunsch) in Stellungsregler einbauen.
12. Stellungsregler einjustieren.
13. Handnotbetätigung (falls vorhanden), auf gegenüberliegende Seite einschrauben.

Soll der Umbau von Schließventil in Öffnungsventil erfolgen, so ändern sich folgende Punkte:

6. Antrieb mit Luft beaufschlagen und Kolbenstange ca. 1 mm ausfahren.
7. Hebel in Zustellung drücken.

Maintenance

8) Adjust actuator stem to put in connection-bolt to the valve stem, lock the counter nut of actuator stem and fasten boot.

9) Release air pressure on actuator.

10) Reconnect air pressure again.

11) Provide the positioner with the proper camplate »S« Log. for equal percentage curve. »S«Lin. for linear curve.

12) Adjust positioner.

13) Attach emergency handwheel (if fitted) in the opposite side of the bracket.

To reverse a spring to open valve into a spring to close valve, the same procedure is applicable except.

6) Put slight air pressure on the actuator to achieve appr. $\frac{1}{6}$" (ca. 1 mm) travel.

7) Bring plug in »closed« position.

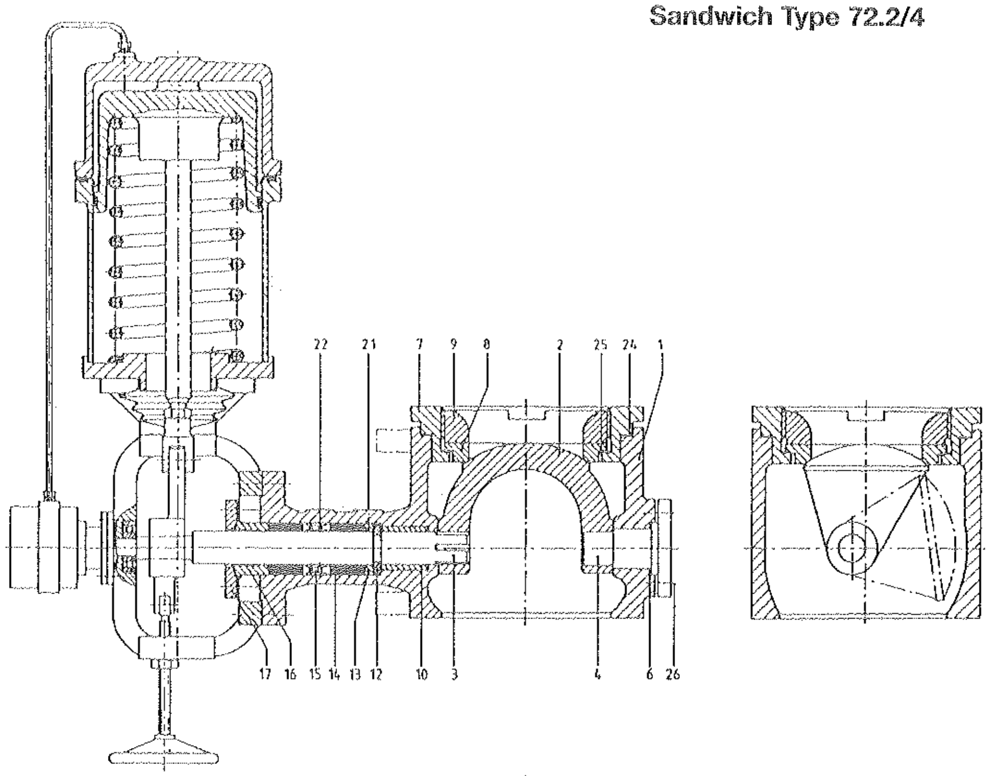
Wartung

Austausch von Sitz und Kegel bei Maxifluss-Ventil

Maintenance

Replacing seatring and plug of Maxifluss-Control-Valves

Sandwich Type 72.2/4



Vor Demontage Punkt 9 beachten

1. Herausschrauben des Gewinderinges 9
2. Herausnehmen des Sitzringes 8 u. der Dichtung 25
3. Lösen der beiden Innensechskantschrauben und abnehmen des Halteringes 7, sowie der Dichtung 24
4. Lösen der beiden Sechskantschrauben und herausziehen des Lagerzapfens 4, mit Dichtung 6
5. Herausschrauben der Halteschrauben 21
6. Welle in axialer Richtung aus dem Gehäuse 1 herausziehen.
7. Herausnehmen des Kegels 2 aus dem Gehäuse 1
8. Austauschkegel in das Gehäuse einbringen
9. Welle in axialer Richtung in das Gehäuse und in die Nuten des Kegels einschieben. Hierbei ist darauf zu achten, daß die Federn der Welle und die Nuten des Kegels so stehen, wie vorher die des alten Kegels, um die gleiche Stellung des Kegels im Gehäuse zu erhalten.

Before disassembly consider item 9.

1) Unscrew seat holder item 9.
2) Remove seatring (8) and gasket (25).
3) Loose both inner hexagonal bolts and remove seat flange (7) as well as gasket (24).
4) Loose both bolts and pull out bearing (4) and seal (6).
5) Unsrew the plug (21).
6) The shaft can be drawn out in axial direction.
7) Remove plug (2) from body.
8) Put new plug (2) in the body.
9) Push shaft in axial direction into the body and the holes of the plug (2). Be sure that the keys of the shaft and the key-ways in the plug have the same position as the old plug, just to maintain the right position of plug in the body.

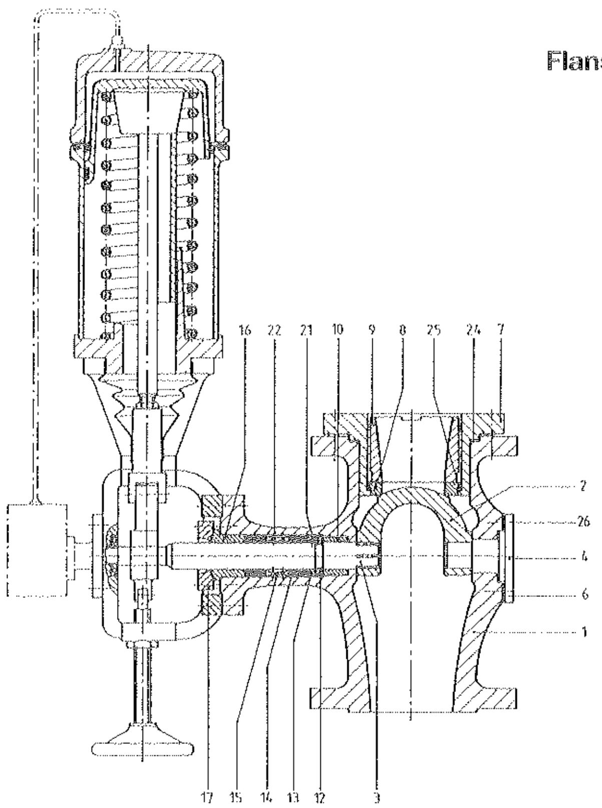
Wartung

Austausch von Sitz und Kegel bei Maxifluss-Ventil

Maintenance

Replacing seatring and plug of Maxifluss-Control-Valves

Flansch-Type 72.1/3



10. Einlegen der Dichtung 6, Lagerzapfen 4 einführen und mit den beiden Sechskantschrauben fest anschrauben.

11. Halteschraube 21 einschrauben. Es ist darauf zu achten, daß der Zapfen der Halteschraube 21 in die Nut des Grundringes 13 hineinragt, damit die Welle gegen axiales Verschieben gesichert ist.

12. Einlegen der Dichtung 24 und des Halteringes 7, sowie festziehen der beiden Innensechskantschrauben.

13. Kegel nun in Zustellung bringen, und Dichtung 25 sowie Sitzring 8 einlegen. (der Sitzring zentriert sich selbst)

14. Gewindering 9 einschrauben und von Hand leicht anziehen.

15. Kegel in Richtung „Auf" schwenken.

16. Kegel nun wieder in „Zu"-Stellung bringen, damit die Zentrierung gewährleistet ist. Gewindering fest anziehen. Hierbei ist darauf zu achten, daß der Kegel sich an den Sitzring anlehnen muß und nicht in den Sitzring gepreßt werden darf (Kegel muß ohne Losbrechmoment von „Zu"- in „Auf"-Stellung gebracht werden können).

10) Put in seal 6, introduce bearing 4 and tighten flange bolts 26.

11) Connect plug 21, be sure that the end of the plug 21, slips into the opening of the containering 13, to prevent axial sliding of the shaft 3.

12) Put in gasket 24 and seatflange 7 and tie-up inner hexagonal bolts.

13) Now turn plug 2 in closed position and put in gasket 25 and seat-ring 8.

14) Screw in seat holder 9 slightly by hand.

15) Turn plug in open position and tighten seatholder 9.

16) Again turn plug 2 in the closed position. Be sure that there is no „brake torque" in moving the plug from closed to open position.

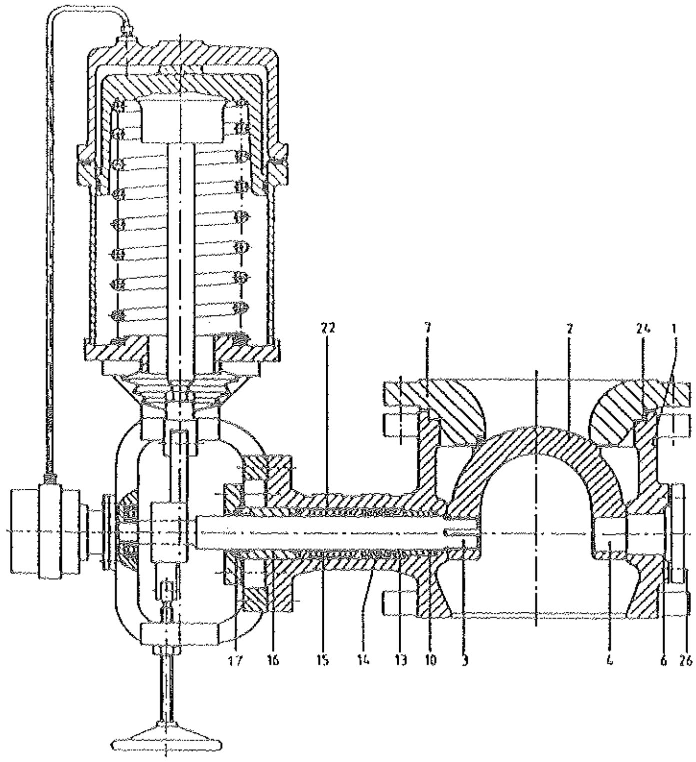
Wartung

Maintenance

Austausch von Sitz und Kegel bei Maxifluss-Ventil

Replacing seatring and plug of Maxifluss-Control-Valves

Sandwich Type 72.6



Vor Demontage Punkt 6 beachten

1. Lösen der beiden Innensechskantschrauben und abnehmen des Sitzes (7), sowie Dichtung (24).
2. Lösen der beiden Sechskantschrauben und herausziehen des Lagerzapfens (4), mit Dichtung (6).
3. Welle (3) in axialer Richtung aus dem Gehäuse (1) herausziehen.
4. Herausnehmen des Kegels (2) aus dem Gehäuse (1).
5. Austauschkegel in das Gehäuse einbringen.
6. Welle (3) in axialer Richtung in das Gehäuse und in die Nuten des Kegels einschieben. Hierbei ist darauf zu achten, daß die Federn der Welle und die Nuten des Kegels so stehen, wie vorher die des alten Kegels, um die gleiche Stellung des Kegels im Gehäuse zu erhalten.

Before disassembly consider item 6.

1) Loose both inner hexagonal bolts and remove seat (7) as well as gasket (24).
2) Loose both bolts and pull out bearing (4) and seal (6).
3) The shaft can be drawn out in axial direction.
4) Remove plug (2) from body.
5) Put new plug (2) in the body.
6) Push shaft (3) in axial direction into the body and the holes of the plug (2). Be sure that the keys of the shaft and the key-ways in the plug have the same position as the old plug, just to maintain the right position of the plug in the body.

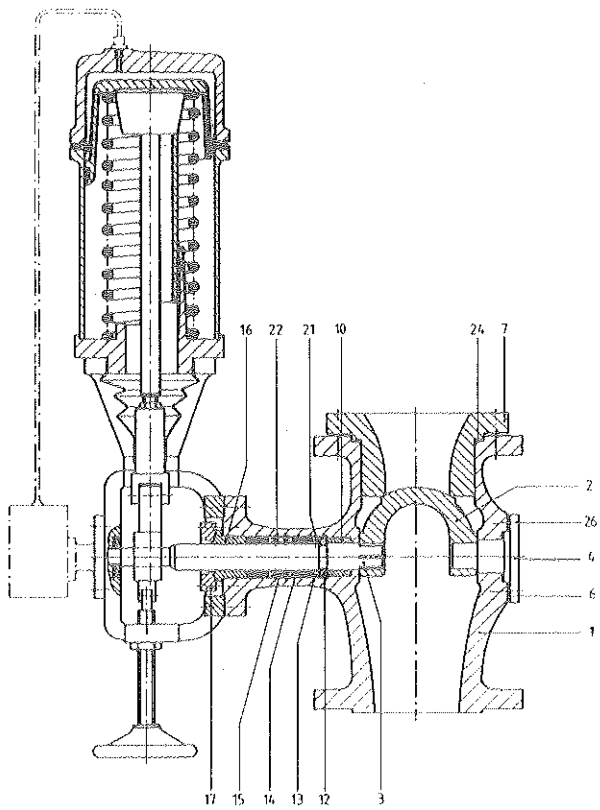
Wartung

Maintenance

Austausch von Sitz und Kegel bei Maxifluss-Ventil

Replacing seatring and plug of Maxifluss-Control-Valves

Flansch-Type 72.5



Vor Demontage Punkt 6 beachten

1. Lösen der beiden Innensechskantschrauben und abnehmen des Sitzes (7), sowie Dichtung (24).
2. Lösen der beiden Sechskantschrauben und herausziehen des Lagerzapfens (4), mit Dichtung (6).
3. Welle (3) in axialer Richtung aus dem Gehäuse (1) herausziehen.
4. Herausnehmen des Kegels (2) aus dem Gehäuse (1).
5. Austauschkegel in das Gehäuse einbringen.
6. Welle (3) in axialer Richtung in das Gehäuse und in die Nuten des Kegels einschieben. Hierbei ist darauf zu achten, daß die Federn der Welle und die Nuten des Kegels so stehen, wie vorher die des alten Kegels, um die gleiche Stellung des Kegels im Gehäuse zu erhalten.

Before disassembly consider item 6.

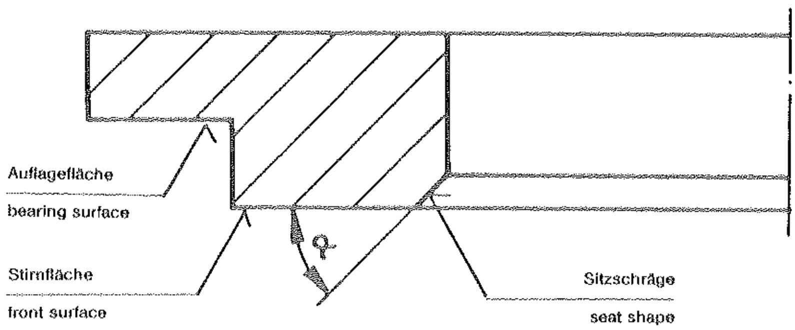
1) Loose both inner hexagonal bolts and remove seat (7) as well as gasket (24).
2) Loose both bolts and pull out bearing (4) and seal (6).
3) The shaft can be drawn out in axial direction.
4) Remove plug (2) from body.
5) Put new plug (2) in the body.
6) Push shaft (3) in axial direction into the body and the holes of the plug (2). Be sure that the keys of the shaft and the key-ways in the plug have the same position as the old plug, just to maintain the right position of the plug in the body.

Wartung

Maintenance

Austausch von Sitz und Kegel bei Maxifluss-Ventilen

Replacing seatring and plug of Maxifluss-Control-Valves



DN size	Sitz-schräge	K_{VS} 100%	Sitz-Ø	Sitz-schräge	K_{VS} 60%	Sitz-Ø	Sitz-schräge	K_{VS} 40%	Sitz-Ø
25	22°	16	18	19,5°	10	16	17°	6	14
40	24°	40	26	19,5°	24	21,5	17°	16	18,5
50	25°	80	36	20,5°	48	29,5	17,5°	33	25,5
80	31,5°	245	60	26°	147	50	23°	105	44
100	33°	370	76	25,5°	220	60	22,5°	150	53
150	32,5°	685	105	26,5°	410	86	22°	275	73
200	33,5°	950	135	26°	570	106	21°	380	88
250	34,5°	1925	170	29,5°	1230	146	25°	770	126
300	37°	2680	210	28°	1640	163	22,5°	1070	133

Kommt es dennoch vor, daß der Kegel sich nicht ganz in „Zu"-Stellung bringen läßt (was sich aufgrund der Vielzahl der Toleranzen nicht vermeiden läßt) ist wie folgt zu verfahren:

17. Herausnehmen des Sitzringes nach Punkt 1 und 2, geringfügiges abdrehen des Sitzringes an der Stirnfläche und anbringen der Sitzschräge.

Tritt der Fall ein, daß sich der Kegel über die Zustellung hinaus schwenken läßt, dann ist folgendes zu beachten:

18. Herausnehmen des Sitzringes nach Punkt 1 und 2, geringes abdrehen des Sitzringes an der Auflagefläche.

19. Sollten reduzierte Sitze eingebaut werden, so brauchen die Kegel bis einschließlich DN 250 (10") nicht ausgetauscht zu werden. Es sind jedoch die Punkte 17 bzw. 18 zu beachten.

If the plug cannot fully brought into closed position (because of inevitable production tolerances):

17) Take off seat ring acc. 1) and 2). Insignificantly turn off front surface and seat shape.

If the plug moves beyond the close position:

18) Take off seat ring acc. 1) and 2). Insignificantly turn off the bearing surface.

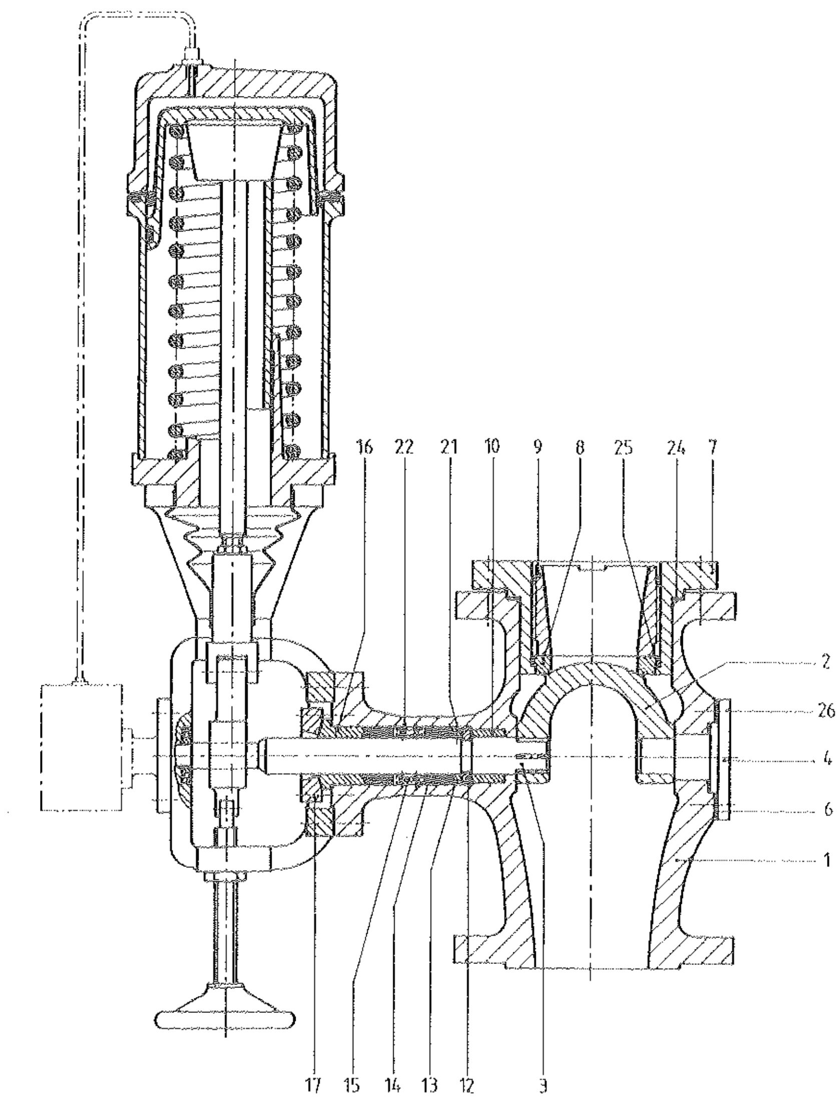
19) If only reduced seats are to be fitted, there is no need for disassembling the plug. Points 17) and 18) have to be considered.

Ersatzteile

Spare parts

Ersatzteilliste für Typ 72.1 Maxifluss-Stellventil mit pneumatischem Antrieb

Spare parts list for Type 72.1 Maxifluss-Control-Valve with pneumatic Actuator



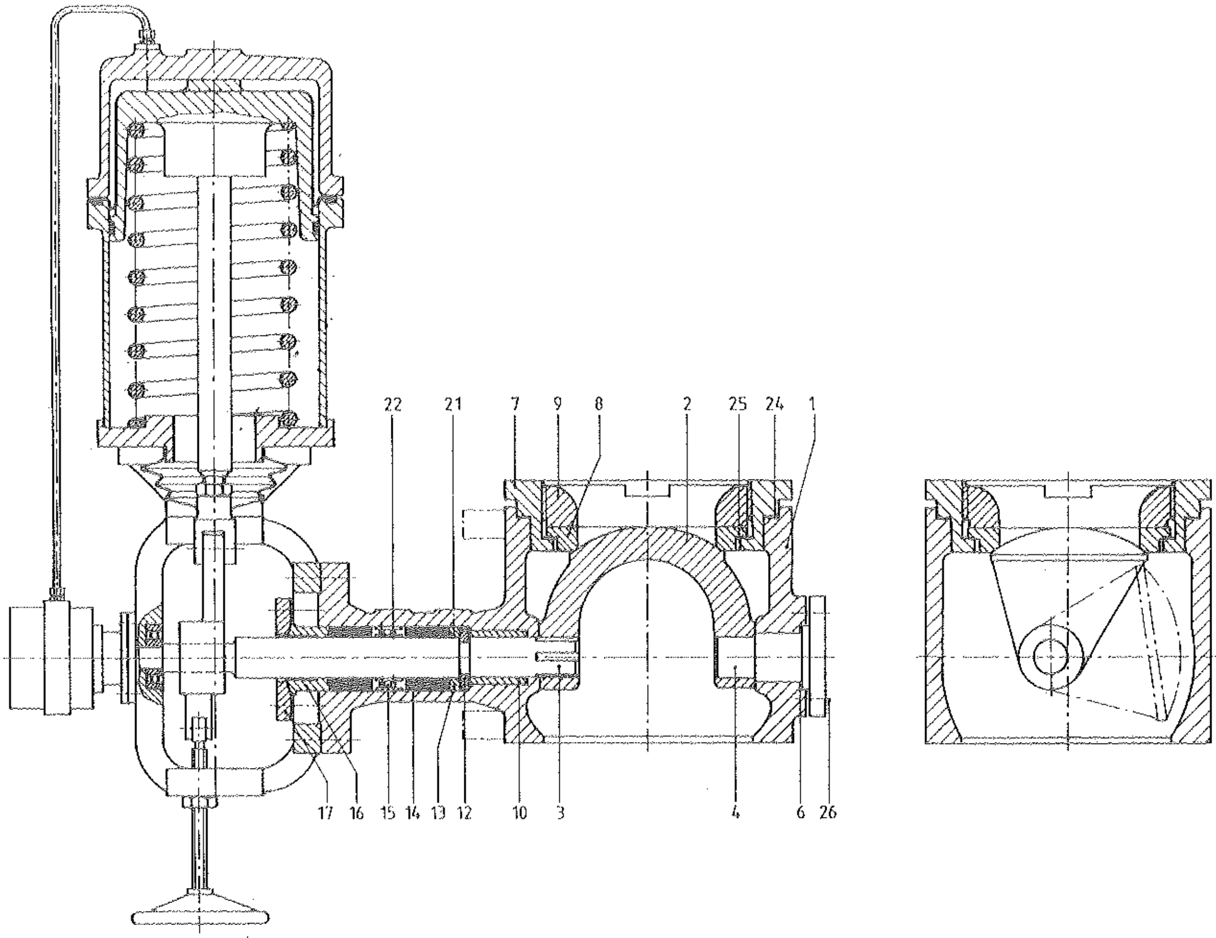
1 = Gehäuse	13 = Grundring	1 = Body	13 = Container ring
2 = Kegel	14 = Packung	2 = Plug	14 = Packing
3 = Welle	15 = Schmierbuchse	3 = Shaft	15 = Lubricator
4 = Lagerzapfen	16 = Stopfbuchse	4 = Trunnion bearing	16 = Bonnet
6 = Dichtung	17 = Stopfbuchsbrille	6 = Seal	17 = Bonnet plate
7 = Haltering	21 = Verschlußschraube	7 = Seat flange	21 = Plug
8 = Sitzring	22 = Verschlußstopfen	8 = Seat ring	22 = Plug
9 = Gewindering	24 = Dichtung	9 = Seat holder	24 = Gasket
10 = Lagerbuchse	25 = Dichtung	10 = Bushing	25 = Gasket
12 = geteilter Ring	26 = Sechskantschrauben	12 = Split ring	26 = Flange bolt

Ersatzteile

Ersatzteilliste für Typ 72.2 Maxifluss-Stellventil mit pneumatischem Antrieb

Spare parts

Spare parts list for Type 72.2 Maxifluss-Control-Valve with pneumatic Actuator



1 = Gehäuse
2 = Kegel
3 = Welle
4 = Lagerzapfen
6 = Dichtung
7 = Haltering
8 = Sitzring
9 = Gewindering
10 = Lagerbuchse
12 = geteilter Ring
13 = Grundring
14 = Packung
15 = Schmierbuchse
16 = Stopfbuchse
17 = Stopfbuchsbrille
21 = Verschlußschraube
22 = Verschlußstopfen
24 = Dichtung
25 = Dichtung
26 = Sechskantschrauben

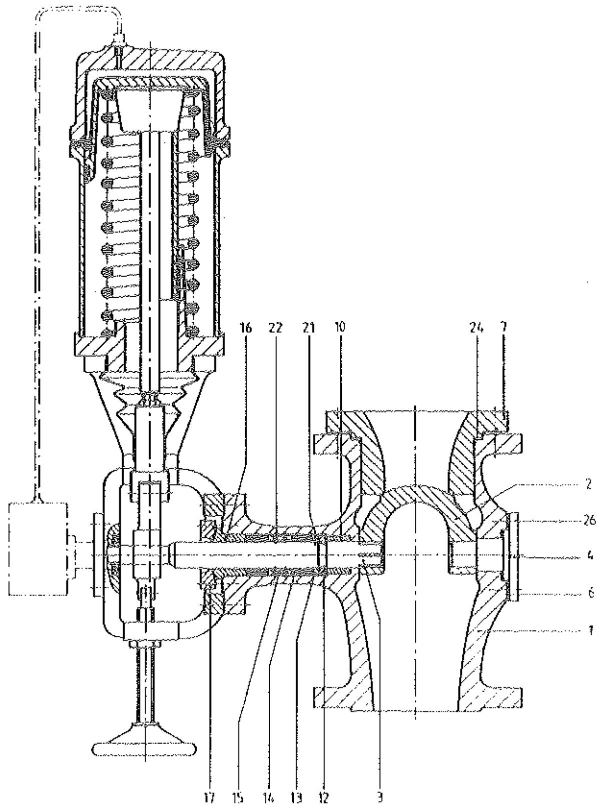
1 = Body
2 = Plug
3 = Shaft
4 = Trunnion bearing
6 = Seal
7 = Seat flange
8 = Seat ring
9 = Seat holder
10 = Bushing
12 = Split ring
13 = Container ring
14 = Packing
15 = Lubricator
16 = Bonnet
17 = Bonnet plate
21 = Plug
22 = Plug
24 = Gasket
25 = Gasket
26 = Flange bolt

Ersatzteile

Ersatzteilliste für Typ 72.5
Maxifluss-Stellventil mit pneumatischem Antrieb

Spare parts

Spare parts list for Type 72.5
Maxifluss-Control-Valve with pneumatic Actuator



1 = Gehäuse
2 = Kegel
3 = Welle
4 = Lagerzapfen
6 = Dichtung
7 = Sitz
10 = Lagerbuchse
13 = Grundring
14 = Packung
15 = Schmierbuchse
16 = Stopfbuchse
17 = Stopfbuchsbrille
22 = Verschlußstopfen
24 = Dichtung
26 = Sechskantschrauben

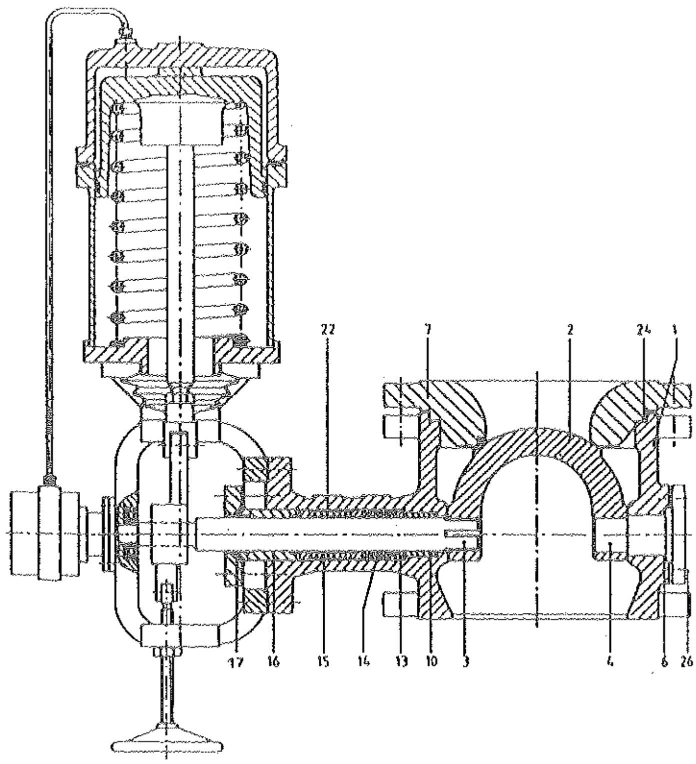
1 = Body
2 = Plug
3 = Shaft
4 = Trunnion bearing
6 = Seal
7 = Seat
10 = Bushing
13 = Container ring
14 = Packing
15 = Lubricator
16 = Bonnet
17 = Bonnet plate
22 = Plug
24 = Gasket
26 = Flange bolt

Ersatzteile

Spare parts

Ersatzteilliste für Typ 72.6 Maxifluss-Stellventil mit pneumatischem Antrieb

Spare parts list for Type 72.6 Maxifluss-Control-Valve with pneumatic Actuator



1 = Gehäuse
2 = Kegel
3 = Welle
4 = Lagerzapfen
6 = Dichtung
7 = Sitz
10 = Lagerbuchse
13 = Grundring
14 = Packung
15 = Schmierbuchse
16 = Stopfbuchse
17 = Stopfbuchsbrille
22 = Verschlußstopfen
24 = Dichtung
26 = Sechskantschrauben

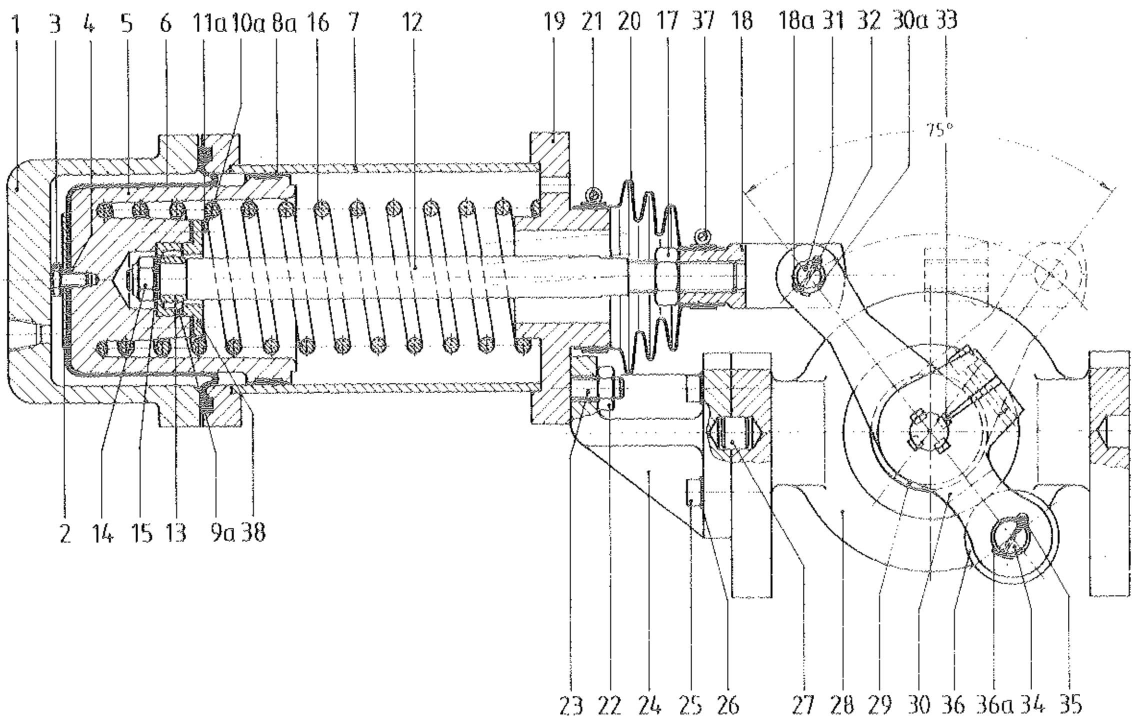
1 = Body
2 = Plug
3 = Shaft
4 = Trunnion bearing
6 = Seal
7 = Seat
10 = Bushing
13 = Container ring
14 = Packing
15 = Lubricator
16 = Bonnet
17 = Bonnet plate
22 = Plug
24 = Gasket
26 = Flange bolt

Ersatzteile

Spare parts

Ersatzteilliste für Antrieb R 110
Maxifluss-Ventil DN 25 – 50

Spare parts list for Actuator R 110
Maxifluss-Control-Valve DN 25 – 50



1	= Zylinderhaube	21	= Schlauchklemme
2	= Befestigungsplatte	22	= Sechskantmutter
3	= Sechskantschraube	23	= Verbindungsbolzen
4	= O-Ring	24	= Anschlußstück
5	= Kolben	25	= Zylinderschraube
6	= Rollmembrane	26	= Federring
7	= Zylinderrohr	27	= Zylinderstift
8a	= Kolbenführungsring	28	= Bügel
9a	= Zwischenring	29	= Kugellager
10a	= Sechskantschraube	30	= Hebel
11a	= Federring	30a	= DU-Buchse
12	= Kolbenstange	31	= Bolzen
13	= Gelenklager	32	= Federsicherung
14	= Sechskantmutter	33	= Paßfeder
15	= Unterlegscheibe	34	= Bolzen
16	= Druckfeder	35	= Federsicherung
17	= Sechskantmutter	36	= Druckring
18	= Gabelkopf	36a	= DU-Buchse
18a	= DU-Buchse	37	= Schlauchklemme
19	= unterer Flansch	38	= Lagerdeckel
20	= Faltenbalg		

1	= Cylinder cap	21	= Hose clamp
2	= Mounting plate	22	= Hex. nut
3	= Screw	23	= Bolt
4	= O-Ring	24	= Connecting piece
5	= Piston	25	= Socket head screw
6	= Rolling diaphr.	26	= Spring washer
7	= Cylinder housing	27	= Pin
8a	= Cyl. support ring	28	= Bracket
9a	= Ring	29	= Ball bearing
10a	= Screw	30	= Crank
11a	= Spring washer	30a	= DU-Bushing
12	= Piston rod	31	= Bolt
13	= Rod coupling	32	= Retaining pins
14	= Hex. nut	33	= Key
15	= Washer	34	= Bolt
16	= Spring	35	= Retaining pins
17	= Hex. nut	36	= Compression ring
18	= Yoke	36a	= DU-Bushing
18a	= DU-Bushing	37	= Hose clamp
19	= Flange	38	= Bearing cover
20	= Bellows		

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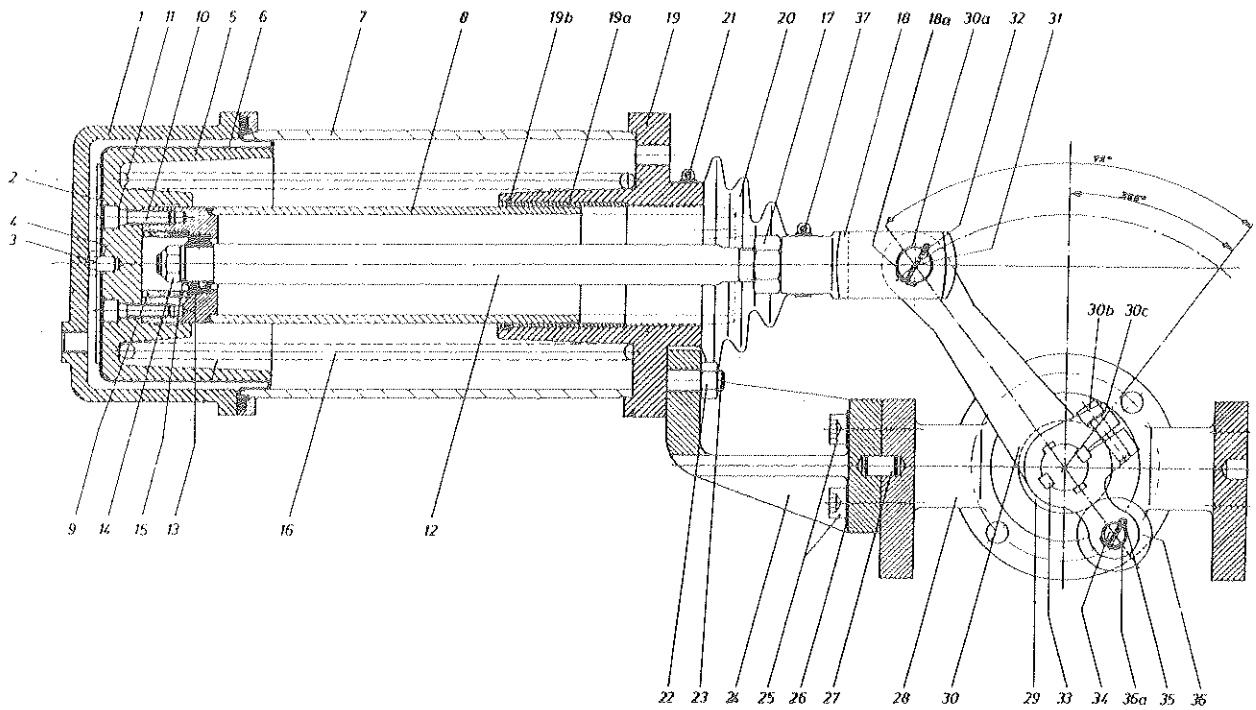
Ersatzteile

Ersatzteilliste für Antrieb R 150 – R 250
Maxifluss-Ventil DN 80 – 300



1	= Zylinderhaube	20	= Faltenbalg
2	= Befestigungsplatte	21	= Schlauchklemme
3	= Sechskantschraube	22	= Sechskantmutter
4	= O-Ring	23	= Verbindungsbolzen
5	= Kolben	24	= Anschlußstück
6	= Rollmembrane	25	= Zylinderschraube
7	= Zylinderrohr	26	= Federringe
8	= Führungsstange	27	= Zylinderstift
9	= Lagerbuchse	28	= Bügel
10	= Zylinderschraube	29	= Kugellager
11	= Federring	30	= Hebel
12	= Kolbenstange	30a	= DU-Buchse
13	= Gelenklager	30b	= Sechskantschr.
14	= Sechskantm.	30c	= Sicherungsr.
15	= Unterlegsch.	31	= Bolzen
16	= Druckfeder	32	= Federsicherung
17	= Sechskantmutter	33	= Paßfeder
18	= Gabelkopf	34	= Bolzen
18a	= DU-Buchse	35	= Federsicherung
19	= unterer Flansch	36	= Druckring
19a	= DU-Buchse	36a	= DU-Buchse
19b	= Sprengring	37	= Schlauchklemme

Spare parts

Spare parts list for Actuator R 150 – R 250
Maxifluss-Control-Valve DN 80 – 300

1	= Cylinder cap	20	= Bellows
2	= Mounting plate	21	= Hose clamp
3	= Screw	22	= Hex. nut
4	= O-Ring	23	= Bolt
5	= Piston	24	= Connecting piece
6	= Rolling diaphr.	25	= Socket head screw
7	= Cyl. housing	26	= Spring washer
8	= Guiding rod	27	= Pin
9	= Bushing	28	= Bracket
10	= Socket head screw	29	= Ball bearing
11	= Spring washer	30	= Crank
12	= Piston rod	30a	= DU-Bushing
13	= Rod coupling	30b	= Screw
14	= Hex. nut	30c	= Safety ring
15	= Washer	31	= Bolt
16	= Spring	32	= Retaining pins
17	= Hex. nut	33	= Key
18	= Yoke	34	= Bolt
18a	= DU-Bushing	35	= Retaining pins
19	= Flange	36	= Compression ring
19a	= DU-Bushing	36a	= DU-Bushing
19b	= Spring-ring	37	= Hose clamp

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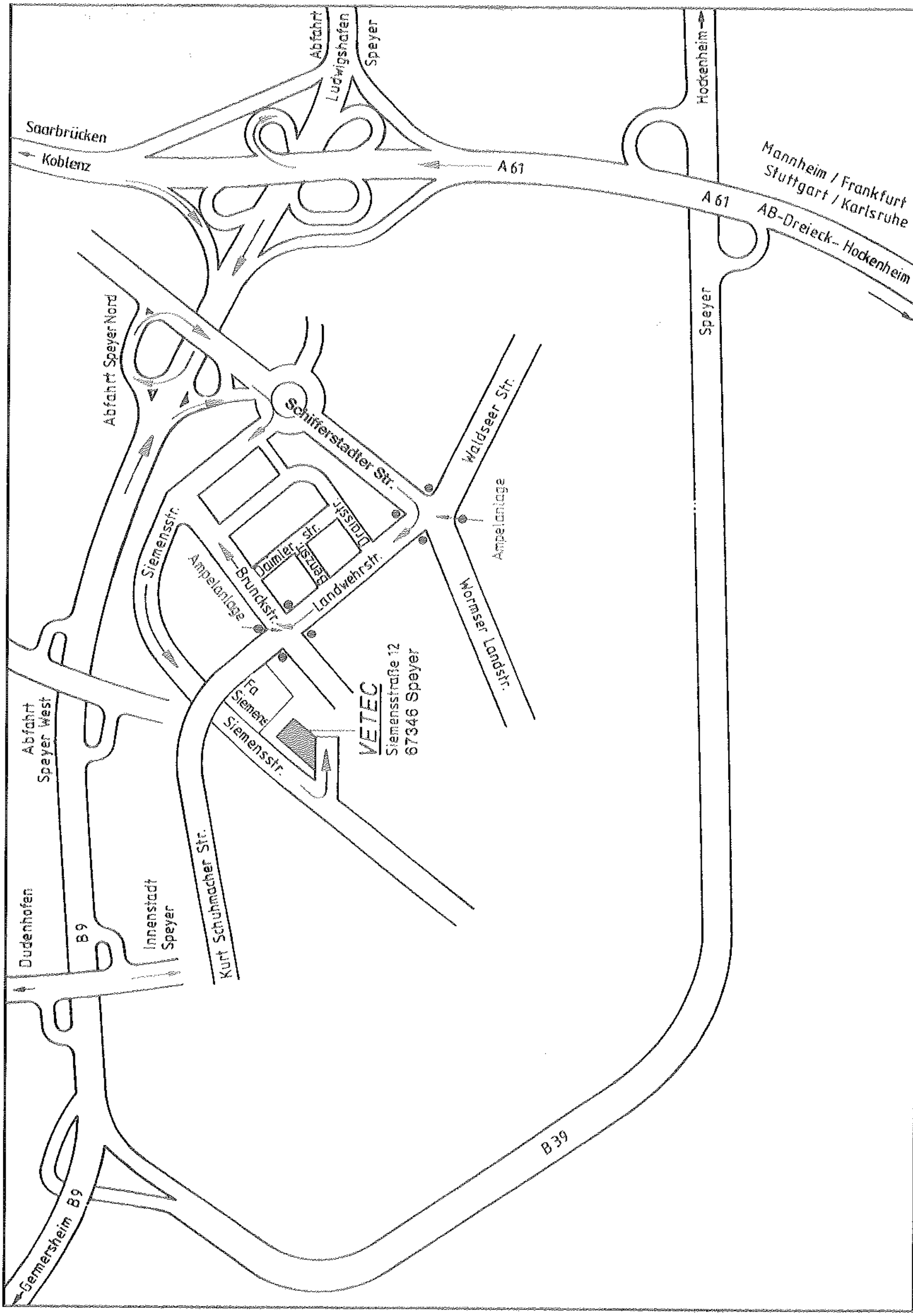
Einspann-Schrauben (Zuganker)

für Maxifluss-Stellventile Typ 72.2/72.6

Mounting-Screws (tie-rods)

for Type 72.2/72.6

DN	NP/DIN	Zuganker m. je 2 Muttern tie-rod with 2 nuts		Sechskantschr. / screw DIN 931		Sechskantschr. / screw DIN 931	
		St/pc	Dimension	St/pc	Dimension	St/pc	Dimension
25	10/16/25/40	4	M 12 x 180				
40	10/16/25/40	4	M 16 x 200				
50	10/16/25/40	4	M 16 x 210				
80	10/16/25/40	6	M 16 x 260	2	M 16 x 50	2	M 16 x 65
100	10/16	6	M 16 x 280	2	M 16 x 55	2	M 16 x 75
100	25/40	6	M 20 x 300	2	M 20 x 55	2	M 20 x 75
150	10/16	4	M 20 x 330	4	M 20 x 55	4	M 20 x 80
150	25/40	4	M 24 x 350	4	M 24 x 60	4	M 24 x 85
200	10	4	M 20 x 350	4	M 20 x 55	4	M 20 x 85
200	16	8	M 20 x 350	4	M 20 x 55	4	M 20 x 85
200	25	8	M 24 x 370	4	M 24 x 65	4	M 24 x 90
200	40	8	M 27 x 385	4	M 27 x 65	4	M 27 x 90
250	10	8	M 20 x 410	4	M 20 x 70	4	M 20 x 105
250	16	8	M 24 x 420	4	M 24 x 70	4	M 24 x 110
250	25	8	M 27 x 440	4	M 27 x 75	4	M 27 x 115
250	40	8	M 30 x 460	4	M 30 x 80	4	M 30 x 120
300	10	8	M 20 x 425	4	M 20 x 70	4	M 20 x 110
300	16	8	M 24 x 440	4	M 24 x 75	4	M 24 x 115
300	25	12	M 27 x 455	4	M 27 x 80	4	M 27 x 120
300	40	12	M 30 x 490	4	M 30 x 85	4	M 30 x 125



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Ausgabe August 2003

Operating, assembly and maintenance instructions for control and shut-off butterfly valve
Series 14c - Type MTD

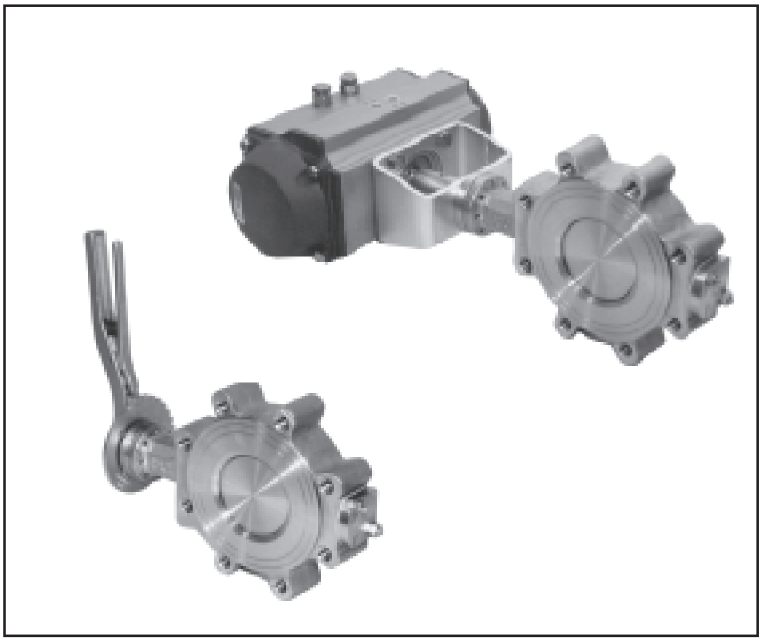

Fig. 1 - High-Performance Butterfly Control Valve BR 14c

1. Design and principle of operation

The pneumatic control valve consists of the tight-closing, double-eccentric, soft sealed butterfly control valve BR 14c and a Pfeiffer AT pneumatic rotary actuator or a diaphragm actuator BR 30a.

The control valve is used for on/off services and in the signal pressure range from 10 to 80% also for throttling services. It is suitable for aggressive liquids or vapors at temperatures between -10 and +200°C .

The process medium can flow through the butterfly control valve in either direction. The position of the butterfly disc (3) determines the flow across the free area between the disc and the body (1). The shaft (2) is sealed by a PTFE V-ring packing (9). It is preloaded by spring washers (10) located above the packing chamber. The packing is free of maintenance.

In butterfly control valves, there is a seal between the butterfly disc (3) and the seat (4). The arising compression force of the sealing ring on the butterfly disc determines at the same time the permissible differential pressure Δp and the breakaway torque when the disc opens or closes depending on which way the medium flows through the valve. The double-eccentric bearing of the shaft (Fig. 2) causes the disc on opening or closing to remain in contact with the seat only over a very small angle of rotation. This reduces wear and increases the service life of the valve, while at the same time, the breakaway torque is reduced.

When the medium flows through the valve from direction “A”, the butterfly disc is slightly pushed out of the seat. This causes the compression force of the sealing ring to be reduced and at the same time the breakaway torque as well.

When the medium flows through the valve from direction “B”, the compression force increases correspondingly with the increase of the breakaway torque.

The shaft (2) is connected to the actuating element via an adapter.

Fail-safe position: Control valve **CLOSED** without supply air
The actuator springs close the butterfly control valve when the pressure is reduced in the rotary actuator and when the supply air fails. The control valve is opened against the force of the actuator springs when the signal pressure increases.

Fail-safe position: Control valve **OPENED** without supply air
The actuator springs open the butterfly control valve with the pressure is reduced in the rotary actuator and when the supply air fails. The control valve is closed against the force of the actuator springs when the signal pressure increases.

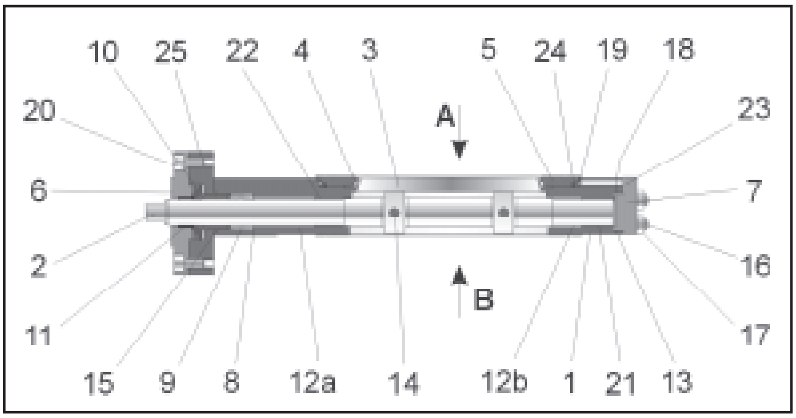

Fig. 2 - View through a butterfly control valve BR 14c - Type MTD, DN 100, (4“); => see page 2 for list of parts

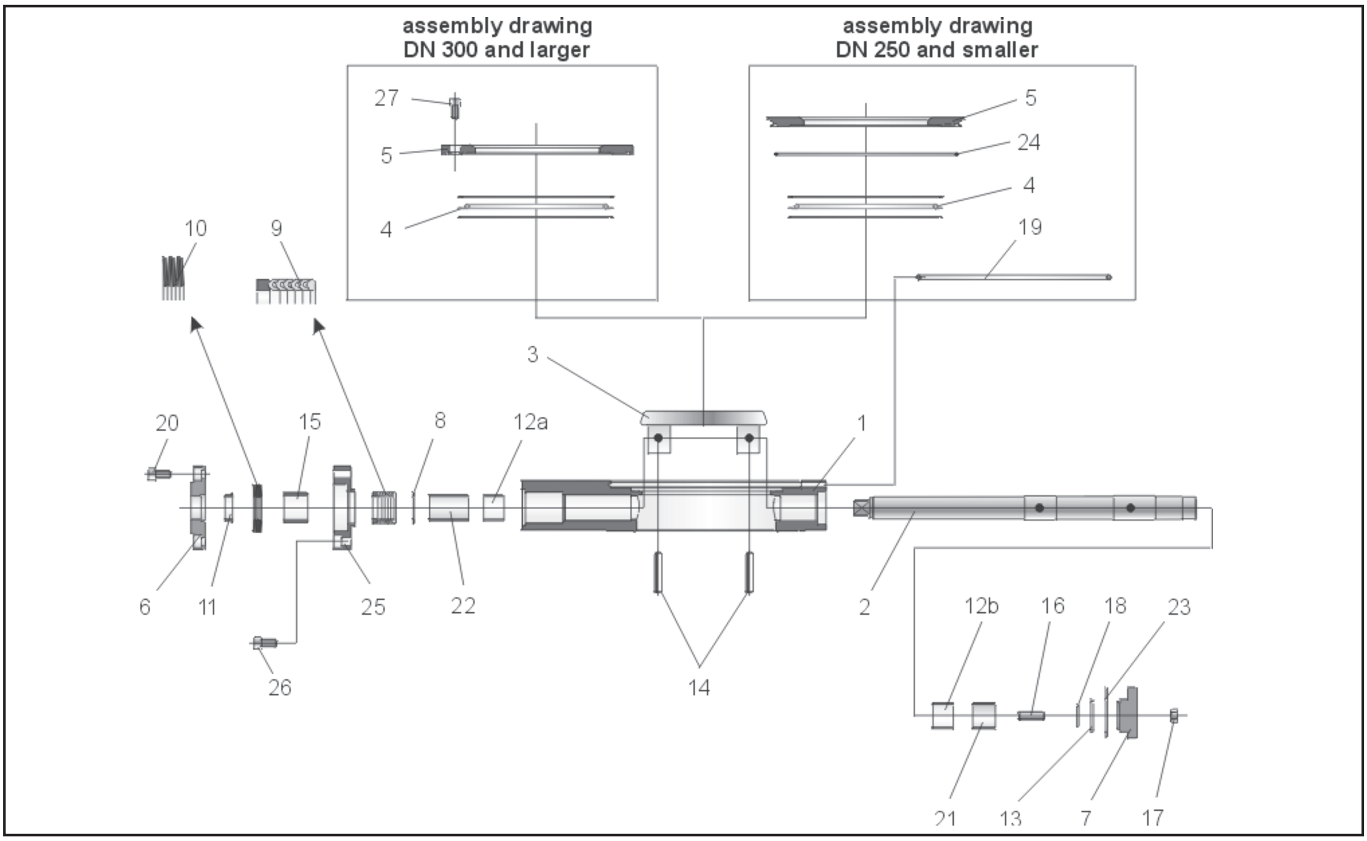

Fig.3 - Exploded view of the butterfly control valve

Item	Description	Material
1	Valve body	WN 14408
2	Shaft	WN 1.4462
3	Disc	WN 1.4408
4	Metallic seat ring	Nickel
5	Fastening ring	WN 1.4408
6	Stuffing box	WN 1.4571
7	Bonnet	WN 1.4571
8	Thrust washer	WN 1.4571
9	V-ring packing	WN 1.4305 / PTFE
10	Set of spring washers	WN 1.8159 / Delta Tone
11	Bearing bushing	PTFE with carbon
12a 12b	Bearing bushing	PTFE with glass
13	Valve body seal	PTFE
14	Grooved pin	DIN 1472, WN 1.4462
15	Spacer	WN 1.4571
16	Stud	DIN 938, A2-70
17	Hexagon nut	DIN 934, A2-70
18	Washer	PTFE
19	Tension spring	WN 1.4310
20	Fillister head screw	DIN 912, A2-70
21	Spacer	WN 1.4571
22	Spacer	WN 1.4571
23	Bonnet seal	PTFE with glass
24	O-ring	viton
25	Intermediate flange	WN 1.4305
26	Fillister head screw	DIN 912, A2-70
27	Fillister head screw	DIN 912, A2-70

Table 1 - List of parts

⚠ The equipment may only be mounted and commissioned by qualified personnel who are acquainted with the starting-up and operation of this product. Qualified personnel in the sense of these installation and operational instructions are persons who, as a result of their training, their knowledge and experience, plus their knowledge of the relevant standards, are able to judge the tasks for which they are responsible and to recognize possible dangers.
Dangers presented at the control valves by flow medium, regulating pressure and moving parts are to be prevented by appropriate measures. Over and above this, it has to be ensured that the control valve is only employed where operating pressure and temperatures do not exceed the design criteria laid down when ordering. The appropriate transportation and professional storage of the equipment are presupposed.

2. Assembly instructions

Preparation for assembling the valve
To assemble the butterfly control valve, all parts must be treated beforehand, e.g. thoroughly clean all parts and lay them on soft padding (rubber mat etc.). Take into account that parts made of plastic are almost always soft and very sensitive and that especially the sealing surfaces should not be damaged.

Assembling butterfly control valves

Note: The position and arrangement of the individual parts shown in the exploded view diagram (Fig. 3) must be strictly adhered to on assembling the valve.
Lay the valve body (1) on a clean surface so that the bearing area of the shaft is within easy reach.
Press in the bearing bushing (12a) as far as it will go into the bearing hole. Then insert the spacer (22).
Note: Butterfly control valves in nominal sizes DN300 or 12" are assembled without a spacer (22).
Insert the butterfly disc (3) into the body so that the bearing holes of the disc are aligned with the bearing hole of the body. Now insert the shaft (2) through the bearing holes of the body and the disc. Push the bearing bushing (12b) as far as it will go over the shaft into the bearing hole of the body. Then insert the spacer (21).
Note: Butterfly control valves in nominal sizes DN100 or DN 4" are assembled without a spacer (21).
Screw studs (16) into the body. Insert the washer (18) into the indentation intended for it in the bonnet (7). Slide the bonnet seal (23) as well as the valve body sealing (13) onto the bonnet.
Note: Butterfly control valves in nominal sizes DN300 or 12" are assembled without a bonnet seal (23).
Insert the previously assembled bonnet into the bearing hole of the body and position correctly with the studs. Fasten tight the bonnet evenly with nuts (17) in a criss-cross patter.
Push the thrust washer (8) over the shaft's free end at the appropriate place in the body. Slide the PTFE V-ring packing (9) together in the sequence PTFE bottom end ring, PTFE V-rings and steel V-ring over the shaft into the body hole and press down using an assembling sleeve.
Place the intermediate flange (25) on the body and position correctly using the fillister head screws (26). Tighten the screws evenly in a criss-cross pattern.
Slide the spacer (15) over the shaft and press it into the body at the appropriate place. Proceed in the same manner to add the set of spring washers (10).
Press the bearing bushing (11) into the stuffing box (6).
Carefully place the stuffing box which has just been assembled together onto the intermediate flange and position correctly using the fillister head screws (20). Tighten the screws evenly in a criss-cross pattern.
Position the two plane faces of the shaft so that they are parallel to the disc and secure the shaft against further turning. On doing so, make sure that the shaft adjoins the washer (18). Drill fitting holes to connect the shaft to the disc. Then connect the disc and shaft using close-tolerance grooved pins (14).
Further assembly steps depend on the version concerned.

Assembling butterfly control valves in sizes DN 250 (10") and smaller

Insert the metallic seat ring (4)with the graphite rings into the body. On doing so, make sure that all parts are clean.
Place the O-ring (24) in the fastening ring (5).
Place the previously assembled fastening ring onto the sealing ring and press it in using a hydraulic press.
Loosen the bonnet (7) again and push the tension spring (19) into the oblong hole/slot. Fasten the bonnet as previously described.

Assembling butterfly control valves in sizes DN 300 (12") and larger

Insert the metallic seat ring (4) with the graphite rings into the body. On doing so, make sure that all parts are clean.
Place the fastening ring onto the sealing ring and position correctly using the screws (27). Tighten the screws evenly in a criss-cross pattern.

3. Installing the butterfly control valves

The butterfly control valve can be installed horizontally or vertically in pipelines. The medium may flow through the valve in either direction, however, the following must be observed concerning the direction of flow:
If the butterfly control valve is used as a shut-off valve, the medium flow in direction "B" (see Fig. 2) guarantees the best shut-off.
When the butterfly control valve is used for throttling services, the medium must flow through the valve in direction "A".
Basically we recommend installing the butterfly control valve with the shaft lying horizontally so that the medium flow opens the lower section of the disc especially when the process medium used has high concentrations of suspended particles. This avoids deposits from building up which could prevent the disc from opening.
Do not weld through flanges and pipelines with a weld torch when the butterfly control valve is installed in the pipeline, otherwise the valve could be damaged.
All normal flange gaskets can be used.

Flange connection

The butterfly control valve BR 14c is designed for installation between all normal DIN and ANSI flanges. Please take into account that a butterfly control valve which has designed for a certain flange standard cannot normally be used with other flanges.
The free inside diameter of the flange must have sufficient clearance to the disc.

Installation

- Prior to installing the valve, rinse the pipeline and remove all foreign material such as weld spatter, etc.
- Check whether the flange space corresponds to the installation length of the butterfly control valve.
- Prior to installing the valve, expand the flange sufficiently using an appropriate tool.
- The butterfly control valve must be completely closed.
- To support the valve whilst installing it between the flanges, we recommend (depending on the position of installation) inserting the lower flange bolts without tightening them.
- Push the valve and gaskets between the flanges.
- Insert the remaining flange bolts.
- Remove flange expanding device and finger tighten the bolts.

- Check whether the butterfly control valve, the gaskets and the flanges are correctly aligned.
- Carefully open and close the butterfly control valve and check that the disc does not touch the pipeline.
- Tighten the flange bolts in a criss-cross pattern using the prescribed tightening torque.

Removing the valve from the pipeline
- Relieve pressure in the pipeline.
- The pipeline and valve must be clean.
- Completely close the valve: the two plane surfaces of the shaft run parallel to the disc.
- Loosen the flange bolts and pull them out.
- Expand the flanges with the appropriate tool and remove the butterfly control valve.

Attaching actuating elements
The tight shut-off of the valve can only be achieved if the disc is made to close exactly. If actuating elements (hand lever, gears, actuators, etc.) are attached, their end positions must be set to match the valve's end positions.

⚠ Double-eccentric butterfly control valves must always close with a clockwise rotation of the valve shaft! Therefore observe the direction of rotation when installing the actuator!

A label on the butterfly control valve indicates the direction of rotation.

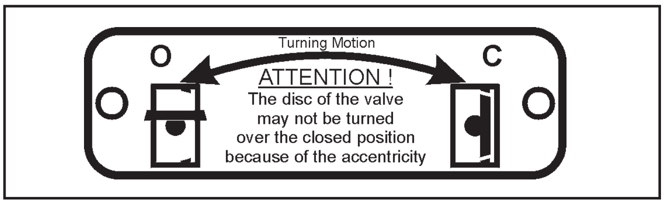

Fig. 4 – Indicating label stating the direction of rotation

On installing the valve in the recommended direction of flow through the valve, the opening direction is assisted by the pressure from the process medium due to the valve design (double-eccentric valves). Therefore when switching with the hand lever, the lever must be held tight until it can be secured.

4. Maintenance instructions

Routine maintenance or lubricating the valve is not necessary

Replacing packing (9)
If there is any leakage at the shaft, it can be remedied by replacing the V-ring packing. The valve does not need to be removed from the pipeline for this.

⚠ Relieve pressure from the pipeline and drain it. Remove the actuating element.

Unscrew the fillister head screws (20). Take out the stuffing box (6) together with the attached bearing bushing (11). Remove the set of spring washers (10) and the spacer (15). After that, the V-ring packing can be easily replaced with a new packing.
To reassemble, proceed as described previously in the assembly instructions.

Changing the sealing ring
To change the sealing ring, the valve must be removed from the pipeline.

Butterfly control valves in sizes DN 250 (10") and smaller
Place the valve on a clean surface. Unscrew the bonnet (7) and remove the tension spring (19). Loosen and take out the fastening ring (5). After that, the sealing ring (4) can be easily to replaced with a new ring.
To reassemble, proceed as described previously in the assembly instructions.

Butterfly control valve in size DN 300 (12") and larger
Place the valve on a clean surface and unscrew the fillister head screws (27). Take out the fastening ring (5). After that, the sealing ring (4) can be easily replaced with a new ring.
To reassemble, proceed as previously described in the assembly instructions.

Our team will gladly assist you to find the right solution for your special requirements.

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Declaration of Conformity as per Directive 97/23/EC

and Manufacturer's Declaration as per Directive 98/37 EG

The manufacturer	**Pfeiffer Chemie-Armaturenbau GmbH, 47906 Kempen, Germany**
declares that:	**Butterfly valves Series 14a, Series 14b-MTD, Series 14b-WTD, Series 14c-MTD, Series 14c-WTD, Series 74b-MTD and Series 74b-WTD** **• with pneumatic/electric/hydraulic actuator** **• with free shaft end for subsequent mounting of an actuator**

1. The valves are pressure accessories within the meaning of the Pressure Equipment Directive 97/23/EC and conform with the requirements of this Directive,
2. The valves are not complete machinery within the meaning of the Machinery Directive 98/37/EC, but meet the relevant requirements of this Directive,
3. They may only be operated observing the operating instructions <**BA14b-01_EN**> delivered together with the valve.

The commissioning of these valves is only permitted after the valve has been installed from both sides in the pipeline and a risk of injury can be ruled out.
(For butterfly valves which are intended for dead-end service, see section 2.3).

Applied standards:

EN 593	**Product standard for butterfly valves**
AD 2000 Regulations	**Regulations for pressurized valve body parts**
DIN-EN 292-2000	**Safety of Machinery,** Part 2: Technical requirements

Type designation and technical features:

Pfeiffer data sheets
<**TB14a_EN, TB14b-mt_EN, TB14b-wt_EN, TB14c-mt_EN, TB14c-wt_EN, TB74b-mt_EN and TB74b-wt_EN**>
NOTE: This Manufacturer's Declaration applies to all valve types listed in this catalog.

Applied conformity assessment procedure:

Conforming to Annex II of the Pressure Equipment Directive 97/23/EC, Module H

Name of notified body:	*Identification number of the notified body:*
TÜV Anlagentechnik GmbH Am Grauen Stein 51101 Köln Germany	**0035**

These Declarations become invalid when modifications are made to the butterfly valves and/or assemblies that affect the technical data of the butterfly valve or the <Intended use> described in section 1 of the operating instructions, and considerably change the valve or an assembly delivered with it.

Kempen, 26 September 2002 Lorenz Stolzenberg, Managing Director

These Declaration of Conformity and operating instructions have been generated electronically and are legally binding without signature

Operating instructions
Butterfly valves
actuated

Contents

600636 / PDF=288

0 Introduction

These instructions are designed to assist the user during installation, operation and maintenance of butterfly valves from the Series 14a, Series 14b-MTD, Series 14b-WTD, Series 14c-MTD, Series 14c-WTD, Series 74b-MTD and Series 74b-WTD.
These instructions apply only to the butterfly valve itself. In addition, refer to the instructions of the mounted actuator.

Note	The WARNING and CAUTION notes must be strictly adhered to. **Otherwise this may lead to personal injury and equipment damage** and the manufacturer's warranty may become void. Please contact the manufacturer if you have any queries, see section 8 for contact address.

1 Intended use

After installing the valve in the pipeline and connecting the actuator to the control equipment, these butterfly valves are designed exclusively for shutting off or controlling media (often corrosive) within the permissible pressure and temperature ranges.

The permissible pressure and temperature ranges for these butterfly valves are specified in the data sheets <TB14a_EN, TB14b-mt_EN, TB14b-wt_EN, TB14c-mt_EN, TB14c-wt_EN, TB74b-mt_EN and TB74b-wt_EN>.

Danger	Do not operate a butterfly valve when its permissible pressure/temperature rating is not sized for the operating conditions specified in the data sheets <TB14a_EN, TB14b-mt_EN, TB14b-wt_EN, TB14c-mt_EN, TB14c-wt_EN, TB74b-mt_EN and TB74b-wt_EN>. **Failure to follow these safety precautions may result in personal injury and can damage equipment installed in the pipeline.**

Refer to the limitations in the above mentioned data sheets if the butterfly valve is intended for throttling services.

Observance of section 2 <Safety instructions> is presumed for the Intended use.

2 Safety instructions

2.1 General safety instructions

For butterfly valves, the same safety regulations apply as for the pipelines in which they are installed, as well as for the control equipment connected to the actuator. These instructions only specify those safety instructions which need to be additionally observed concerning butterfly valves.

Additional safety instructions are specified in the instructions for the actuator assemblies.

2.2 Safety instructions for the operator

The manufacturer does not assume any responsibility. Therefore, on using the butterfly valve, make sure the following instructions are observed:

⇨ The valve is to be used only for its intended use as described in section 1.

Warning	***Preventing misuse of the butterfly valve:*** It is especially important to make sure that the wetted parts in the butterfly valve are suitable for the media used as well as the prevailing pressures and temperatures. **Failure to follow these safety precautions may result in personal injury and can damage equipment installed in the pipeline. The manufacturer does not assume any final responsibility.**

⇨ Make sure that the pipeline and control equipment have been installed correctly and are checked at regular intervals. The valve body wall thickness must be designed to take into account the additional forces and moments usually found in the pipeline.

⇨ The valve needs to be connected correctly to the pipeline and to the control equipment.

⇨ Make sure the usual flow velocities are not exceeded in continuous service in this pipeline. Exceptional operating conditions such as oscillations, water hammering, cavitation and large proportions of solid matter in the process medium, especially abrasive, must be clarified beforehand with the manufacturer.

⇨ Butterfly valves that are operated at temperatures greater than +50°C or lower than -20°C must be protected, together with the pipeline connections, against being touched.

⇨ An actuator unit mounted subsequently onto the valve must fit the butterfly valve properly and its final positions, especially the closed position, need to be correctly adjusted.

⇨ The valve should only be operated and serviced by personnel appropriately qualified for pressurized pipelines.

2.3 Particular hazards

⚠ Danger	Prior to unscrewing the bonnet or removing the butterfly valve from the pipeline, **relieve pressure entirely in the pipeline** to ensure the process medium cannot escape uncontrollably from the pipeline.
⚠ Warning	Should it be necessary to remove a butterfly valve from the pipeline, process medium may escape from the pipe or out of the butterfly valve. In the case of process media that can damage health or are dangerous, drain the pipeline completely before removing the butterfly valve from the pipeline. Take special care concerning **any remaining media that may still be in the pipeline** or **have collected in the cavities of the valve**.
⚠ Warning	*For butterfly valves intended for dead-end service:* During standard operation, in particular, with gases or hot and/or dangerous media, **mount a blank flange at the free end connection** or ensure that the butterfly valve is **properly protected against unauthorized operation**.
⚠ Warning	If a butterfly valve used for dead-end service must be opened in a pressurized pipeline, special care must be taken to ensure that **any process media escaping under pressure** do not cause any damage.

2.4 Designation of the butterfly valve

The designation of the butterfly valve includes the following details:

Details	Designation	Comments
Manufacturer	**Pfeiffer**	Address, see section 8 <Information>
Valve type	**BR (and number)**	e.g. BR 14a = Series 14a, see Pfeiffer catalog
Body material	e.g.: **1.4408**	Material number acc. to DIN EN 10213-4
Size	**DN (and number)**	Value in mm, e.g. DN200
Maximum pressure	**PN** or **PS (and number)**	Value in [bar] at room temperature
Perm. temperature	**t_b (and number)**	Value in [°C] = top application limit
Perm. pressure at t_b	**p_b (and number)**	Value in [bar] **p_b** and **t_b** are the associated values at maximum permissible application temperature
Serial no./year of man.	e.g.: **2020153/001/001**	(2.+3.) Number = year of manufacture, e.g. 02 = 2002
Conformity	**CE**	Conformity is certified separately by the manufacturer
Identification no.	**0035**	Notified body as per EU Directive = TÜV Anlagentechnik GmbH
Flow coefficient	**kvs (and number)**	Corresponds to the flow rate at a pressure of 1 bar at 20°C, measured in water
Direction of flow	➔	**Note**: see note in section 4.2 <Installation instructions>

Table 1 – Designation of the butterfly valve

Keep the labeling on the valve body and on the nameplate to ensure that the valve can be identified at all times.

3 Transport and storage

Butterfly valves **must be carefully handled, transported and stored:**

⇨ Store the valve with its protective packing and/or with its protective caps in place in the end connections. Store and transport the butterfly valves that weigh over approx. 10 kg on pallets (or a similar type of support) right up to the point of installation.
The packing is designed to protect the valve's internal parts against being damaged.

⇨ Store the valve in a closed room before it is installed. Protect it against damaging influences such as dirt or moisture.

⇨ Make sure, in particular, that the facings of the flanges are not damaged through mechanical or other influences. **Do not stack butterfly valves!**

⇨ As a rule, butterfly valves are delivered in the closed position. Store the valves in the condition they were delivered in. Do not operate the actuator.

4 Installation in the pipeline
4.1 General

The same instructions apply for installing the butterfly valves in the pipeline as for connecting pipes and similar pipeline equipment. The following instructions additionally apply for butterfly valves. Also observe section 3 for transporting the butterfly valve to the point of installation.

⚠ **Note**	The mating flanges must have smooth facings. Preferably use flanges, e.g. conforming to form B1 or B2 in DIN EN 1092-1 or smooth finish in ANSI B 16.5. Contact the manufacturer if you intend to use other flange forms.
⚠ **Note**	*The actuating device is set for the operating data specified in the order.* **Do not alter the settings for the final positions OPEN and CLOSED** without the manufacturer's prior consent.
⚠ **Danger**	If an actuator unit has been mounted subsequently, torque, direction of rotation, operating angle as well as the final positions OPEN and CLOSED must be adapted to the butterfly valve. **Failure to follow these safety precautions may result in personal injury and can damage equipment installed in the pipeline.**
⚠ **Warning**	*Only for butterfly valves with electric actuator:* Make sure that the actuator is switched off in the **CLOSED** position by the **torque switch's signal**. In the **OPEN** position, the actuator must be switched off by the **limit switch's signal** *See the instructions for the electric actuator for further details.*
⚠ **Note**	*Closing/opening times for pneumatic piston actuators:* Adapt the supply/venting of the compressed air to the valve to achieve the recommended valve closing time: t [sec] = DN [mm] / 25, should there be no special specifications.

The following warnings are to be observed for actuators:

⚠ **Warning**	*Actuators are not designed to be used as step-ladders:* Do not apply any weight/load to the actuators. This can damage or destroy the butterfly valve.
⚠ **Warning**	*Actuators that weigh more than the butterfly valve:* Support any actuator which due to its size and/or mounting situation would otherwise cause the valve to bend under the load.

The following warnings are to be observed for high-performance butterfly valves including a seat with metal sealing (Types Series 14b-MTD, Series 14c-MTD and Series 74b-MTD):

⚠ **Caution**	To avoid that the seat seal is damaged, make sure the pipeline upstream and downstream of the place of installation is carefully cleaned from all hard and abrasive foreign material prior to installation of the butterfly valve.

4.2 Installation instructions

⚠ **Note**	The inside diameter of the mating flanges must leave sufficient room for the opened butterfly disc to ensure that it cannot be damaged on swinging out. See Table 2.

DN	80	100	150	200	250	300	350	400	500	600
Ø D_i	82.5	107.1	159.3	206.5	258.8	307.9	338.0	384.4	479.6	592.4

Table 2 – Minimum required inside diameter Di of the mating flanges

⇨ Store and transport the valve with its protective packing right up to the point of installation.

⇨ Check valve and actuator for signs of damage that may have occurred during transportation. Do not install a damaged butterfly valve or actuator.

- Make sure that only butterfly valves are installed when their pressure rating, end connections, (flow rate) and face to face dimensions match the conditions of application. See the designation of the butterfly valve.

Danger	Do not install a butterfly valve if its permissible pressure/temperature ranges do not apply to the operating conditions. The limits of application are marked on the valve, see section 2.4 <Designation>. The permissible range is determined in section 1 <Intended use>. **Failure to follow these safety precautions may result in personal injury and can damage equipment installed in the pipeline.**

- The connecting specifications for the actuator unit must match those of the control equipment. See nameplate(s) on the actuator unit.
- Make sure the end connections of the pipeline are aligned with the butterfly valve's end connections and their ends have parallel planes.
- Prior to installation, carefully clean the valve and the connecting section of the pipeline from dirt, especially hard foreign material.
- On inserting the valve (and flange gaskets) into a ready mounted pipeline, keep a certain clearance between the pipeline ends to ensure that all facings (and gaskets) remain undamaged.
- The preferable mounting position for butterfly valves is with the shaft in a horizontal position. However, if possible, the actuator should not be located directly underneath the butterfly valve.
- If there is an **arrow** on the valve body, make sure it corresponds with the direction of flow in the pipeline.

Note	In special cases, it may be necessary for the valve to be tightly shut against the direction of flow. The installation in such special cases **must be determined by the operator of the pipeline** (e.g. to protect a pump).

- The associated instructions apply for connecting the actuator unit to the control equipment.
- After completing installation, carry out a function check using the signals issued by the control equipment. The valve must open and close properly corresponding with the control signals. Any function errors that are recognized must be remedied before commissioning. See also section 7 <Troubleshooting>.

Warning	Control commands that are not carried out correctly **may result in personal injury and can damage equipment installed in the pipeline.**

5 Pressure check in pipeline section

The pressure check of valves has already been carried out by the manufacturer. To check the pressure of a section of pipeline with installed valves, the following points must be observed:

- Carefully flush newly installed pipes to remove any foreign material before operating the valve.
- **Valve OPEN:** The test pressure should not exceed **the value 1.5 x (PN or PS)** (see nameplate).
  (PN or PS = maximum permissible operating pressure)
- **Valve CLOSED:** The test pressure should not exceed **the value 1.1 x (PN or PS)** (see nameplate).

If a valve leaks, see section 7 <Troubleshooting>.

6 Standard operation and maintenance

Operate the valve/actuator unit over the control equipment signals. Butterfly valves delivered with the actuator already mounted are precisely set and should not be readjusted.

The shaft is sealed with a PTFE V-ring packing preloaded with a set of spring washers and does not require any maintenance.

Normal manual force is sufficient to operate the manual override on the actuator (if required). It is not permissible to use extensions to increase the operating torque.

Regular maintenance work on the butterfly valves is not necessary. When checking the pipeline section, make sure that no medium leaks out at the flanged and threaded ends of the body and at the shaft packing. If a valve leaks, proceed as described in section 7 <Troubleshooting>.

7 Troubleshooting

Observe the safety instructions listed in section 2 on troubleshooting.

Warning	*To remove a valve from a pipeline containing dangerous media and to take it out of the plant:* Decontaminate the valves properly first.

Type of fault	Action to be taken	Comment
Leak at the connection to the pipeline or at the cover	Tighten flange bolts. *If the medium leaks out at the flanges even after tightening the flange bolts:* Unscrew the flange bolts and remove the valve (on doing so, observe the instructions in section 2.3 <Particular hazards>).	***Note 1:*** *When ordering spare parts, include all the specifications listed in the valve designation. Only use original parts from Pfeiffer.* ***Note 2:*** *If, after removing the valve from the pipeline, it is found that the internal parts are not sufficiently resistant to the process medium, select parts made of a suitable material.*
Leak at the shaft packing	Remove the valve (observing the instructions in section 2.3 <Particular hazards>), dismantle the valve and replace the shaft packing. Contact Pfeiffer for spare parts and necessary instructions.	
No tight shut-off when the valve is closed	Check whether the valve is 100% closed. *If the valve is closed:* Check whether the actuator closes with full torque. *If actuator closes with full torque:* Open/close the pressurized valve several times. *If the valve still leaks:* Increase the actuator torque in CLOSED position up to a maximum value of 1.1 x the rated torque. *If the valve still leaks:* The valve must be repaired: replace the seat ring (observing the instructions in section 2.3 <Particular hazards>). Contact Pfeiffer for spare parts and necessary instructions.	
Malfunction	Check actuator unit and control signals. *If actuator and control equipment are in order:* Remove the valve (observing the instructions in section 2.3 <Particular hazards>) and check it. *If the valve is damaged:* The valve must be repaired. Contact Pfeiffer for spare parts and necessary instructions.	
If a pneumatic actuator with springs must be removed from the valve	**<u>Caution: Risk of injury</u>** Before removing the actuator from the valve, disconnect the signal pressure.	

For malfunctioning actuator units, refer to the actuator instructions.

8 Further information

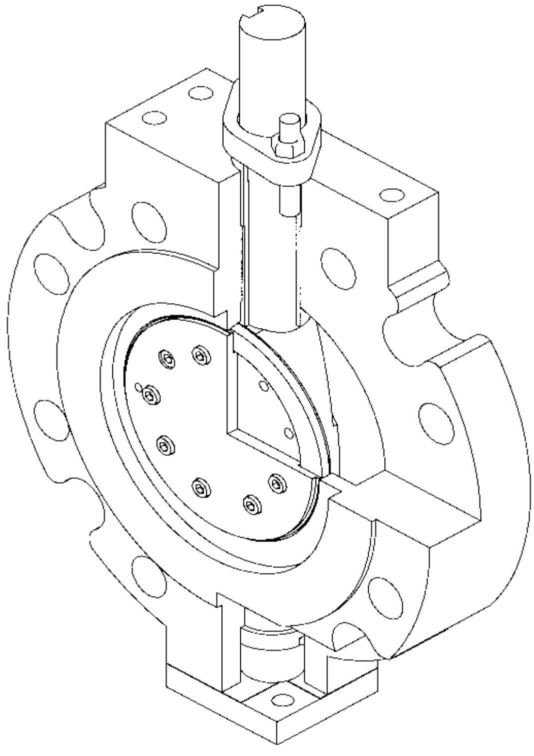
Contact the address below for the listed <Data sheets> and <Repair instructions> as well as further information.

Pfeiffer Chemie-Armaturenbau GmbH
Hooghe Weg 41 • 47906 Kempen
Telefon: 02152 / 2005-0 • Telefax: 02152 / 1580
E-Mail: vertrieb@pfeiffer-armaturen.com • Internet: www.pfeiffer-armaturen.com

Operating Instructions

Butterfly Valves Series TRI-CON
(with actuator)

Type 14t



Declaration of Conformance acc. to Directive 97/23 EC

and Manufacturer's Declaration acc.to Directive 98/37 EC

The manufacturer	**ZWICK GmbH, D-58256 Ennepetal**
declares, that (for) the valves	**ZWICK butterfly valves Series TRI-CON** • **supplied with pneumatic/hydraulic actuator,** • **supplied with electric actuator** • **prepared to connect a 90°-part-turn actuator,**

1. are a pressure equipment within the meaning of the European Directive 97/23 EC (PED) and conform to this directive,
2. are not a complete machine within the meaning of the European Directive 98/37 EC (Machinery Directive) but conform to this directive,
3. the operation instruction no. Zw-TriCon-2002-A1 shall be observed.

It is forbidden to put the valve into operation as long as the valve is not yet installed into the pipeline to prevent injury of the user**.**

Technical Standards used

EN 593	**Product standard for butterfly valves**
DIN 3840	**Design of the valve shell**
EN 292	**Safety of machines, Part 2: Technical specifications**

Technical Specifications

ZWICK-catalogue <Butterfly Valves series TRI-CON>

Used method of conformity:

Annex II of the Pressure Equipment Directive 97/23 EG, category III, module H

Name of Independent Expert:	*Identification-no. of the Independent Expert*
Lloyd's Register	**0525**

Any modification of the valve and/or the valve actuator unit, which changes the design and/or the valve application other than specified in clause 1 <valve destination>, invalidates this declaration.

Ennepetal / February 2002

Hans Zwick, General Manager

0 Introduction

This instruction may support the user to store, install, start-up, use and maintain ZWICK-butterfly valves series TRI-CON.

Attention	**It will be dangerous for the user if the following „attention“-, „warning“- and „danger“-notices are not observed,** and the liability of the manufacturer may become ineffective. In case of any question to the manufacturer, see addresses in clause 8 <information>.

1 Valve destination

These butterfly valves **series TRI-CON** are exclusively destined – after installation at or between flanges or butt welded into a pipe system and after connection of the actuator to the plant control system – to let pass or shut off media in the allowable pressure and temperature range, or to control the flow.
For fluids with more than very small content of solid particulates – especially hard and/or sharp ones – this series should not be used.

Note:
The ZWICK catalogue layout-sheets <Butterfly Valves TRI-CON> specify the admissible range of p/t-rating.

Clause 2.2 < Important information for the user> shall be observed.

Warning	If a valve is used for permanent flow control at differential pressure more than about 0,15 bar (liquid fluids) the flow parameters shall be accepted by the manufacturer. Avoid cavitation in any case.

2 Safety information

2.1 General Safety Information

The safety requirements apply for valve units same as for the pipe system into which the valve is installed and same as for the plant control system, to which the actuator is connected. This instruction gives such advices only, which **shall be observed additionally**.

More safety information may be included in the relevant manual of the actuator.

2.2 Important information for the user

It is not the valve manufacturer’s liability, and therefore it shall be observed by the user, that

⇒ the valve is only used as specified in clause 1 <valve destination>,

Danger	No valve shall be used, that’s certified pressure/temperature range (= "rating") is not sufficient for the operating conditions: The relevant diagrams in the ZWICK catalogue <Butterfly Valves TRI-CON> specify this admissible range. See clause 8 <information>. If other materials are used or at service conditions not included in the above mentioned diagrams, the manufacturer shall be asked for release. **Ignoring these requirements could mean danger for the life or health of the user and/or cause damage in the piping system.**
Danger	The user shall check and ensure, that the choice of the valve’s materials is suitable for the fluids used. The valve manufacturer is not liable for damage resulting from corrosion. **Ignoring these requirements could mean the danger of injury of the user and/or cause damage in the piping system.**

⇒ an actuator installed at a valve supplied bare shaft has been sized and assembled according to the manufacturer’s recommendations, and has been adjusted correctly for both valve end positions. Specifically in the CLOSED end position the **body seat** shall stop the stroke,

not the actuator end stop. Any limitation of the stroke to full closure shall be made ineffective.

⇒ the pipe system has been installed by experts and that these systems are regularly inspected. The stiffness of the body is designed to support the usual additional pipe forces F_Z equal to $\pi/4 \cdot DN^2 \cdot PS$. Wafer type butterfly valves may support higher values of additional pipe forces F_Z.
(PS = design pressure at ambient temperature)

⇒ the valve has been connected to these systems by experts, especially a valve with butt-weld ends,

⇒ the operating time of a pneumatic/hydraulic actuator has been adjusted to the pipe system characteristics,

⇒ the flow velocity in the pipe system is limited to usual values (i.e. 4 m/s for liquid fluids) and that abnormal conditions such as vibration, waterhammer, erosion (i.e. by wet steam), cavitation and a relevant content of solid – especially abrasive – particulates in the fluid are agreed by the manufacturer,

⇒ at service temperature between >+50°C and <–20°C the valve and the valve connection surfaces are protected from contact by the user,

⇒ only experts for pressurized pipe systems operate und maintain the valve unit.

2.3 Special dangers

⚠ **Danger**	The valve shaft is tightened by a stuffing box. Before the bolting of this stuffing box is loosened be sure, that the pipe system is **completely depressurised.**
⚠ **Danger**	Before a valve is disassembled from the pipe or before the plug (or cover) from the valve body is loosened, be sure, that the pipe system **is completely depressurised**, to prevent leakage from the pipe system. Be sure that **the valve is 5°-10° opened** and remains in this position to equalize the pressure at both sides. If the actuator shall be disassembled for stuffing box repair, first open the disc to depressurise the valve completely **and leave it in this position**.
⚠ **Danger**	*Valves in end-of-line-position:* For normal service, specifically at gaseous, hot or dangerous fluids, a butterfly valve shall be used only, if **a blind flange or cover is assembled downstream** or – for short-term only – if the valve is duly locked in the CLOSED position. Attention when closing such a valve: Avoid getting one's hand between body and disc.
⚠ **Warning**	If a valve is used in end-of-line-service and shall be opened under pressure, open the valve very carefully: The **fluid splashes out with high velocity**! Attention when closing: Avoid getting one's hand between body and disc.
⚠ **Warning**	*If a valve shall be disassembled from the pipe:* Take care, that the adjacent pipe system **is completely drained**, before the valve is disassembled from the pipe. Take special care to residual amounts of the fluid that **remain trapped in the valve and/or in the adjacent pipe.**

2.4 Valve marking

Each butterfly valve is marked as follows (see label, left column):

for	marking	remark
manufacturer	**Zwick GmbH**	Address see clause 8 <Information>
Model No.	For ex.: **C10125C-AA-11CP**	Explanation see ZWICK-catalogue <TRI-CON>
S.- No.	For ex.: **02-03-7806**	Corresponding to: year – month – order-n°
Size	**DN (**and **value)**	Value mm, for ex. DN200 or inch, for ex. 8“
PN / class	**Value** for PN or class	PN / class = dimensional standard for the flanged connection
CWP / PS	**Value** in bar or PSI	= pressure, upper limit of application at 20°C
max. T / TS	**Value** in °C or °F	= temperature, upper limit of application
Date	**year / month**	

and markings for materials of the valve parts in contact with the fluid (see label, right column):

for	marking	Remark
Body	**Markings according to the relevant material standard**	material of the body
Disc.		material of disc and seat ring retainer
Shaft		material of shaft
Seat		material of the stainless seat surface in the body
Lamella		material of the exchangeable laminated ring in the disc
Key		material of the key for connection shaft-disc
Bolting		material of the bolting of the seat ring retainer
Bush		material of the bushes
Standards	**API 609B/ B16.34**	Standards for design and testing

To allow the valve identification the label shall not be damaged.

3 Shipment and Storage

The valve shall be handled, shipped and stored with care.

⇒ The valve shall be stored in the protective packaging or caps at the flanged or butt weld ends. Store and transport it at a pallet or similar even to the place of installation.

⇒ If the valve shall be stored before installation, store it in a closed building and protect the valve from harsh environmental conditions, such as dirt, debris and humidity.

⇒ Take special care to protect the metallic seat, the flange or butt weld end faces and the actuator from damage at transport.

⇒ Butterfly valves shall be stored in the position of the actuator (=disc) as supplied, do not operate the actuator.

Danger	*Valves supplied without actuator:* Handle the valve very carefully at transport: The disc is not fixed and may open by influence from outside (i.e. by shaking or vibration).
Attention	*Valves with actuator type fail-safe to „OPEN“:* At supply, the disc may protrude from the valve body at both sides. **The actuator shall be disassembled and the disc shall be closed for transport.**

4 Installation

4.1 General

The requirements for the installation apply for valve units same as for the piping system into which the valve is installed and as for the plant control system, to which the actuator is connected. This instruction gives such advices only, which **shall be observed additionally**.

Attention	Butterfly valves – especially wafer type valves – shall be transported and installed **disc closed only.** Otherwise the disc could be damaged and the valve will no more be tight.
Danger	*When the valve is not yet installed: Prevent to get one's hand between body and disc:* The actuator unit shall not be connected to the plan control system not before the valve has been installed into the pipe system. If a butterfly valve is used in end-of-line-service, take special care to assemble a blind flange or a cover behind or to lock the valve safely in the CLOSED position.
Attention	*The valve unit has been adjusted for tight shut-off by the manufacturer:* Do not change **the end stop adjustment** of the unit valve/actuator in the CLOSED position. In this position the body seat shall stop the disc stroke. Any actuator end stop has been adjusted appropriately. **This adjustment shall not be changed**.
Danger	*When a butterfly valve is supplied bare shaft (without actuator):* You may install the valve**, but don't pressurise it!** When the actuator is installed later, the nominal size and torque, the sense and range of rotation and the limit stops in the OPEN and CLOSED positions of the actuator unit shall be exactly adjusted to the butterfly valve and to the service conditions. **Ignoring these requirements could mean the danger of injury of the user and cause damage in the piping system.**
Attention	*Valve with electric actuator only:* Check and be sure that **the signal of the torque switch stops the valve in the CLOSED end-position** and the signal of the limit switch stops the valve in the OPEN end-position. *More instruction is given in the actuator manual.*

4.2 Installation

⇒ Bring the valve in its protective packaging to the place of installation and do not unpack it earlier.

⇒ Check and be sure, that the valve and the gear unit are free from damage. Valves or gear units with visible damage shall not be installed.

⇒ Check and be sure, that the valve pressure class and the connecting type and dimensions and the actuator data correspond to the plant data. See markings in the valve's label.

Danger	No valve shall be installed, that's certified pressure/temperature range (= "rating") is not sufficient for the operating conditions: This range is defined in the catalogue <butterfly valves TRI-CON>. See section 8 < information >. If other materials are used or at service conditions not included in the above mentioned diagrams, the manufacturer shall be asked for release. **Ignoring these requirements could mean danger for the life or health of the user and/or cause damage in the piping system.** At any doubt, contact the manufacturer.

⇒ *Wafer type Butterfly valves:*
To protect damage of the valve disc at operation, be sure, that the clearance of the adjacent pipe flanges is sufficient for the disc in full open position.

⇒ Inspect and be sure, that the valve waterway and both adjacent pipe insides are free from dirt, rust, pipe scale, welding slag and any other foreign material.

	*Valves with pneumatic actuator type **"fail safe to open":*** Steps to install this special type of valve:

Danger	- connect the actuator to a (temporary) pilot pressure supply, - close the disc by the pilot pressure and make sure, that the disc remains 100% closed under the full pilot pressure until the valve is properly fixed in the pipework, - finally disconnect the pneumatic actuator from the (temporary) pilot pressure supply with care for smooth opening. **Ignoring these requirements could mean danger for the health of the personnel and/or cause damage in the piping system.**

⇒ *TRI-CON butterfly valves are suitable for both flow directions. But respect the “arrow”-marking of the valve body:*
The valve should be installed with this “arrow”-direction same as the direction of the pressure against the closed disc. This direction may be different from the flow direction of the opened valve!

⇒ Butterfly valves should be installed preferably in the optimal position with the valve shafts horizontal. Avoid putting the actuator directly under the valve: Stuffing box leakage may damage the actuator unit.

⚠ **Danger**	An actuator assembled to a valve installed bare shaft shall be supported, if the mass of the actuator and/or if the actuator position causes a too high bending torque to the valve body.

⇒ At installation into an existing pipe system be sure, that the gap between the pipe ends has sufficient clearance to protect all connecting surfaces (and gaskets) from damage.
But the gap shall not be larger than necessary to limit additional pipe load.

Flanged butterfly valves only:

⇒ The flanged pipe ends shall be installed in line with the faces being parallel.

⚠ **Attention**	*Butterfly valves with flanged ends:* The mating flange surfaces shall be conform to EN 1092-1 or “stock-finish” conform to ANSI B16.5, with flat mating faces (i.e. form C or form D or form E). The manufacturer ZWICK shall release flanges of other standards or other kinds of mating faces.
⚠ **Attention**	Install a wafer type butterfly valve into the clearance between the adjacent pipe flanges with the disk in full closed position. Otherwise the valve disc is damaged and the valve will not be tight.

⇒ When fastening the flange bolting, be sure, that the bolts centre the valve body correctly.

⚠ **Attention**	Wafer type butterfly valves series TRI-CON may need flange bolts and studs with different length for connection to the pipe flanges. For bolting dimensions refer to ZWICK-document < Zw-TriCon-Scr-2002-A1>.

Butt-welded butterfly valves only:

⇒ The pipe ends shall have been installed in line with the faces being parallel.

⇒ The butt-weld ends of the valve – see valve marking – shall fit to the pipe material. The valve and pipe welding ends shall have the same diameter and the same welding die.

⇒ Connect the welding cable not at the valve body, but at the pipe only.

⇒ The seam shall be welded by experts to reduce stresses produced by the welding process in the valve body and in the adjacent pipe. The body wall temperature shall be limited to <300°C.

⇒ *Valves >DN400:*

Attention	Be careful at the welding process: The temperature in the valve body shall be restricted to protect it from local deformation. The seam shall be welded with interruption, alternating crossover, to limit the temperature in the seam area. Ignoring these requirements could mean a permanent deformation in the valve body. Even by 1/10 mm permanent deformation of the body seat (around the body necks) the valve may become useless.

All butterfly valves:

⇒ To connect the actuator to the plant control system, follow the manual of the actuator.

⇒ Last step of the installation: Make a functional test with the signals of the plant control system: Open and close the valve to the tight position and check the correct function and signalisation of the limit switches (if any).
At any trouble see clause 7 <Trouble shooting guide>.

Danger	Defaults of signals and signalisation could mean **danger of injury of the user and/or cause damage in the piping system**

5 Pressure test of the pipe system

The valve manufacturer before supply has made the pressure test of the valve. When testing a pipe section with valves installed, take care to observe:

- ⇒ Flush new installed pipe systems carefully before the pressure test to be sure, that all hard particulates have been flushed out,
- ⇒ **Valve in OPEN position:** The test pressure shall be limited to **1,5 x PS** (see valve marking) (*PS = maximal admissible pressure at 20°C).*
- ⇒ **Valve in CLOSED position:** The test pressure shall be limited to **1,5 x PS** (see valve marking) (*PS = maximal admissible pressure at 20°C).*

In case of leakage at the valve connections section 7 <troubleshooting> shall be observed.

6 Normal service and inspection

Actuated valves shall be operated by the plant control system. The adjustment of an actuator supplied together with the valve shall not be changed as long as the valve operates correctly.

To operate an emergency manual actuation at the actuator unit – if any –, normal manual force is sufficient. It is not permitted to use extension levers to increase the torque.

Regular maintenance is not required for valves. When at examination of the line section a leakage is detected at a valve section 7 <troubleshooting> shall be observed.

For valves remaining permanently in the same position, it is recommended, to operate it 1x to 2x each year to check their function.

Danger	*A butterfly valve is not self-locking:* The actuator shall not be disassembled, **as long as the valve is pressurised.**
Danger	*A butterfly valve is not self-locking:* Piston actuators need a permanent supply of control pressure in all those positions, for which control pressure is needed.

7 Troubleshooting Guide

At any troubleshooting, respect the requirements of clause 2 <Safety instructions>.

Possible Defect	Remedy	Remark
If an actuator type “fail safe to open” shall be disassembled	**Attention: Danger of injury of the user:** Disconnect the actuator from the pilot pressure supply before the actuator is disassembled from the valve.	***Note 1:*** *To order spare parts, transmit all markings from the valve tag. Only original ZWICK-parts shall be used.*
Leakage at the pipe flange or at a cover flange connection	Tighten the gasket by the flange bolting. *If this is in vain:* Replace the flange or cover gasket. Observe clause 2.3 <Special danger> and order cover gaskets and repair instruction from ZWICK.	***Note 2:*** *If a disassembled valve is corroded at body or trim surfaces, choose wear and spare parts of a more resistant material quality.*
Leakage in the seat	Check and be sure, that the actuator closes the valve completely. *If valve is in closed position:* Check, if the actuator closes the valve under full torque. *If the actuator closes the valve under full torque:* Open and close the valve several times under differential pressure. *If the seat continues to leak:* Increase the actuator torque at 1,1x nominal torque. *If the seat continues to leak:* The valve shall be repaired: Replace the seat ring in the disc. Observe clause 2.3 <Special danger> and order spare parts and repair instruction from ZWICK.	
Leakage at the stuffing box	Tighten the stuffing box by the stuffing box bolting in little steps of ¼ turn clockwise alternating at both nuts. *If the stuffing box continues to leak:* The shaft seal shall be replaced. Observe clause 2.3 <Special danger> and order spare parts and repair instruction from ZWICK. *If the nuts at the stuffing box shall be loosened or disassembled (anti-clockwise):* **Attention: Danger for the life or health of the user:** Make sure, that the pipe at both sides of the valve is completely depressurised before the actuator is disassembled from the valve disconnect the pilot pressure supply.	

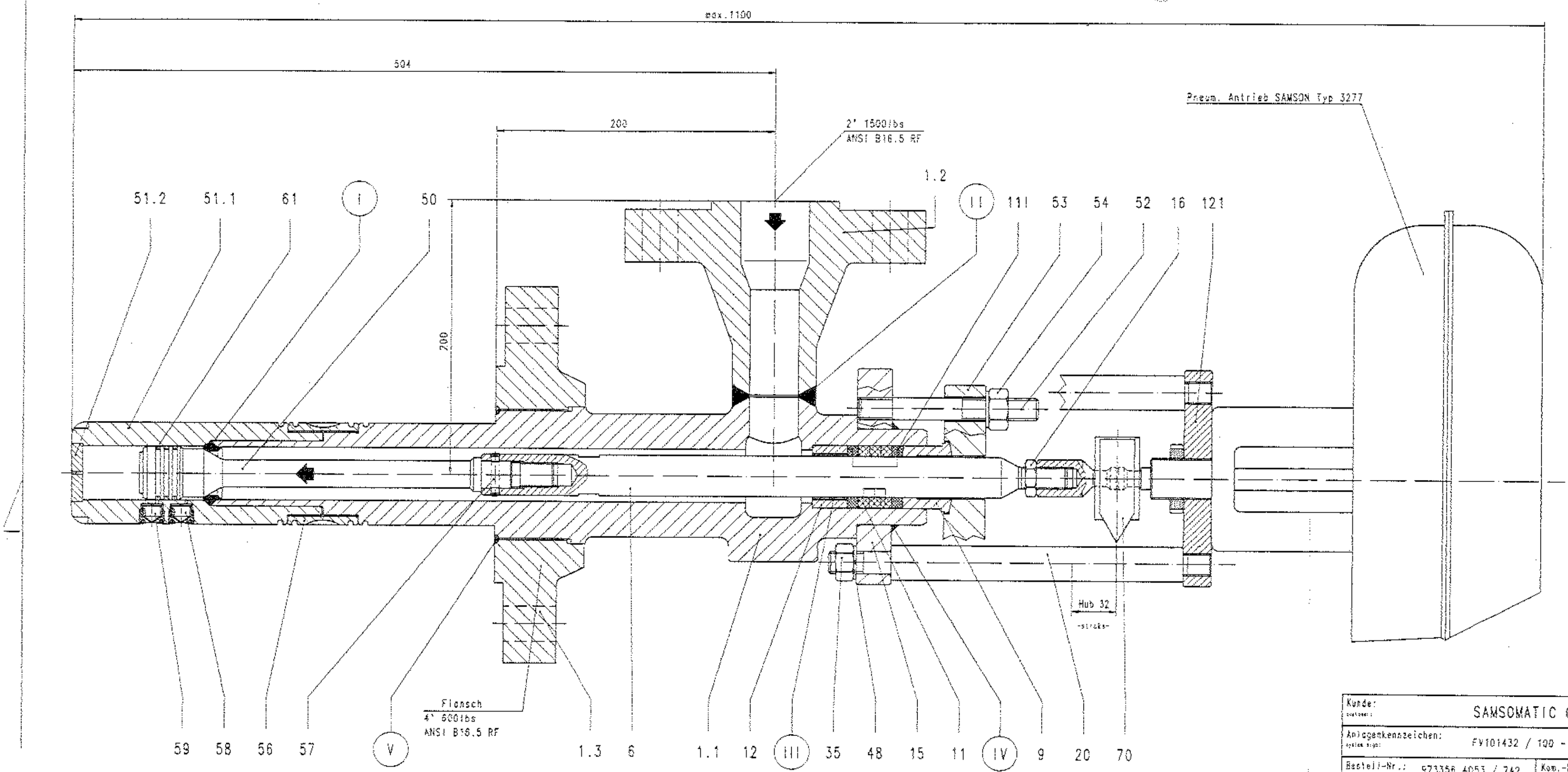
Defect of the valve functional parts	Check the actuator and the signals of the plant control system to be correct. *If both are OK:* Disassemble the valve from the pipe system and inspect it. Observe clause 2.3 <Special danger> *If the valve is damaged:* The valve shall be repaired: Order spare parts and repair instruction from ZWICK and replace it.	

More troubleshooting guide may be included in the relevant manual of the actuator.

8 More information

This manual, ZWICK-catalogue-sheets and other information – even in other languages – are also available at:

ZWICK GmbH
Egerstraße 25
D-58526 Ennepetal
Tel: +49 (0) 2333 98565
Fax +49 (0) 2333 98566
www.zwick-gmbh.de
E-Mail: info@zwick-gmbh.de



Kunde: customer: SAMSOMATIC GmbH	
Anlagenkennzeichen: system sign: FV101432 / 100 - 22	
Bestell-Nr.: order no.: 973356 4053 / 742	Kom.-Nr.: K03-0227.1
zul. Betriebsüberdruck: allowable working pressure: 54 bar 98 bar	Medium: Wasser medium: water
zul. Betriebstemperatur: allowable working temperature: 420°C 140°C	Gesamtgewicht inkl. Antrieb: weight incl. act. actuator: ca.90kg
Prüfdruck Pe: test pressure:	
Spezifikation: specification:	Anforderungsstufe: valve class:
Prüfvermerke: test certificates:	Prüfvermerke:

Zugehörige Unterlagen belonging documents

Stückliste: list parts: 3DKVP088-116U-SL	Schweißprüfplan: test and exam. spec. plan:
Schweißnahtspezifikation: welding specification: SP-0227.2	Berechnung: design calculation:

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Allgemeintoleranzen general tolerance ISO 2768 - m

Maßstab scale 1:2,5 | Komm-Nr. order-no. K03-0227.1
Werkstoff material | Stückzahl quantity 1

	Datum date	Name name
Bearb. drawn	15.06.2000	
Gepr. checked		Sabel

SCHROEDAHL-ARAPP

Heißdampfkühler
desuperheater

2"/4" 1500/600lbs ASME B16.5

1DKVP088/116U-0

Bl. 1 von 1

Zahl	Änderung	Datum	Name
index	revision	date	name

Ursp.: | Ers. für: | Ers. durch:

Pos. pos.	Anz. qty	Benennung description		Zeichnungs-Nr. drawing No.	Abmessung dimension	Werkstoff material DIN 17007	Werkstoff material DIN 17006	Bemerkung remark	Werkstoffabnahme material accep.condition Prüfungen	Belegung DIN EN10204
1	1	Gehäuse kpl.	case cpl.	2DKV088/116U-1		15Mo3	1.5415			
1.1	1	Gehäuse	case	2DKV088/116U-1.1	Ø125x519	15Mo3	1.5415			
1.2	1	Flansch	flange	4DKV088U-1.2	Ø215,9x152,5	15Mo3	1.5415			
1.3	1	Flansch	flange	4DKV116U.01-1.4	Ø273,1x65,5	15Mo3	1.5415			
6	1	Ventilspindel	valve spindle	3DN80.421.01-6	Ø30x421	X22CrNi17	1.4057			
9	1	Stopfbuchsendrücker	packing-follower	4N30.46.35-9	Ø52x35	X35CrMo17	1.4122	vergütet/quenched		
11	3	Packungsring	packing	Art. 901/B6	Ø46/30x8		Grafit			
11I	2	Packungsring	packing	Art. 6011A	Ø46/30x8		Grafit			
12	1	Grundring	base ring	4N30.46.25-12/1	Ø46x25	X6CrNiNb1810	1.4550	Vordrehmaß:Ø70x33		
15	1	Anbauflansch	flange	4N70.157.25-21	Ø157x25	15Mo3	1.5415			
16	1	Sechskantmutter	hexagon nut	DIN 439	M16x1,5		8	*		
20	2	Distanzbolzen	distance bolt	4N16.25.275.03-20	Ø25x275	Ck35	1.1181	*		
35	2	Sechskantmutter	hexagon nut	DIN 934	M16		8	*		
48	2	Sicherungsscheibe	lock washer	VS 16	Ø24/17x2	50Cr4	1.8159	*		
50	1	Regelkolben	control piston	4D80.297.01-50	Ø39,8x297	X35CrMo17	1.4122			
51	1	Sprühkopf kpl.	spray head cpl.							
51.1	1	Sprühkopf	spray head	3D80.180.02-51.1	Ø74,5x180	X10Cr13	1.4006			
51.2	1	Einsatz	insert	4D80.043.01-51.2	Ø43x8	X10Cr13	1.4006			
52	2	Stiftschraube	stud bolt	4N16.130-52	Ø16x130	21CrMoV57	1.7709	*		
53	1	Stopfbuchsenscheibe	gland	4N32.53.30.04-53	30x60x135	15Mo3	1.5415	*		
54	2	Sechskantmutter	hexagon nut	DIN 2510	NF M16	24CrMo5	1.7258	*		

Kunde: customer:
SAMSOMATIC GmbH

Anlagenkennzeichen: identifikation note:
FV101432 / 100-22

Bestell-Nr.: order No.:
820 448

Zulässiger Betriebsüberdruck: allowable working pressure:
54 bar 98 bar

Zulässige Betriebstemperatur: allow. Working temperature:
420 °C 140 °C

Spezifikation: spezification:

Anforderungsstufe: valve class:

Prüfvermerk: test mark:

Prüfvermerk: test mark:

Zugehörige Zeichnungs-Nr.: belonging drawing No.:
1DKVP088/116U-0

* Verzinkt und olivchromatiert
zink galvanized and olivchromatized

Prüfungen:

C	= Chemische Analyse	chemical analysis -
M	= Mechanische Erprobung	destructive testing -
US	= Ultraschallprüfung	ultrasonic examination -
MP	= Magnetpulverprüfung	magnetic particle inspection -
H	= Härteprüfung	hardeness traverse -
B+M	= Besichtigung und Maßkontrolle	approval and dimension test -
W	= Wärmebehandlung	heat treatment for properties -

⑧ ⑦ ⑥ ⑤ ④ ③ ② ①

Dateiname: K03-0227-1.doc

	Datum/date	Name/name
Bearbei.: wrought:	28.05.03	Giebeler
Geprüft: checked:	03.07.03	Sei

SCHROEDAHL-ARAPP
Spezialarmaturen GmbH & Co. KG
51580 Reichshof - Mittelagger

Stückzahl: 1 Quantity:

Kom.-Nr.: K03-0227.1 com. No.:

Stückliste / Item List

Typ: DKVP088/116U

2"/4" 1500/600 lbs

3DKVP088/116U-St

Blatt 1 von 2

Pos. pos.	Anz. qu	Benennung description		Zeichnungs-Nr. drawing No.	Abmessung dimension	Werkstoff material DIN 17007	DIN 17006	Bemerkung remark	Werkstoffabnahme material accep.condition Prüfungen	Belegung DIN EN10204
56	1	Spannmutter	compression nut	4D80.050.01-53	Ø74,8x50	X10Cr13	1.4006			
57	1	Stift	pin	4N6.33-46	Ø6x33	X5CrNi189	1.4301			
58.0	1	Einsatz	insert	4DK10A-58.0	Ø14x13,4	X5CrNi189	1.4301			
58.1	2	Einsatz	insert	4DK10A-58.1	Ø14x13,4	X5CrNi189	1.4301			
58.2	1	Einsatz	insert	4DK10A-58.2	Ø14x13,4	X5CrNi189	1.4301			
58.4	2	Einsatz	insert	4DK10A-58.4	Ø14x13,4	X5CrNi189	1.4301			
59.0	3	Düse	nozzle	4DK10A-59.0	Ø18x13,5	X5CrNi134	1.4313			
59.1	1	Düse	nozzle	4DK10A-59.1	Ø18x13,5	X5CrNi134	1.4313			
59.3	2	Düse	nozzle	4DK10A-59.3	Ø18x13,5	X5CrNi134	1.4313			
61	3	Kolbenring	piston ring	R001E	Ø40/36,6x3,5	X22CrMoV121	1.4923			
70	1	Hubanzeige	Stroke index	4N25.75-70	25x70x					
121	1	Anbauflansch	flange	4N30.157.20-21	Ø157x20	C22.8	1.0460	*		

Kunde: customer:
SAMSOMATIC GmbH

Anlagenkennzeichen: identifikation note:
FV101432 / 100-22

Bestell-Nr.: order No.:
820 448

Zulässiger Betriebsüberdruck: allowable working pressure:
54 bar 98 bar

Zulässige Betriebstemperatur: allow. Working temperature:
420 °C 140 °C

Spezifikation: spezification:

Anforderungsstufe: valve class:

Prüfvermerk: test mark:

Prüfvermerk: test mark:

Zugehörige Zeichnungs-Nr.: belonging drawing No.:
1DKVP088/116U-0

* Verzinkt und olivchromatiert
zink galvanized and olivchromatized

Prüfungen:

C	= Chemische Analyse	chemical analysis -
M	= Mechanische Erprobung	destructive testing -
US	= Ultraschallprüfung	ultrasonic examination -
MP	= Magnetpulverprüfung	magnetic particle inspection -
H	= Härteprüfung	hardeness traverse -
B+M	= Besichtigung und Maßkontrolle	approval and dimension test -
W	= Wärmebehandlung	heat treatment for properties -

⑧ ⑦ ⑥ ⑤ ④ ③ ② ①

Dateiname: K03-0227-1.doc

	Datum/date	Name/name
Bearbei.: wrought:	28.06.03	Giebeler
Geprüft: checked:	03.07.03	Seidel

SCHROEDAHL-ARAPP
Spezialarmaturen GmbH & Co. KG
51580 Reichshof - Mittelagger

Stückzahl: 1 quantity:
Kom.-Nr.: K03-0227.1 Com. No.:

Stückliste / Item List

Typ: DKVP088/116U

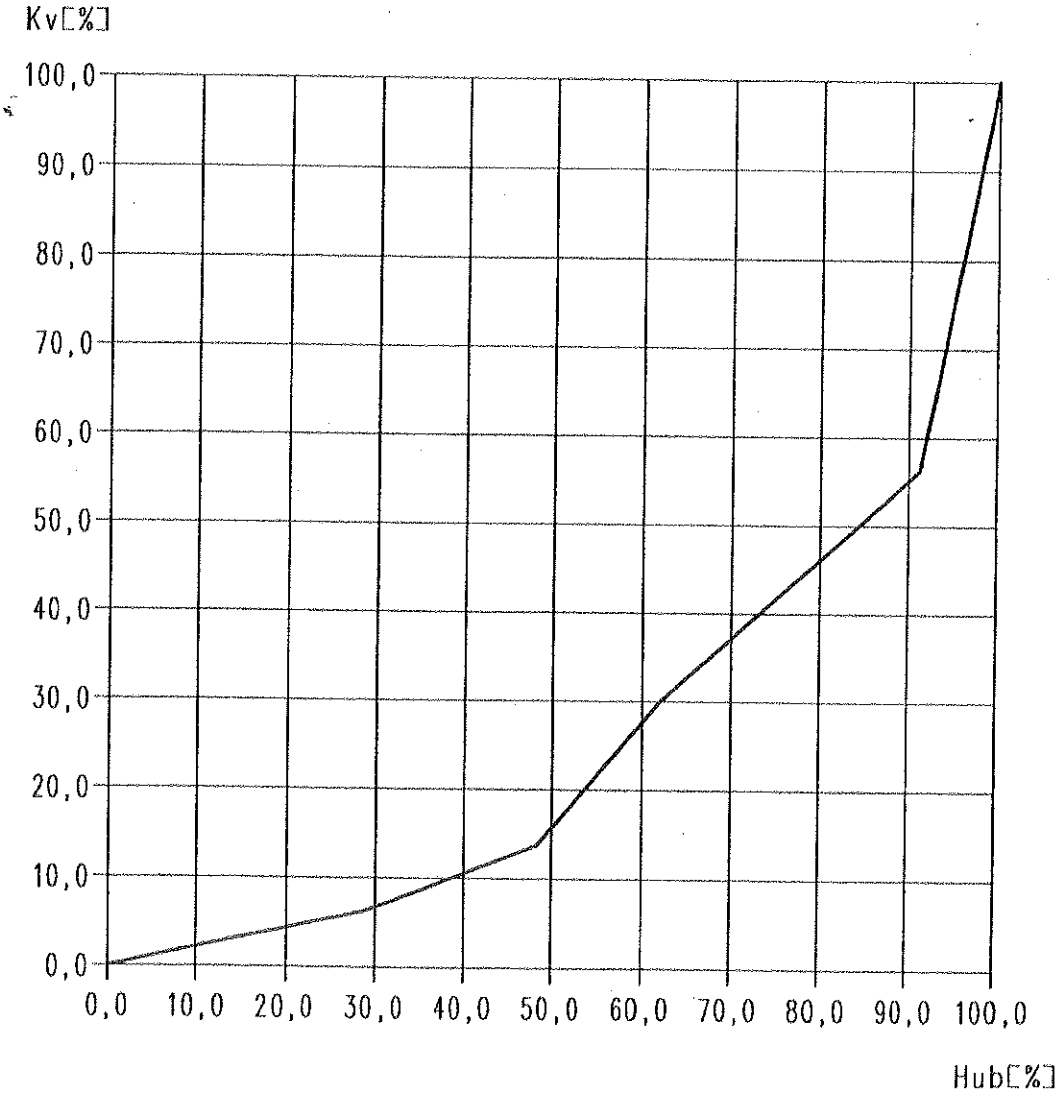
2"/4" 1500/600 lbs

3DKVP088/116U-St

Blatt 2 von 2

ARAPP - REGELVENTIL BAUGRUPPE DKV
ARAPP - CONTROL - VALVE COMPONENT - GROUP

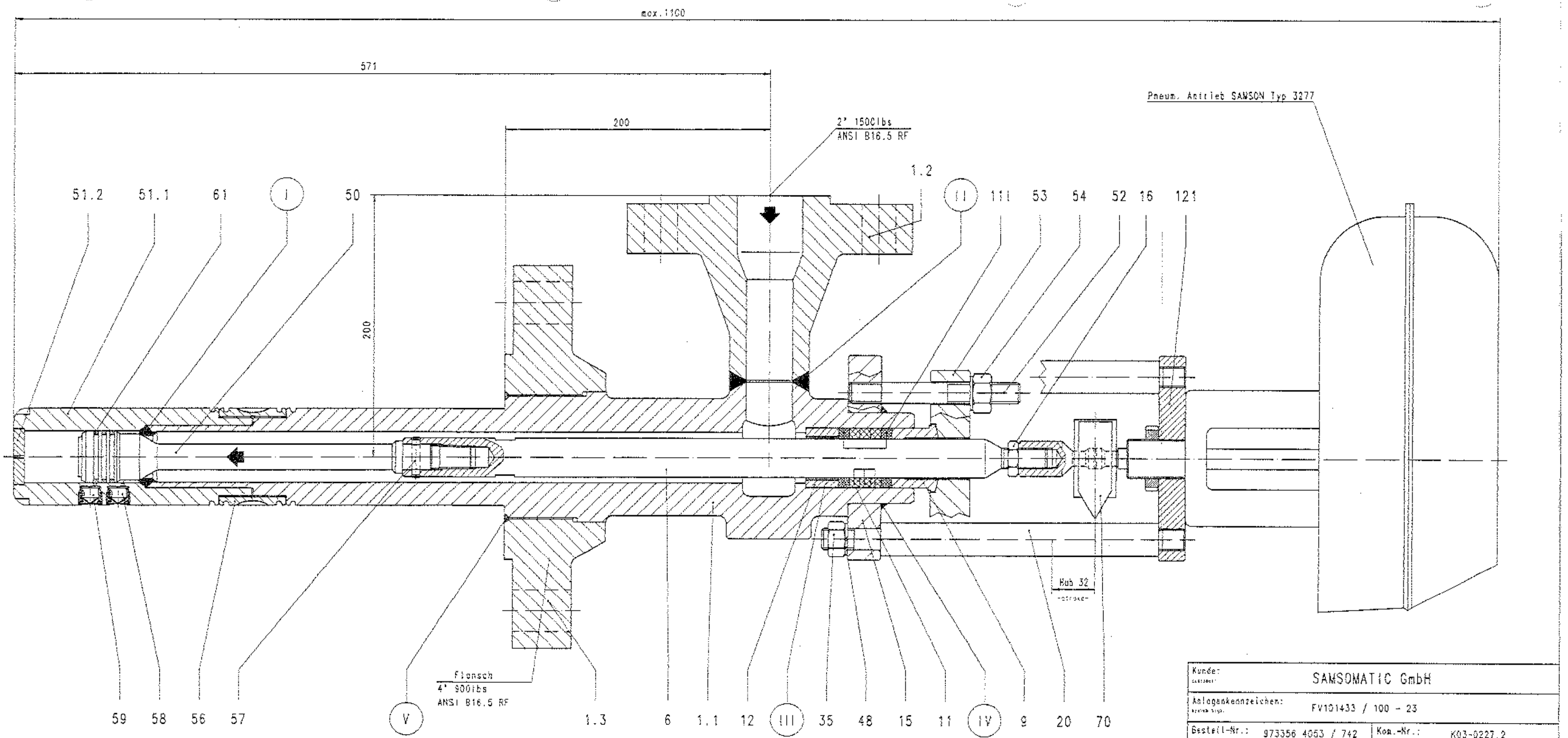
Kunde: customer: SAMSOMATIC GmbH	Kom.: work-no.: K03-0227.1 — Stück: quantity: 1
Anlagengruppe: project-group:	Type: type: DKVP088/116U DN: 2"/4" PN: 1500/600lbs
Anlagenkennzeichen: project-charecteristic: FV101432 / 100-22	Hub: stroke: 32 mm
	Kvs: kvs: 1 m^3/h



Zust Index	Änderung revision	Datum date	Bearb. draw.	Gepr. checked
4				
3				
2				
1				
0	Erstellung	28.06.03	Giebel	[signature]

Schroedahl-Arapp Spezial-Armaturen GmbH & Co KG - Postfach 10 08 44 - D-51608 Gummersbach
Hausanschrift: Schönenbacher Str.4 - 51580 Reichshof Mittelagger
Telefon (0 22 65) 99 27-0 - Telefax (02265) 99 27 27

SCHROEDAHL
Spezial-Armaturen



Kunde: customer	SAMSOMATIC GmbH
Anlagenkennzeichen:	FV101433 / 100 - 23
Bestell-Nr.: 973356 4053 / 742	Kom.-Nr.: K03-0227.2
zul. Betriebsüberdruck: allowable working pressure: 54 bar 98 bar	Medium: Wasser water
zul. Betriebstemperatur: allowable working temperature: 470°C 140°C	Gesamtgewicht inkl. Antrieb: ca.90kg
Prüfdruck Pe: test pressure	
Spezifikation:	Anforderungsstufe:
Prüfvermerke: test certificates	Prüfvermerke:

Zugehörige Unterlagen belonging documents

Stückliste: item list: 3DKVP088-117U-St	Bauprüfplan: test and exam. sequ. plan
Schweißnahtspezifikation: welding specification: SP0227.2	Berechnung: design calculation

Für diese Zeichnung behalten wir uns alle Rechte vor! All rights reserved!	Allgemeintoleranzen general tolerances ISO 2768 - m	Maßstab scale 1:1,5	Kom-Nr. com-no. K03-0227.2
		Werkstoff material	Stückzahl quantity 1

	Datum date	Name name
Bearb. drawn	19.06.2003	
Gepr. checked	2003	

SCHROEDAHL-ARAPP Spezialarmaturen GmbH & Co.KG 51580 Reichshof-Wildbergerhütte

Heißdampfkühler desuperheater 2"/4" 1500/900lbs ASME B16.5

1DKVP088/117U-0

Zust.	Änderung	Datum	Name
index	revision	date	name

Pos. pos.	Anz. qu.	Benennung description		Zeichnungs-Nr. drawing No.	Abmessung dimension	Werkstoff material DIN 17007	DIN 17006	Bemerkung remark	Werkstoffabnahme material accep.condition Prüfungen	Belegung DIN EN10204
1	1	Gehäuse kpl.	case cpl.	2DKV088/117U-1		15Mo3	1.5415			
1.1	1	Gehäuse	case	2DKV088/17U-1.1	Ø125x586	15Mo3	1.5415			
1.2	1	Flansch	flange	4DKV088U-1.2	Ø215,9x152,5	15Mo3	1.5415			
1.3	1	Flansch	flange	4DKV117U.02-1.4	Ø292,1x77,4	15Mo3	1.5415			
6	1	Ventilspindel	valve spindle	3DN80.488.01-6	Ø30x488	X22CrNi17	1.4057			
9	1	Stopfbuchsendrücker	packing-follower	4N30.46.35-9	Ø52x35	X35CrMo17	1.4122	vergütet/quenched		
11	3	Packungsring	packing	Art. 901/B6	Ø46/30x8		Grafit			
11I	2	Packungsring	packing	Art. 6011A	Ø46/30x8		Grafit			
12	1	Grundring	base ring	4N30.46.25-12/1	Ø46x25	X6CrNiNb1810	1.4550	Vordrehmaß:Ø70x33		
15	1	Anbauflansch	flange	4N70.157.25-21	Ø157x25	15Mo3	1.5415			
16	1	Sechskantmutter	hexagon nut	DIN 439	M16x1,5		8	*		
20	2	Distanzbolzen	distance bolt	4N16.25.275.03-20	Ø25x275	Ck35	1.1181	*		
35	2	Sechskantmutter	hexagon nut	DIN 934	M16		8	*		
48	2	Sicherungsscheibe	lock washer	VS 16	Ø24/17x2	50Cr4	1.8159	*		
50	1	Regelkolben	control piston	4D80.297.01-50	Ø39,8x297	X35CrMo17	1.4122			
51	1	Sprühkopf kpl.	spray head cpl.							
51.1	1	Sprühkopf	spray head	3D80.180.22-51.1	Ø74,5x180	X10Cr13	1.4006			
51.2	1	Einsatz	insert	4D80.043.01-51.2	Ø43x8	X10Cr13	1.4006			
52	2	Stiftschraube	stud bolt	4N16.130-52	Ø16x130	21CrMoV57	1.7709	*		
53	1	Stopfbuchsenscheibe	gland	4N32.53.30.04-53	30x60x135	15Mo3	1.5415	*		
54	2	Sechskantmutter	hexagon nut	DIN 2510	NF M16	24CrMo5	1.7258	*		

Kunde: customer:
SAMSOMATIC GmbH

Anlagenkennzeichen: identifikation note:
FV101433 / 100-23

Bestell-Nr.: order No.:
820 448

Zulässiger Betriebsüberdruck: allowable working pressure:
54 bar 98 bar

Zulässige Betriebstemperatur: allow. Working temperature:
470 °C 140 °C

Spezifikation: spezification:

Anforderungsstufe: valve class:

Prüfvermerk: test mark:

Prüfvermerk: test mark:

Zugehörige Zeichnungs-Nr.: belonging drawing No.:
1DKVP088/117U-0

* Verzinkt und olivchromatiert
zink galvanized and olivchromatized

Prüfungen:

C	= Chemische Analyse	chemical analysis -
M	= Mechanische Erprobung	destructive testing -
US	= Ultraschallprüfung	ultrasonic examination -
MP	= Magnetpulverprüfung	magnetic particle inspection -
H	= Härteprüfung	hardeness traverse -
B+M	= Besichtigung und Maßkontrolle	approval and dimension test -
W	= Wärmebehandlung	heat treatment for properties -

⑧ ⑦ ⑥ ⑤ ④ ③ ② ①

Dateiname: K03-0227-2.doc

	Datum/date	Name/name
Bearbei.: wrought:	27.06.03	Giebeler
Geprüft: checked:	03.07.03	Sü

SCHROEDAHL-ARAPP
Spezialarmaturen GmbH & Co. KG
51580 Reichshof - Mittelagger

Stückzahl: 1 Quantity:
Kom.-Nr.: K03-0227.2 com. No.:

Stückliste / Item List

Typ: DKVP088/117U

2"/4" 1500/900 lbs

3DKVP088/117U-St

Blatt 1 von 2

Pos. pos.	Anz.	Benennung description		Zeichnungs-Nr. drawing No.	Abmessung dimension	Werkstoff material DIN 17007	DIN 17006	Bemerkung remark	Werkstoffabnahme material accep.condition Prüfungen	Belegung DIN EN10204
56	1	Spannmutter	compression nut	4D80.050.01-53	Ø74,8x50	X10Cr13	1.4006			
57	1	Stift	pin	4N6.33-46	Ø6x33	X5CrNi189	1.4301			
58.2	5	Einsatz	insert	4DK10A-58.2	Ø14x13,4	X5CrNi189	1.4301			
58.3	1	Einsatz	insert	4DK10A-58.3	Ø14x13,4	X5CrNi189	1.4301			
59.3	3	Düse	nozzle	4DK10A-59.3	Ø18x13,5	X5CrNi134	1.4313			
59.4	3	Düse	nozzle	4DK10A-59.4	Ø18x13,5	X5CrNi134	1.4313			
61	3	Kolbenring	piston ring	R001E	Ø40/36,6x3,5	X22CrMoV121	1.4923			
70	1	Hubanzeige	Stroke index	4N25.75-70	25x70x					
121	1	Anbauflansch	flange	4N30.157.20-21	Ø157x20	C22.8	1.0460	*		

Kunde: customer:
SAMSOMATIC GmbH

Anlagenkennzeichen: identification note:
FV101433 / 100-23

Bestell-Nr.: order No.:
820 448

Zulässiger Betriebsüberdruck: allowable working pressure:
54 bar 98 bar

Zulässige Betriebstemperatur: allow. Working temperature:
470 °C 140 °C

Spezifikation: specification:

Anforderungsstufe: valve class:

Prüfvermerk: test mark:

Prüfvermerk: test mark:

Zugehörige Zeichnungs-Nr.: belonging drawing No.:
1DKVP088/117U-0

* Verzinkt und olivchromatiert
zink galvanized and olivchromatized

Prüfungen:

- C = Chemische Analyse — chemical analysis -
- M = Mechanische Erprobung — destructive testing -
- US = Ultraschallprüfung — ultrasonic examination -
- MP = Magnetpulverprüfung — magnetic particle inspection -
- H = Härteprüfung — hardeness traverse -
- B+M = Besichtigung und Maßkontrolle — approval and dimension test -
- W = Wärmebehandlung — heat treatment for properties -

⑧ ⑦ ⑥ ⑤ ④ ③ ② ①

Dateiname: K03-0227-2.doc

	Datum/date	Name/name
Bearbei.: wrought:	27.06.03	Giebeler
Geprüft: checked:	03.07.03	Sü

SCHROEDAHL-ARAPP
Spezialarmaturen GmbH & Co. KG
51580 Reichshof - Mittelagger

Stückzahl: 1 quantity:
Kom.-Nr.: K03-0227.2 Com. No.:

Stückliste / Item List

Typ: DKVP088/117U

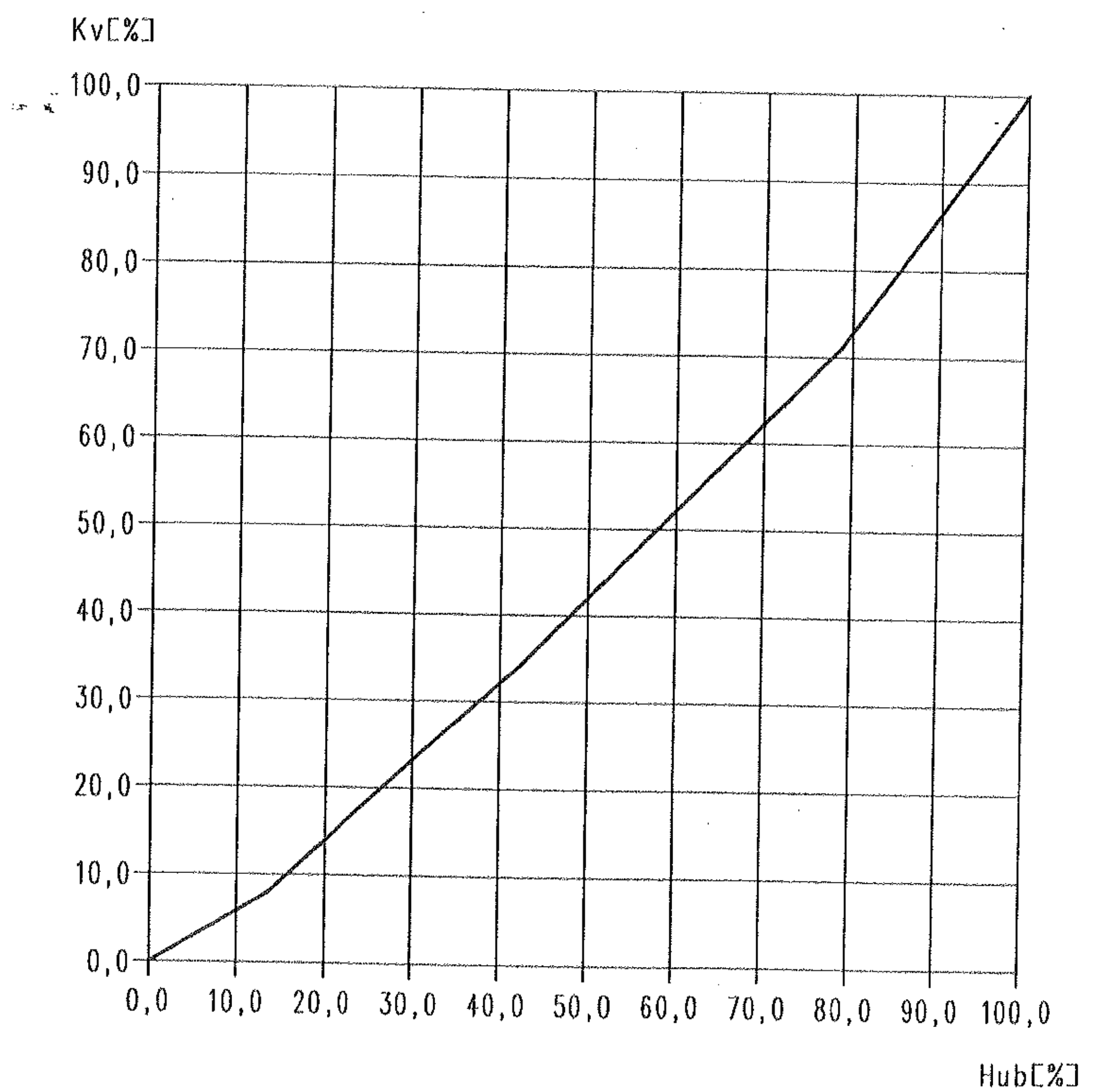
2"/4" 1500/900 lbs

3DKVP088/117U-St

Blatt 2 von 2

ARAPP - REGELVENTIL BAUGRUPPE DKV
ARAPP - CONTROL - VALVE COMPONENT - GROUP

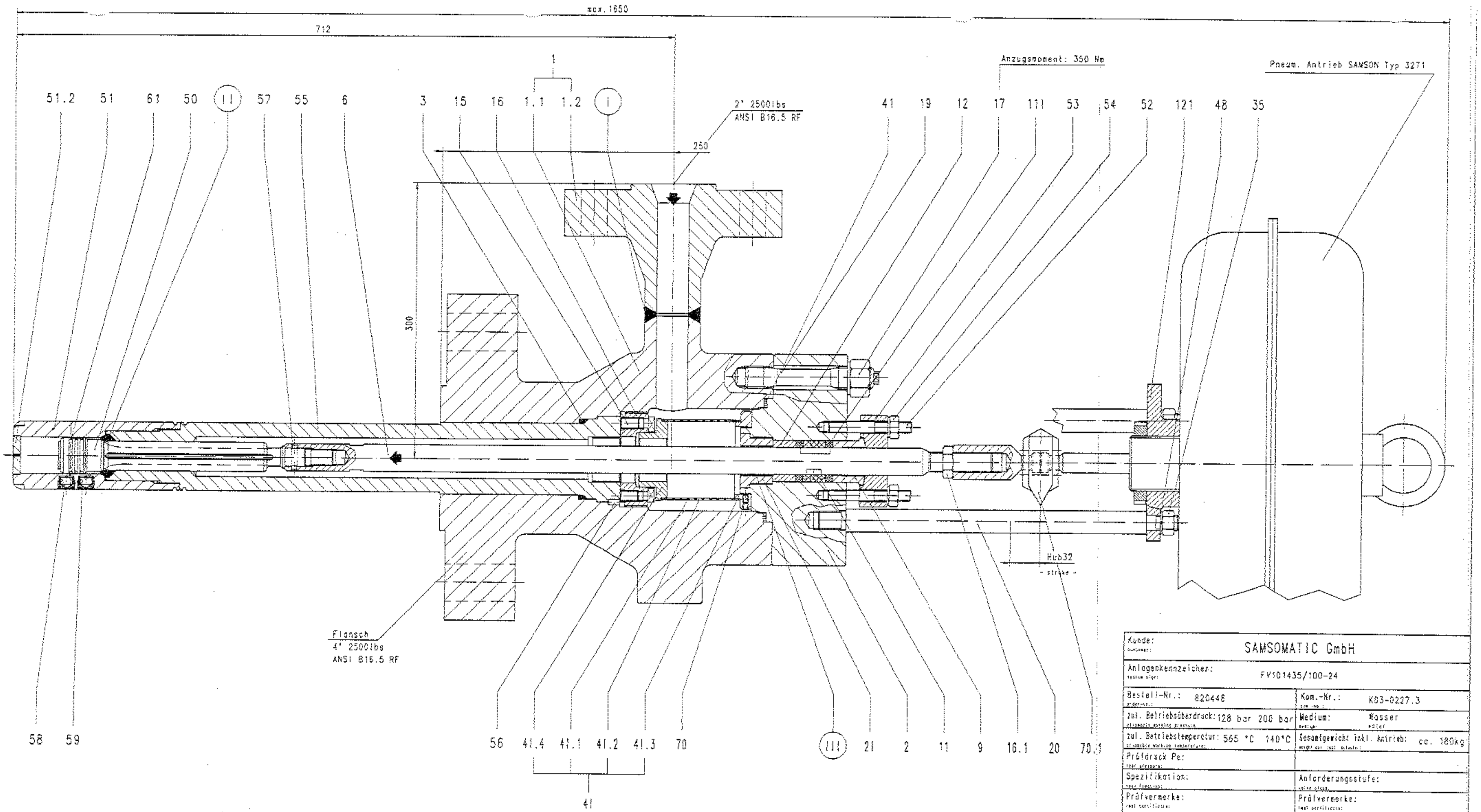
Kunde: / customer: SAMSOMATIC GmbH	Kom.: / work-no.: K03-0227.2 Stück: / quantity: 1
Anlagengruppe: / project-group:	Type: / type: DKVP088/117U DN: 2"/4" PN: 1500/900lbs
Anlagenkennzeichen: / project-charecteristic: FV101433 / 100-23	Hub: / stroke: 32 mm
	Kvs: / kvs: 4,2 m^3/h



Zust / Index	Änderung / revision	Datum / date	Bearb. / draw.	Gepr. / checked
(4)				
(3)				
(2)				
(1)				
(0)	Erstellung	07.07.03	Giebel	Stichel

Schroedahl-Arapp Spezial-Armaturen GmbH & Co KG - Postfach 10 08 44 - D-51608 Gummersbach
Hausanschrift: Schönenbacher Str.4 - 51580 Reichshof Mittelagger
Telefon (0 22 65) 99 27-0 - Telefax (02265) 99 27 27

SCHROEDAHL
Spezial-Armaturen



Kunde: customer:	SAMSOMATIC GmbH
Anlagenkennzeichen: system sign:	FV101435/100-24
Bestell-Nr.: 820448	Kom.-Nr.: K03-0227.3
zul. Betriebsüberdruck: 128 bar 200 bar	Medium: Wasser water
zul. Betriebstemperatur: 565 °C 140°C	Gesamtgewicht inkl. Antrieb: ca. 180kg
Prüfdruck Pe:	
Spezifikation:	Anforderungsstufe:
Prüfvermerke: test certificates:	Prüfvermerke: test certificates:

Zugehörige Unterlagen belonging documents

Stückliste: 3DKVP080-110U-SL	Bauprüfplan:
Schweißnahtspezifikation: SP-0227.3	Berechnung: design calculation

Für diese Zeichnung behalten wir uns alle Rechte vor! All rights reserved!	Allgemeintoleranzen general tolerance ISO 2768 - m	Maßstab scale 1:2	Komm-Nr. KO3-0227.3
		Werkstoff material	Stückzahl quantity 1
	Datum date / Name name		
	Bearb. 16.06.2003 Salewski	Heißdampfkühler desuperheater	
	Gepr. 02.07.03	Typ: DKVP080/110U 2"/4" 2500lbs	
	SCHROEDAHL-ARAPP	1DKP080/110U-0	Bl. 1
Zust. Änderung Datum Name			

Pos. pos.	Anz. que	Benennung description		Zeichnungs-Nr. drawing No.	Abmessung dimension	Werkstoff material DIN 17007	DIN 17006	Bemerkung remark	Werkstoffabnahme material accep.condition Prüfungen	Belegung DIN EN10204
1	1	Gehäuse kpl.	case cpl.	2DK080/110U.01-1		X10CrMoVNb91	1.4903			
1.1	1	Gehäuse	case	2DK080/110U.01-1.1	Ø355,6x360	X10CrMoVNb91	1.4903			
1.2	1	Flansch	flange	4DK080U.01-1.2	Ø255x155	X10CrMoVNb91	1.4903			
2	1	Deckel	cover	3DK080/110U-02	Ø230x115	X10CrMoVNb91	1.4903			
2I	1	Buchse	bushing	4N30.60.35.01-2I	Ø60x35	X6CrNiNb1810	1.4550			
3	1	Verschlußdeckeldichtung	gasket		78,6x88x11,3		Grafit			
4I	1	Sieb kpl.	strainer cpl	4DK70/100-4I/U						
4I.1	1	Lochblech	perforated plate	4DK70/100FK-4I.1	Ø276x86x2	X5CrNi1810	1.4301			
4I.2	1	Feinsieb	strainer	4DK70/100FK-4I.2	Ø278x86x0,32	X5CrNi1810	1.4301			
4I.3	1	Haltering	ring guide	4DK70/100FK-4I.3	Ø108x18	X6CrNiNb18	1.4550			
4I.4	1	Haltering	ring guide	4DK70/100FK-4I.4/U	Ø90x31	X6CrNiNb18	1.4550			
6	1	Ventilspindel	valve spindle	3DN80.766.01-6	Ø30x766	X20CrNi172	1.4057			
9	1	Stopfbuchsendrücker	packing follower	4N30.46.35-9	Ø52x35	X35CrMo17	1.4122			
11	3	Packung	packing	Nr. 0901/B6	Ø46/30x8		Grafit			
11I	2	Packung	packing	Nr. 6011A	Ø46/30x8		Grafit			
12	1	Grundring	base ring	4N30.46.25.02-12	Ø45,9x25	X35CrMo17	1.4122	Vergütet/quenched		
15	4	Gewindestift	pin	DIN 913	M12x20		A2			
16	1	Gewindering	ring nut	4DG104.32-16.1	Ø104x37	X35CrMo17	1.4122			
16.1	1	Sechskantmutter	hexagon nut	DIN 439	M22x1,5		04			
17	8	Sechskantmutter	hexagon nut	DIN 2510	NF M24	24CrMo5	1.7258	*		
19	8	Stiftschraube	stud bolt	DIN 2510	HR M24x150	21CrMoV57	1.7709	*		
20	4	Distanzbolzen	distance bolt	4N16.25.390-20	Ø25x390	CK35	1.1181			
35	4	Sechskantmutter	hexagon nut	DIN 934	M16		8			
41	1	Spiraldichtung	gasket	Form FJ1	135x115	X10CrNiTi189/Grafit	1.4541/Grafit			
48	4	Sicherungsscheibe	lock washer	VS 16	Ø24/17x2	50CrV4	1.8159			

Kunde: customer:
SAMSOMATIC GmbH

Anlagenkennzeichen: identifikation note:
FV101435 / 100-24

Bestell-Nr.: order No.:
820 448

Zulässiger Betriebsüberdruck: allowable working pressure:
128 bar 200 bar

Zulässige Betriebstemperatur: allow. Working temperature:
565 °C 140 °C

Spezifikation: spezification:

Anforderungsstufe: valve class:

Prüfvermerk: test mark:

Prüfvermerk: test mark:

Zugehörige Zeichnungs-Nr.: belonging drawing No.:
1DKP080/110U-0

* Verzinkt und olivchromatiert
zink galvanized and olivchromatized

Prüfungen:
C = Chemische Analyse — chemical analysis -
M = Mechanische Erprobung — destructive testing -
US = Ultraschallprüfung — ultrasonic examination -
MP = Magnetpulverprüfung — magnetic particle inspection -
H = Härteprüfung — hardeness traverse -
B+M = Besichtigung und Maßkontrolle — approval and dimension test -
W = Wärmebehandlung — heat treatment for properties -

⑧ ⑦ ⑥ ⑤ ④ ③ ② ①

Dateiname: K03-0227-1.doc

	Datum/date	Name/name
Bearbei.: wrought:	26.06.03	Giebeler
Geprüft: checked:	07.07.03	Stöckl

SCHROEDAHL-ARAPP
Spezialarmaturen GmbH & Co. KG
51580 Reichshof - Mittelagger

Stückzahl: 1 quantity:
Kom.-Nr.: K03-0227.3 com. No.:

Stückliste / Item List

Typ: DKP080/110U
2" / 4" 2500lbs RF

3DKP080/110U-St

Blatt 1 von 2

Pos. pos.	Anz. qty	Benennung description		Zeichnungs-Nr. drawing No.	Abmessung dimension	Werkstoff material DIN 17007	Werkstoff material DIN 17006	Bemerkung remark	W... stoffabnahme material accep.condition ...ifungen	Belegung DIN EN10204
50	1	Regelkolben	control pistom	4DK80/110U-50	Ø39,8X297	X35CrMo17	1.4122	Vergütet/quenched		
51	1	Sprühkopf	spray head	3S80.180.23-51.1	Ø74,5x180	X10Cr13	1.4006			
51.2	1	Einsatz	insert	4D80.043.01-51.2	Ø43x8	X10Cr13	1.4006			
52	4	Stiftschraube	studt bolt	4N12.90-52	Ø12x90	21CrMoV57	1.7709	*		
53	1	Stopfbuchsscheibe	gland	4N32.53.30.1-53	Ø100x30	X10CrMoVNb91	1.4903			
54	4	Sechskantmutter	hexagon nut	DIN 2510	NF M12	24CrMo5	1.7258	*		
55	1	Einsatz	insert	2DN94.562.01-55	Ø96x568	X10CrMoVNb91	1.4903			
56	1	Stift	pin	4DK70/100FK-56	Ø6x7	X5CrNi1810	1.4301			
57	1	Stift	pin	4N6.33-46	Ø6x33	X5CrNi1810	1.4301			
58.0	1	Einsatz	insert	4DK10A-58.0	Ø14x13,4	X5CrNi1810	1.4301			
58.1	1	Einsatz	insert	4DK10A-58.1	Ø14x13,4	X5CrNi1810	1.4301			
58.2	1	Einsatz	insert	4DK10A-58.2	Ø14x13,4	X5CrNi1810	1.4301			
58.3	1	Einsatz	insert	4DK10A-58.3	Ø14x13,4	X5CrNi1810	1.4301			
59.0	1	Düse	nozzle	4DK10A-59.0	Ø18x13,4	X5CrNi1810	1.4301			
59.1	1	Düse	nozzle	4DK10A-59.1	Ø18x13,4	X5CrNi1810	1.4301			
59.3	1	Düse	nozzle	4DK10A-59.3	Ø18x13,4	X5CrNi1810	1.4301			
59.4	3	Düse	nozzle	4DK10A-59.4	Ø18x13,4	X5CrNi1810	1.4301			
61	3	Kolbenring	piston ring	R001E	Ø40/36,6x3,5	X22CrMoV121	1.4923			
70	1	Gewindestift	pin	DIN 914	M6x10		A2-70			
70.1	1	Hubanzeige	strokr index	4N25.75-70	25x75		Alu			
121	1	Anbauflansch	flange	4N60.170.35-21	Ø170/60x35	C22.8	1.0460			

Kunde: customer: SAMSOMATIC GmbH

Anlagenkennzeichen: identifikation note: FV101435 / 100-24

Bestell-Nr.: order No.: 820 448

Zulässiger Betriebsüberdruck: allowable working pressure: 128 bar 200 bar

Zulässige Betriebstemperatur: allow. Working temperature: 565 °C 140 °C

Spezifikation: spezification:

Anforderungsstufe: valve class:

Prüfvermerk: test mark:

Prüfvermerk: test mark:

Zugehörige Zeichnungs-Nr.: belonging drawing No.: 1DKP080/110U-0

* Verzinkt und olivchromatiert
zink galvanized and olivchromatized

Prüfungen:

- C = Chemische Analyse — chemical analysis -
- M = Mechanische Erprobung — destructive testing -
- US = Ultraschallprüfung — ultrasonic examination -
- MP = Magnetpulverprüfung — magnetic particle inspection -
- H = Härteprüfung — hardeness traverse -
- B+M = Besichtigung und Maßkontrolle — approval and dimension test -
- W = Wärmebehandlung — heat treatment for properties -

⑧ ⑦ ⑥ ⑤ ④ ③ ② ①

Dateiname: K03-0227-3.doc

	Datum/date	Name/name
Bearbei.: wrought:	26.06.03	Giebeler
Geprüft: checked:	07.07.03	Stickel

SCHROEDAHL-ARAPP
Spezialarmaturen GmbH & Co. KG
51580 Reichshof - Mittelagger

Stückzahl: 1 Quantity:

Kom.-Nr.: K03-0227.3 com. No.:

Stückliste / Item List

Typ: DKP080/110U

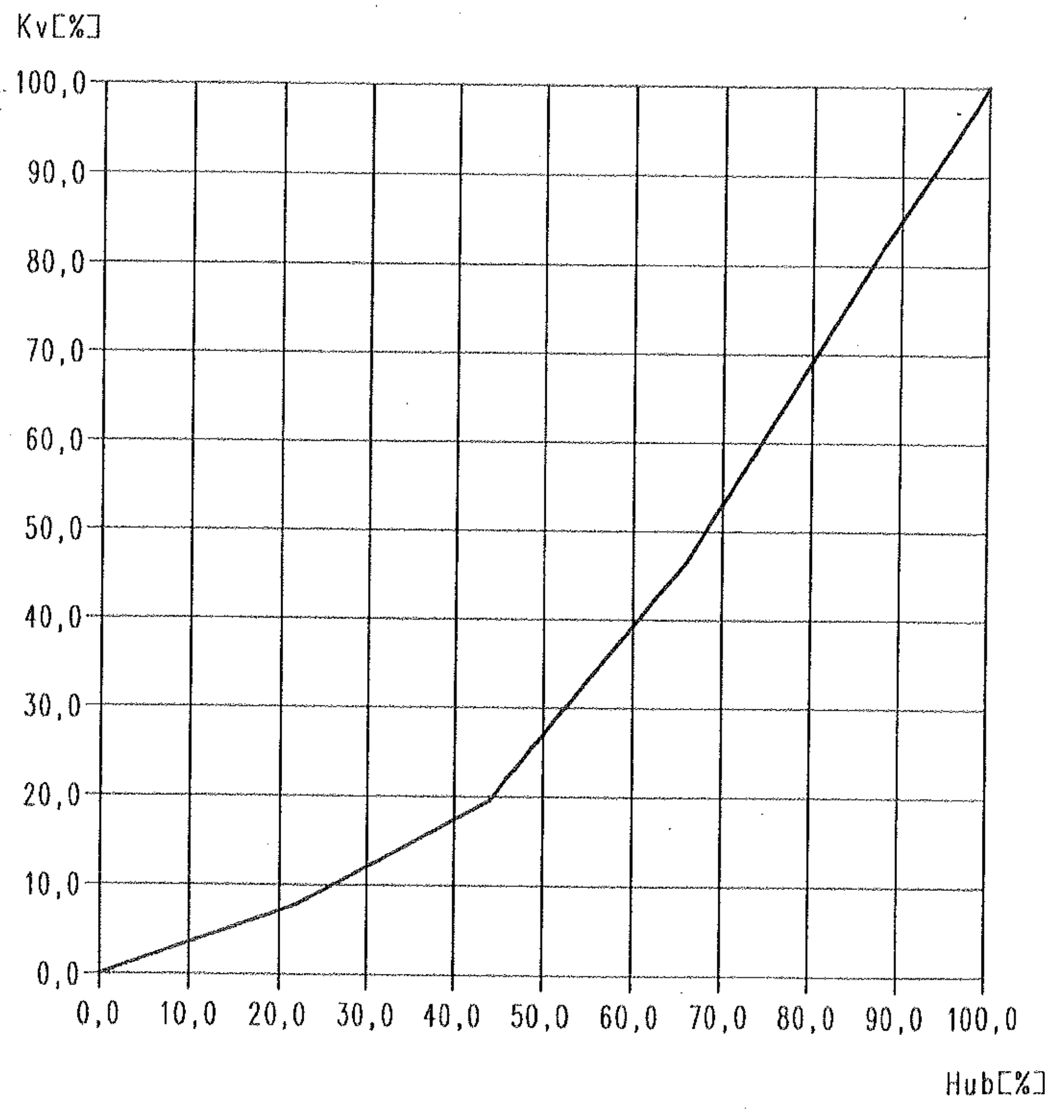
2" / 4" 2500lbs RF

3DKP080/110U-St

Blatt 2 von 2

ARAPP - REGELVENTIL BAUGRUPPE
ARAPP - CONTROL - VALVE COMPONENT - GROUP DKV

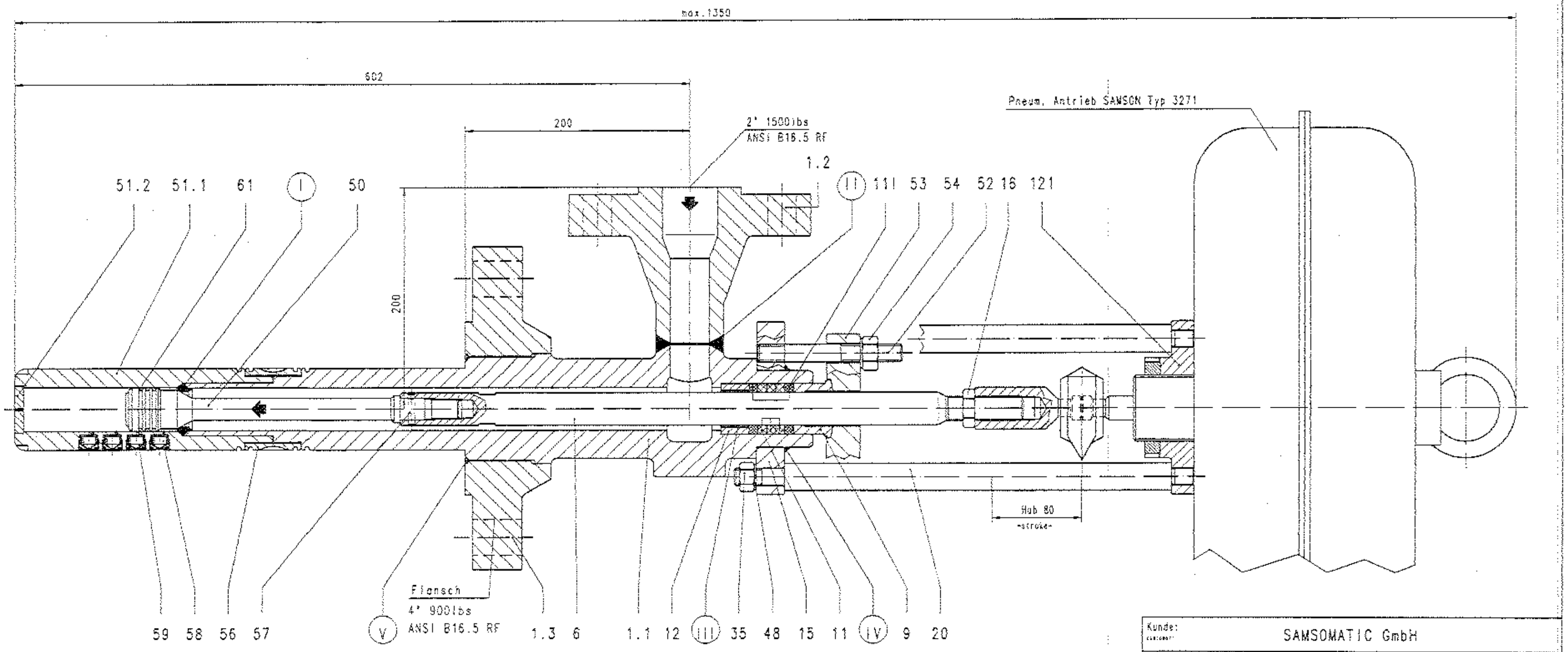
Kunde: customer: SAMSOMATIC GmbH	Kom.: work-no.: K03-0227.3 Stück: quantity: 1
Anlagengruppe: project-group:	Type: type: DKVP080/110U DN: 2"/4" PN: 2500lbs
Anlagenkennzeichen: project-charecteristic: FV101435 / 100-24	Hub: stroke: 32 mm
	Kvs: kvs: 2,7 m^3/h



Zust Index	Änderung revision	Datum date	Bearb. draw.	Gepr. checked
4				
3				
2				
1				
0	Erstellung	07.07.03	Giebler	Seidel

Schroedahl-Arapp Spezial-Armaturen GmbH & Co KG - Postfach 10 08 44 - D-51608 Gummersbach
Hausanschrift: Schönenbacher Str.4 - 51580 Reichshof Mittelagger
Telefon (0 22 65) 99 27-0 - Telefax (02265) 99 27 27

SCHROEDAHL Spezial-Armaturen



Kunde: customer:	SAMSOMATIC GmbH
Anlagenkennzeichen: system sign:	FV150610 / 150 - 02
Bestell-Nr.: order no.: 973356 4053 / 742	Kom.-Nr.: comm.no.: K03-0227.4
zul. Betriebsüberdruck: allowable working pressure: 54 bar 98 bar	Medium: medium: Wasser water
zul. Betriebstemperatur: allowable working temperature: 500°C 160°C	Gesamtgewicht inkl. Antrieb: weight incl. act. actuator: ca. 150kg
Prüfdruck Pe: test pressure:	
Spezifikation: specification:	Anforderungsstufe: class of req.:
Prüfvermerke: test certificates:	Prüfvermerke: test certificates:

Zugehörige Unterlagen belonging documents

Stückliste: item list: 1DKVP088-117U-St	Bauprüfplan: test and exam. requ. plan:
Schweißnahtspezifikation: welding specification: SP-0227.2	Berechnung: design calculation:

Allgemeintoleranzen general tolerance ISO 2768 - m

Maßstab scale 1:2 | Komm-Nr comm-no. K03-0227.4

Werkstoff material | Stückzahl quantity 1

	Datum date	Name name
Bearb. drawn	05.05.2003	
Gepr. checked		

SCHROEDAHL-ARAPP
Spezialarmaturen GmbH u. Co.KG
51580 Reichshof-Mittelagger

Heißdampfkühler

desuperheater

2"/4" 1500/900lbs AMSE B16.5

1DKVP088/117U-0

Zust. Änderung Datum Name
issue revision date name

Urspr. | Ers. für: | Ers. durch:

Pos. pos.	Ar qu	Benennung description		Zeichnungs-Nr. drawing No.	Abmessung dimension	Werkstoff material DIN 17007	DIN 17006	Bemerkung remark	W *offabnahme material accep.condition ungen	Belegung DIN EN10204
1	1	Gehäuse kpl.	case cpl.	2DKV088/117U.02-1		15Mo3	1.5415			
1.1	1	Gehäuse	case	2DKV088/17U.02-1.1	Ø125x573	15Mo3	1.5415			
1.2	1	Flansch	flange	4DKV088U-1.2	Ø215,9x152,5	15Mo3	1.5415			
1.3	1	Flansch	flange	4DKV117U.02-1.4	Ø292,1x77,4	15Mo3	1.5415			
6	1	Ventilspindel	valve spindle	3DN80.556.01-6	Ø30x556	X22CrNi17	1.4057			
9	1	Stopfbuchsendrücker	packing-follower	4N30.46.35-9	Ø52x35	X35CrMo17	1.4122	vergütet/quenched		
11	3	Packungsring	packing	Art. 901/B6	Ø46/30x8		Grafit			
11I	2	Packungsring	packing	Art. 6011A	Ø46/30x8		Grafit			
12	1	Grundring	base ring	4N30.46.25-12/1	Ø46x25	X6CrNiNb1810	1.4550	Vordrehmaß:Ø70x33		
15	1	Anbauflansch	flange	4N70.157.25.01-21	Ø157x25	15Mo3	1.5415			
16	1	Sechskantmutter	hexagon nut	DIN 439	M22x1,5		8	*		
20	4	Distanzbolzen	distance bolt	4N16.25.410-20	Ø25x410	Ck35	1.1181	*		
35	4	Sechskantmutter	hexagon nut	DIN 934	M16		8	*		
48	4	Sicherungsscheibe	lock washer	VS 16	Ø24/17x2	50Cr4	1.8159	*		
50	1	Regelkolben	control piston	4D80.297.01-50	Ø39,8x297	X35CrMo17	1.4122			
51	1	Sprühkopf kpl.	spray head cpl.							
51.1	1	Sprühkopf	spray head	3D80.230.04-51.1	Ø74,5x180	X10Cr13	1.4006			
51.2	1	Einsatz	insert	~~4~~D80.043.01-51.2	Ø43x8	X10Cr13	1.4006			
52	2	Stiftschraube	stud bolt	4N16.130-52	Ø16x130	21CrMoV57	1.7709	*		
53	1	Stopfbuchsenscheibe	gland	4N32.53.30.04-53	30x60x135	15Mo3	1.5415	*		
54	2	Sechskantmutter	hexagon nut	DIN 2510	NF M16	24CrMo5	1.7258	*		

Kunde: customer:
SAMSOMATIC GmbH

Anlagenkennzeichen: identifikation note:
FV150610 / 150-02

Bestell-Nr.: order No.:
820 448

Zulässiger Betriebsüberdruck: allowable working pressure:
54 bar 98 bar

Zulässige Betriebstemperatur: allow. Working temperature:
500 °C 160 °C

Spezifikation: spezification:

Anforderungsstufe: valve class:

Prüfvermerk: test mark:

Prüfvermerk: test mark:

Zugehörige Zeichnungs-Nr.: belonging drawing No.:
1DKVP088/117U-0

* Verzinkt und olivchromatiert
zink galvanized and olivchromatized

Prüfungen:

C	= Chemische Analyse	chemical analysis	-
M	= Mechanische Erprobung	destructive testing	-
US	= Ultraschallprüfung	ultrasonic examination	-
MP	= Magnetpulverprüfung	magnetic particle inspection	-
H	= Härteprüfung	hardeness traverse	-
B+M	= Besichtigung und Maßkontrolle	approval and dimension test	-
W	= Wärmebehandlung	heat treatment for properties	-

⑧ ⑦ ⑥ ⑤ ④ ③ ② ①

Dateiname: K03-0227-4.doc

	Datum/date	Name/name
Bearbei.: wrought:	28.06.03	Giebeler
Geprüft: checked:	03.07.03	Seidel

SCHROEDAHL-ARAPP
Spezialarmaturen GmbH & Co. KG
51580 Reichshof - Mittelagger

Stückzahl: 1 Quantity:

Kom.-Nr.: K03-0227.4 com. No.:

Stückliste / Item List

Typ: DKVP088/117U

2"/4" 1500/900 lbs

3DKVP088/117U-St

Blatt 1 von 2

Pos. pos.	Anz. q[illegible]	Benennung description		Zeichnungs-Nr. drawing No.	Abmessung dimension	Werkstoff material DIN 17007	Werkstoff material DIN 17006	Bemerkung remark	W[illegible]stoffabnahme material accep.condition [illegible]üfungen	Belegung DIN EN10204
56	1	Spannmutter	compression nut	4D80.050.01-53	Ø74,8x50	X10Cr13	1.4006			
57	1	Stift	pin	4N6.33-46	Ø6x33	X5CrNi189	1.4301			
58.1	1	Einsatz	insert	4DK10A-58.1	Ø14x13,4	X5CrNi189	1.4301			
58.2	1	Einsatz	insert	4DK10A-58.2	Ø14x13,4	X5CrNi189	1.4301			
58.3	10	Einsatz	insert	4DK10A-58.3	Ø14x13,4	X5CrNi189	1.4301			
59.2	1	Düse	nozzle	4DK10A-59.2	Ø18x13,5	X5CrNi134	1.4313			
59.3	1	Düse	nozzle	4DK10A-59.3	Ø18x13,5	X5CrNi134	1.4313			
59.4	10	Düse	nozzle	4DK10A-59.4	Ø18x13,5	X5CrNi134	1.4313			
61	3	Kolbenring	piston ring	R001E	Ø40/36,6x3,5	X22CrMoV121	1.4923			
70	1	Hubanzeige	Stroke index	4N25.75-70	25x70x					
121	1	Anbauflansch	flange	4N60.157.30-21	Ø157x20	C22.8	1.0460	*		

Kunde: customer:
SAMSOMATIC GmbH

Anlagenkennzeichen: identification note:
FV150610 / 150-02

Bestell-Nr.: order No.:
820 448

Zulässiger Betriebsüberdruck: allowable working pressure:
54 bar 98 bar

Zulässige Betriebstemperatur: allow. Working temperature:
500 °C 160 °C

Spezifikation: spezification:

Anforderungsstufe: valve class:

Prüfvermerk: test mark:

Prüfvermerk: test mark:

Zugehörige Zeichnungs-Nr.: belonging drawing No.:
1DKVP088/117U-0

* Verzinkt und olivchromatiert
zink galvanized and olivchromatized

Prüfungen:

C	= Chemische Analyse	chemical analysis -
M	= Mechanische Erprobung	destructive testing -
US	= Ultraschallprüfung	ultrasonic examination -
MP	= Magnetpulverprüfung	magnetic particle inspection -
H	= Härteprüfung	hardeness traverse -
B+M	= Besichtigung und Maßkontrolle	approval and dimension test -
W	= Wärmebehandlung	heat treatment for properties -

⑧ ⑦ ⑥ ⑤ ④ ③ ② ①

Dateiname: K03-0227-4.doc

	Datum/date	Name/name
Bearbei.: wrought:	28.06.03	Giebeler
Geprüft: checked:	03.07.03	Stidl

SCHROEDAHL-ARAPP
Spezialarmaturen GmbH & Co. KG
51580 Reichshof - Mittelagger

Stückzahl: 1 quantity:
Kom.-Nr.: K03-0227.4 Com. No.:

Stückliste / Item List

Typ: DKVP088/117U

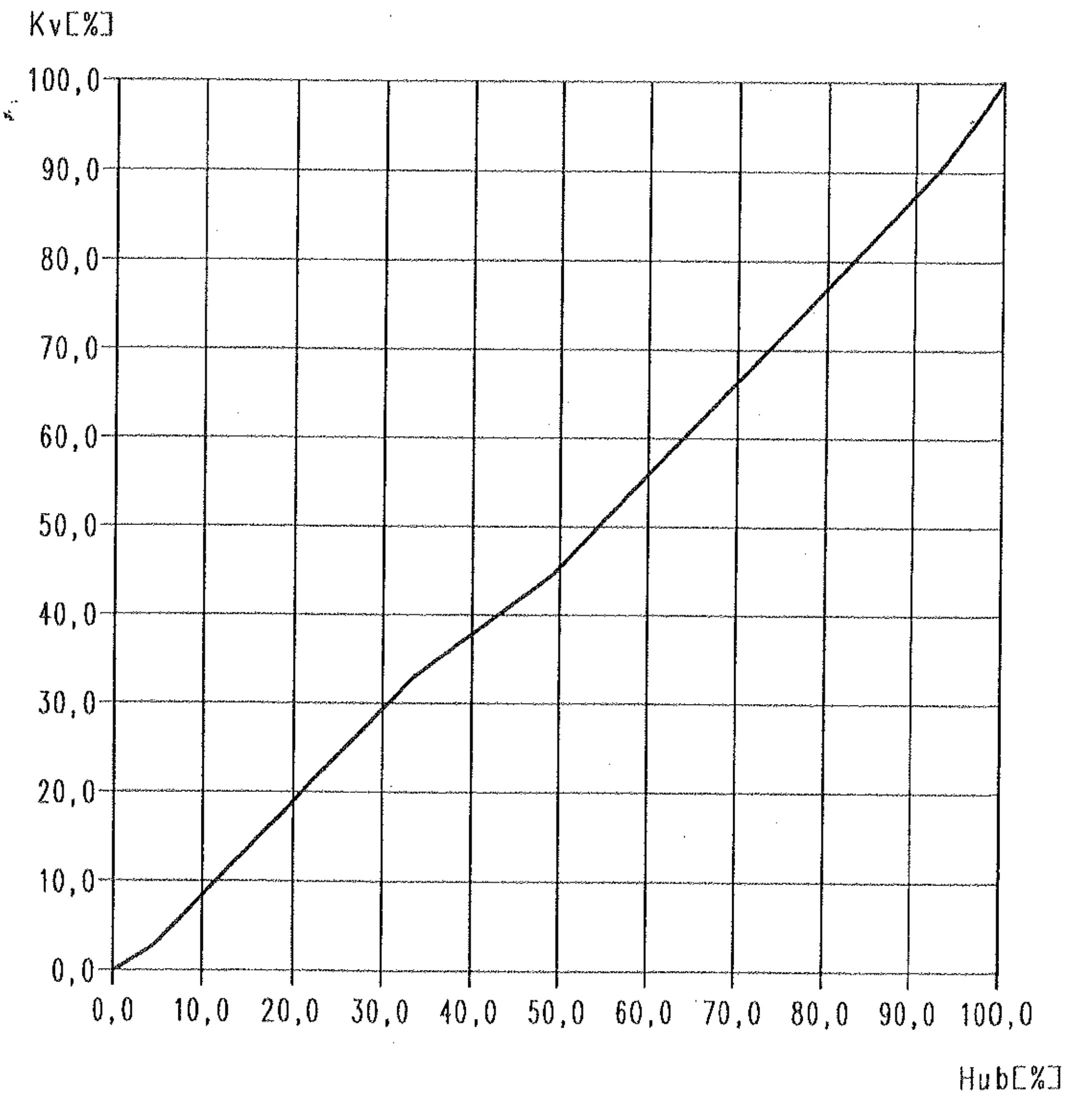
2"/4" 1500/900 lbs

3DKVP088/117U-St

Blatt 2 von 2

ARAPP - REGELVENTIL BAUGRUPPE DKV
ARAPP - CONTROL - VALVE COMPONENT - GROUP

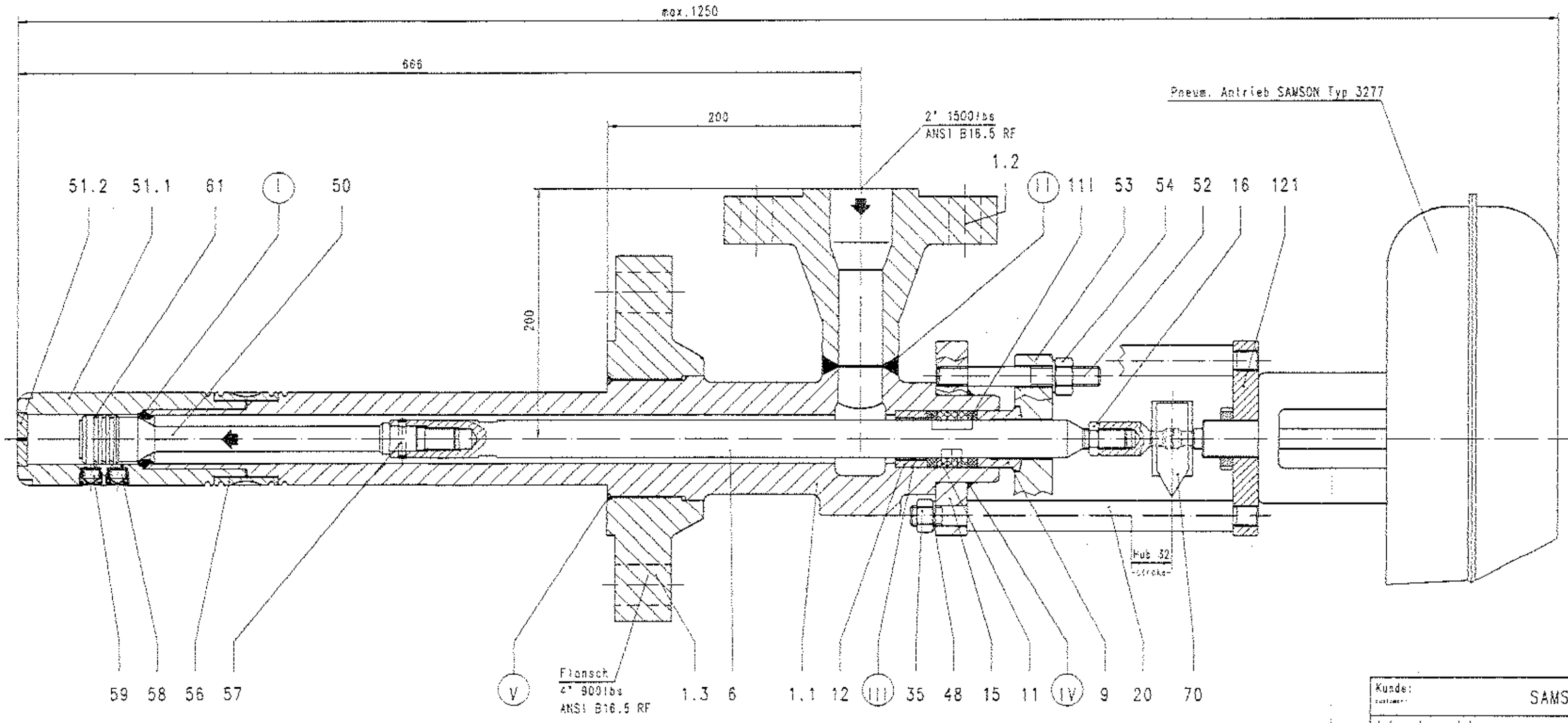
Kunde: / customer: SAMSOMATIC GmbH	Kom.: / work-no.: K03-0227.4 Stück: / quantity: 1
Anlagengruppe: / project-group:	Type: / type: DKVP088/117U DN: 2"/4" PN: 1500/900lbs
Anlagenkennzeichen: / project-charecteristic: FV150610 / 150-02	Hub: / stroke: 80 mm
	Kvs: / kvs: 9,5 m^3/h



Zust Index	Änderung revision	Datum date	Bearb. draw.	Gepr. checked
4				
3				
2				
1				
0	Erstellung	28.06.03	Giebel	Sei

Schroedahl-Arapp Spezial-Armaturen GmbH & Co KG - Postfach 10 08 44 - D-51608 Gummersbach
Hausanschrift: Schönenbacher Str.4 - 51580 Reichshof Mittelagger
Telefon (0 22 65) 99 27-0 - Telefax (02265) 99 27 27

SCHROEDAHL
Spezial-Armaturen



Kunde: customer:	SAMSOMATIC GmbH		
Anlagenkennzeichen: system sign:	FV150630 / 150-03		
Bestell-Nr.: order-no.:	820 448	Kom.-Nr.: com.-no.:	K03-0227.5
zul. Betriebsüberdruck: allowable working pressure:	54 bar/98 bar	Medium: medium:	Wasser water
zul. Betriebstemperatur: allowable working temperature:	500°C/160 °C	Gesamtgewicht inkl. Antrieb: weight incl. actuator:	ca.90kg
Prüfdruck Pe: test pressure:			
Spezifikation: specification:		Anforderungsstufe:	
Prüfvermerke: test certificates:		Prüfvermerke: test certificates:	

Zugehörige Unterlagen belonging documents

Stückliste: item list:	3DKVP088-117U-St	Bauprüfplan:	
Schweißnahtspezifikation: welding specification:	SP-0227.2	Berechnung: design calculation:	

Für diese Zeichnung behalten wir uns alle Rechte vor! All rights reserved!	Allgemeintoleranzen general tolerance ISO 2768 - m	Maßstab scale 1:2	Komm-Nr. com-no. K03-0227.5
		Werkstoff material	Stückzahl quantity 1

	Datum date	Name name
Bearb. draw	16.06.2003	
Gepr. checked		Stöckl

SCHROEDAHL-ARAPP

Heißdampfkühler
desuperheater
2"/4" 1500/900lbs ASME B16.5

1DKVP088/117U-0

Bl. 1 von 1

Zust.	Änderung revision	Datum date	Name name

Pos. pos.	Anz. qu.	Benennung description	Zeichnungs-Nr. drawing No.	Abmessung dimension	Werkstoff material DIN 17007	Werkstoff material DIN 17006	Bemerkung remark	Werkstoffabnahme material accep.condition ...ungen	Belegung DIN EN10204
1	1	Gehäuse kpl. case cpl.	2DKV088/117U.01-1		15Mo3	1.5415			
1.1	1	Gehäuse case	2DKV088/17U.01-1.1	Ø125x687	15Mo3	1.5415			
1.2	1	Flansch flange	4DKV088U-1.2	Ø215,9x152,5	15Mo3	1.5415			
1.3	1	Flansch flange	4DKV117U.02-1.4	Ø292,1x77,4	15Mo3	1.5415			
6	1	Ventilspindel valve spindle	3DN80.583.01-6	Ø30x583	X22CrNi17	1.4057			
9	1	Stopfbuchsendrücker packing-follower	4N30.46.35-9	Ø52x35	X35CrMo17	1.4122	vergütet/quenched		
11	3	Packungsring packing	Art. 901/B6	Ø46/30x8		Grafit			
11I	2	Packungsring packing	Art. 6011A	Ø46/30x8		Grafit			
12	1	Grundring base ring	4N30.46.25-12/1	Ø46x25	X6CrNiNb1810	1.4550	Vordrehmaß:Ø70x33		
15	1	Anbauflansch flange	4N70.157.25-21	Ø157x25	15Mo3	1.5415			
16	1	Sechskantmutter hexagon nut	DIN 439	M16x1,5		8	*		
20	2	Distanzbolzen distance bolt	4N16.25.275.03-20	Ø25x275	Ck35	1.1181	*		
35	2	Sechskantmutter hexagon nut	DIN 934	M16		8	*		
48	2	Sicherungsscheibe lock washer	VS 16	Ø24/17x2	50Cr4	1.8159	*		
50	1	Regelkolben control piston	4D80.297.01-50	Ø39,8x297	X35CrMo17	1.4122			
51	1	Sprühkopf kpl. spray head cpl.							
51.1	1	Sprühkopf spray head	3D80.180.12-51.1	Ø74,5x180	X10Cr13	1.4006			
51.2	1	Einsatz insert	4D80.043.01-51.2	Ø43x8	X10Cr13	1.4006			
52	2	Stiftschraube stud bolt	4N16.130-52	Ø16x130	21CrMoV57	1.7709	*		
53	1	Stopfbuchsenscheibe gland	4N32.53.30.04-53	30x60x135	15Mo3	1.5415	*		
54	2	Sechskantmutter hexagon nut	DIN 2510	NF M16	24CrMo5	1.7258	*		

Kunde: customer: SAMSOMATIC GmbH

Anlagenkennzeichen: identifikation note: FV150630 / 150-03

Bestell-Nr.: order No.: 820 448

Zulässiger Betriebsüberdruck: allowable working pressure: 54 bar 98 bar

Zulässige Betriebstemperatur: allow. Working temperature: 500 °C 160 °C

Spezifikation: spezification:

Anforderungsstufe: valve class:

Prüfvermerk: test mark:

Prüfvermerk: test mark:

Zugehörige Zeichnungs-Nr.: belonging drawing No.: 1DKVP088/117U-0

* Verzinkt und olivchromatiert
zink galvanized and olivchromatized

Prüfungen:

C	= Chemische Analyse	chemical analysis -
M	= Mechanische Erprobung	destructive testing -
US	= Ultraschallprüfung	ultrasonic examination -
MP	= Magnetpulverprüfung	magnetic particle inspection -
H	= Härteprüfung	hardeness traverse -
B+M	= Besichtigung und Maßkontrolle	approval and dimension test -
W	= Wärmebehandlung	heat treatment for properties -

⑧ ⑦ ⑥ ⑤ ④ ③ ② ①

Dateiname: K03-0227-5.doc

	Datum/date	Name/name
Bearbei.: wrought:	28.06.03	Giebeler
Geprüft: checked:	03.07.03	Seidel

SCHROEDAHL-ARAPP
Spezialarmaturen GmbH & Co. KG
51580 Reichshof - Mittelagger

Stückzahl: 1 Quantity:

Kom.-Nr.: K03-0227.5 com. No.:

Stückliste / Item List

Typ: DKVP088/117U

2"/4" 1500/900 lbs

3DKVP088/117U-St

Blatt 1 von 2

Pos. pos.	Anz.	Benennung description		Zeichnungs-Nr. drawing No.	Abmessung dimension	Werkstoff material DIN 17007	DIN 17006	Bemerkung remark	Werkstoffabnahme material accep.condition Prüfungen	Belegung DIN EN10204
56		Spannmutter	compression nut	4D80.050.01-53	Ø74,8x50	X10Cr13	1.4006			
57	1	Stift	pin	4N6.33-46	Ø6x33	X5CrNi189	1.4301			
58.0	1	Einsatz	insert	4DK10A-58.0	Ø14x13,4	X5CrNi189	1.4301			
58.1	3	Einsatz	insert	4DK10A-58.1	Ø14x13,4	X5CrNi189	1.4301			
58.2	1	Einsatz	insert	4DK10A-58.2	Ø14x13,4	X5CrNi189	1.4301			
58.4	1	Einsatz	insert	4DK10A-58.4	Ø14x13,4	X5CrNi189	1.4301			
59.0	2	Düse	nozzle	4DK10A-59.0	Ø18x13,5	X5CrNi134	1.4313			
59.1	1	Düse	nozzle	4DK10A-59.1	Ø18x13,5	X5CrNi134	1.4313			
59.2	1	Düse	nozzle	4DK10A-59.2	Ø18x13,5	X5CrNi134	1.4313			
59.3	2	Düse	nozzle	4DK10A-59.3	Ø18x13,5	X5CrNi134	1.4313			
61	3	Kolbenring	piston ring	R001E	Ø40/36,6x3,5	X22CrMoV121	1.4923			
70	1	Hubanzeige	Stroke index	4N25.75-70	25x70x					
121	1	Anbauflansch	flange	4N30.157.20-21	Ø157x20	C22.8	1.0460	*		

Kunde: customer:
SAMSOMATIC GmbH

Anlagenkennzeichen: identification note:
FV150630 / 150-03

Bestell-Nr.: order No.:
820 448

Zulässiger Betriebsüberdruck: allowable working pressure:
54 bar 98 bar

Zulässige Betriebstemperatur: allow. Working temperature:
500 °C 160 °C

Spezifikation: spezification:

Anforderungsstufe: valve class:

Prüfvermerk: test mark:

Prüfvermerk: test mark:

Zugehörige Zeichnungs-Nr.: belonging drawing No.:
1DKVP088/117U-0

* Verzinkt und olivchromatiert
zink galvanized and olivchromatized

Prüfungen:

C	= Chemische Analyse	chemical analysis -
M	= Mechanische Erprobung	destructive testing -
US	= Ultraschallprüfung	ultrasonic examination -
MP	= Magnetpulverprüfung	magnetic particle inspection -
H	= Härteprüfung	hardness traverse -
B+M	= Besichtigung und Maßkontrolle	approval and dimension test -
W	= Wärmebehandlung	heat treatment for properties -

⑧ ⑦ ⑥ ⑤ ④ ③ ② ①

Dateiname: K03-0227-5.doc

	Datum/date	Name/name
Bearbei.: wrought:	28.06.03	Giebeler
Geprüft: checked:	03.07.03	Seidel

SCHROEDAHL-ARAPP
Spezialarmaturen GmbH & Co. KG
51580 Reichshof - Mittelagger

Stückzahl: 1 quantity:
Kom.-Nr.: K03-0227.5 Com. No.:

Stückliste / Item List

Typ: DKVP088/117U

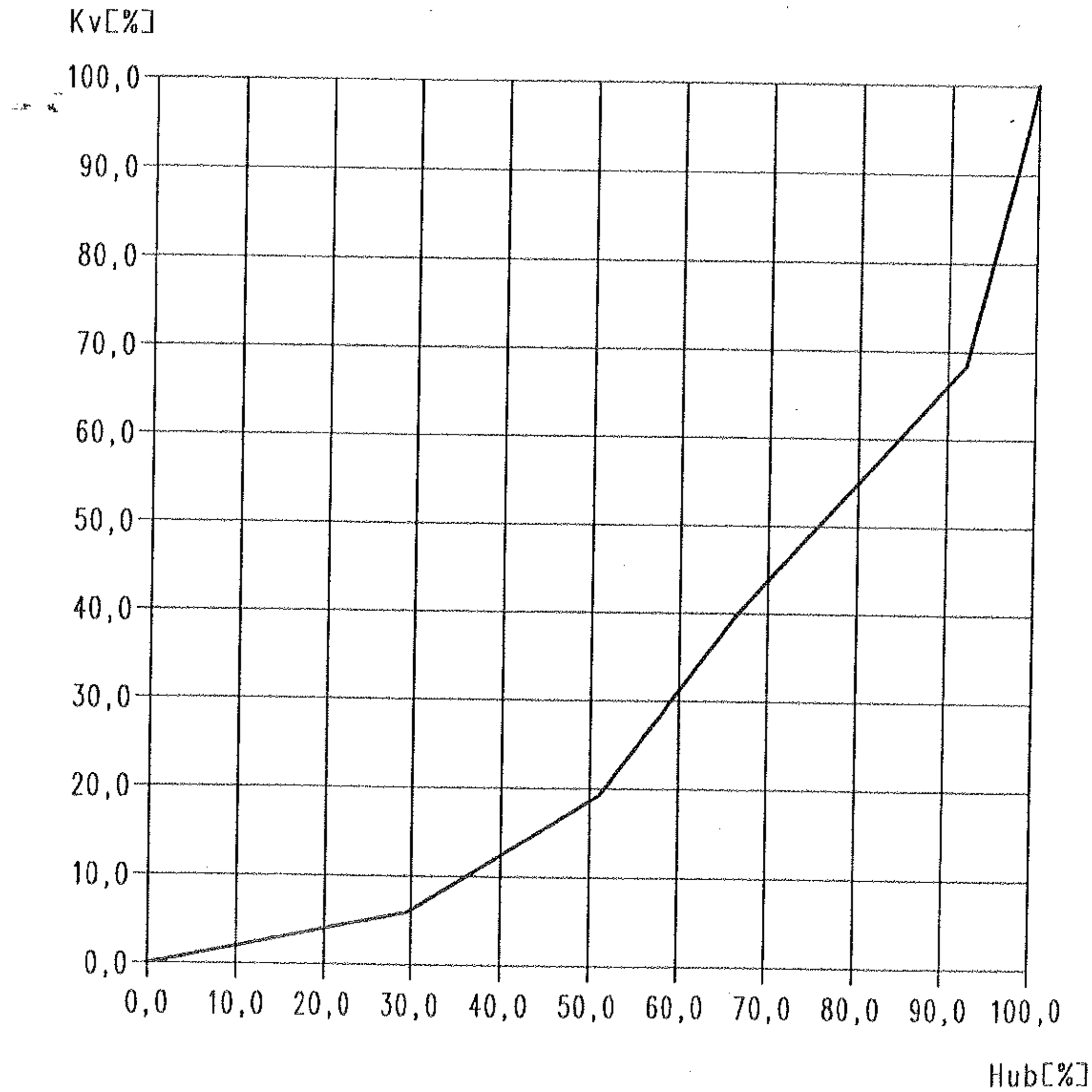
2"/4" 1500/900 lbs

3DKVP088/117U-St

Blatt 2 von 2

ARAPP - REGELVENTIL BAUGRUPPE DKV
ARAPP - CONTROL - VALVE COMPONENT - GROUP

Kunde: / customer: SAMSOMATIC GmbH	Kom.: / work-no.: K03-0227.5 — Stück: / quantity: 1
Anlagengruppe: / project-group:	Type: / type: DKVP088/117U DN: 2"/4" PN: 1500/900lbs
Anlagenkennzeichen: / project-charecteristic: FV150630 / 150-03	Hub: / stroke: 32 mm
	Kvs: / kvs: 1,2 m^3/h



Zust Index	Änderung revision	Datum date	Bearb. draw.	Gepr. checked
4				
3				
2				
1				
0	Erstellung	28.06.03	Giebe	Se.

Schroedahl-Arapp Spezial-Armaturen GmbH & Co KG - Postfach 10 08 44 - D-51608 Gummersbach
Hausanschrift: Schönenbacher Str.4 - 51580 Reichshof Mittelagger
Telefon (0 22 65) 99 27-0 - Telefax (02265) 99 27 27

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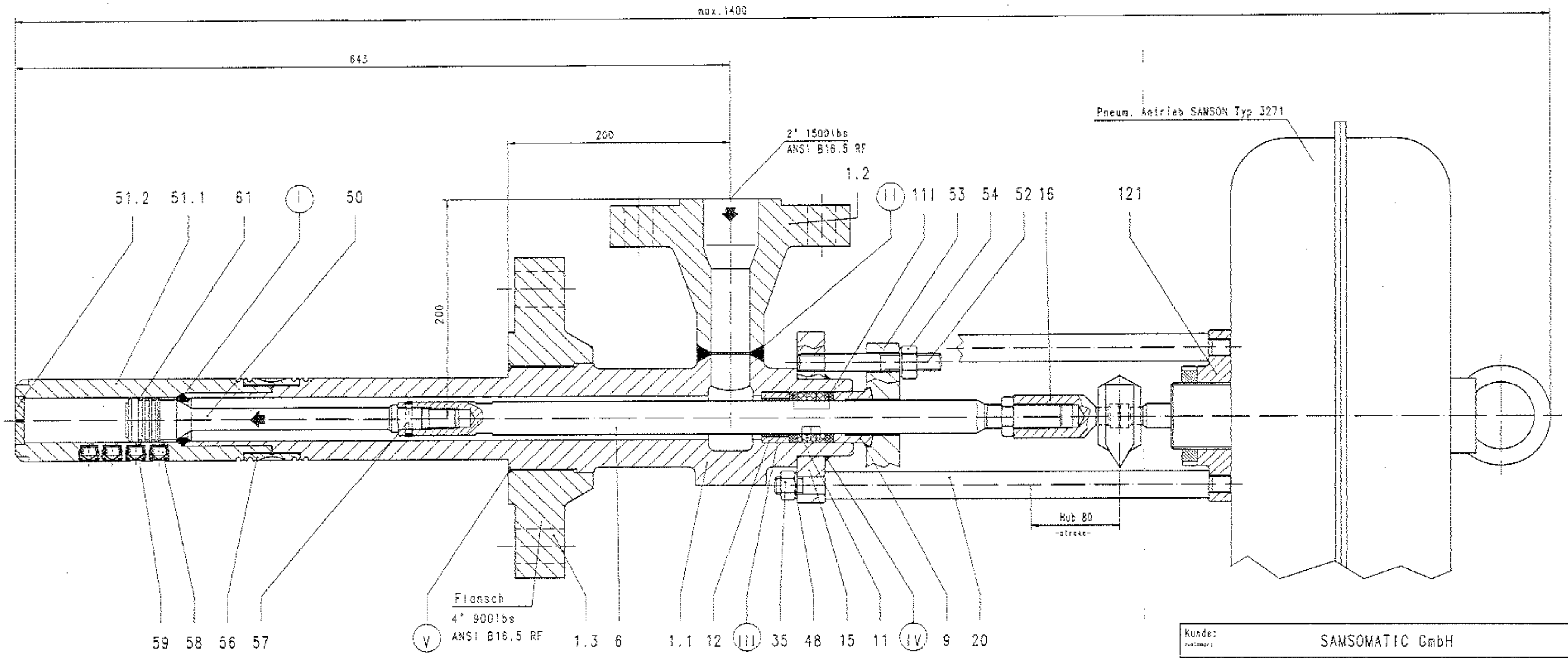
Spezial-Armaturen



Kunde: customer	SAMSOMATIC GmbH
Anlagenkennzeichen: system sign	FV15636 / 150 - 04
Bestell-Nr.: 973356 4053 / 742	Kom.-Nr.: K03-0227.6
zul. Betriebsüberdruck: allowable working pressure 54 bar 98 bar	Medium: Wasser water
zul. Betriebstemperatur: allowable working temperature 500°C 160°C	Gesamtgewicht inkl. Antrieb: weight incl. actuator ca. 150kg
Prüfdruck Pe: test pressure	
Spezifikation: specification	Anforderungsstufe:
Prüfvermerke: test certificates	Prüfvermerke:

Zugehörige Unterlagen belonging documents

Stückliste: part list SDKVP088-117U-St	Bauprüfplan: test and exam. sequ. plan
Schweißnahtspezifikation: welding specification SF-0227.2	Berechnung: design calculation

Für diese Zeichnung behalten wir uns alle Rechte vor! All rights reserved!	Allgemeintoleranzen general tolerance ISO 2768 - m	Maßstab scale 1:2	Komm-Nr. comm-no. K03-0227.6
		Werkstoff material	Stückzahl quantity 1

	Datum date	Name name
Bearb. drawn	15.06.2005	Grasshoff
Gepr. checked	15.07.2005	Sattl

SCHROEDAHL-ARAPP
Spezialarmaturen GmbH u. Co. KG

Heißdampfkühler
desuperheater
2"/4" 1500/900lbs ASME B16.5

1DKVP088/117U-0

Bl. 1

Zust. index	Änderung revision	Datum date	Name name

Pos. pos.	Anz. qty	Benennung	description	Zeichnungs-Nr. drawing No.	Abmessung dimension	Werkstoff material DIN 17007	DIN 17006	Bemerkung remark	Werkstoffabnahme material accep.condition Prüfungen	Belegung DIN EN10204
1		Gehäuse kpl.	case cpl.	2DKV088/117U.03-1		15Mo3	1.5415			
1.1	1	Gehäuse	case	2DKV088/117U.03-1.1	Ø125x614	15Mo3	1.5415			
1.2	1	Flansch	flange	4DKV088U-1.2	Ø215,9x152,5	15Mo3	1.5415			
1.3	1	Flansch	flange	4DKV117U.02-1.4	Ø292,1x77,4	15Mo3	1.5415			
6	1	Ventilspindel	valve spindle	3DN80.597.02-6	Ø30x597	X22CrNi17	1.4057			
9	1	Stopfbuchsendrücker	packing-follower	4N30.46.35-9	Ø52x35	X35CrMo17	1.4122	vergütet/quenched		
11	3	Packungsring	packing	Art. 901/B6	Ø46/30x8		Grafit			
11I	2	Packungsring	packing	Art. 6011A	Ø46/30x8		Grafit			
12	1	Grundring	base ring	4N30.46.25-12/1	Ø46x25	X6CrNiNb1810	1.4550	Vordrehmaß:Ø70x33		
15	1	Anbauflansch	flange	4N70.157.25.01-21	Ø157x25	15Mo3	1.5415			
16	1	Sechskantmutter	hexagon nut	DIN 439	M16x1,5		8	*		
20	4	Distanzbolzen	distance bolt	4N16.25.410-20	Ø25x410	Ck35	1.1181	*		
35	4	Sechskantmutter	hexagon nut	DIN 934	M16		8	*		
48	4	Sicherungsscheibe	lock washer	VS 16	Ø24/17x2	50Cr4	1.8159	*		
50	1	Regelkolben	control piston	4D80.297.01-50	Ø39,8x297	X35CrMo17	1.4122			
51	1	Sprühkopf kpl.	spray head cpl.							
51.1	1	Sprühkopf	spray head	3D80.230.09-51.1	Ø74,5x180	X10Cr13	1.4006			
51.2	1	Einsatz	insert	4D80.043.01-51.2	Ø43x8	X10Cr13	1.4006			
52	2	Stiftschraube	stud bolt	4N16.130-52	Ø16x130	21CrMoV57	1.7709	*		
53	1	Stopfbuchsenscheibe	gland	4N32.53.30.04-53	30x60x135	15Mo3	1.5415	*		
54	2	Sechskantmutter	hexagon nut	DIN 2510	NF M16	24CrMo5	1.7258	*		

Kunde: customer:
SAMSOMATIC GmbH

Anlagenkennzeichen: Identification note:
FV150636 / 150-04

Bestell-Nr.: order No.:
820 448

Zulässiger Betriebsüberdruck: allowable working pressure:
54 bar 98 bar

Zulässige Betriebstemperatur: allow. Working temperature:
500 °C 160 °C

Spezifikation: spezification:

Anforderungsstufe: valve class:

Prüfvermerk: test mark:

Prüfvermerk: test mark:

Zugehörige Zeichnungs-Nr.: belonging drawing No.:
1DKVP088/117U-0

* Verzinkt und olivchromatiert
zink galvanized and olivchromatized

Prüfungen:

C	= Chemische Analyse	chemical analysis -
M	= Mechanische Erprobung	destructive testing -
US	= Ultraschallprüfung	ultrasonic examination -
MP	= Magnetpulverprüfung	magnetic particle inspection -
H	= Härteprüfung	hardeness traverse -
B+M	= Besichtigung und Maßkontrolle	approval and dimension test -
W	= Wärmebehandlung	heat treatment for properties -

⑧ ⑦ ⑥ ⑤ ④ ③ ② ①

Dateiname: K03-0227-6.doc

	Datum/date	Name/name
Bearbei.: wrought:	28.06.03	Giebeler
Geprüft: checked:	03.07.2003	Stichl

SCHROEDAHL-ARAPP
Spezialarmaturen GmbH & Co. KG
51580 Reichshof - Mittelagger

Stückzahl: 1 Quantity:

Kom.-Nr.: K03-0227.6 com. No.:

Stückliste / Item List

Typ: DKVP088/117U

2"/4" 1500/900 lbs

3DKVP088/117U-St

Blatt 1 von 2

Pos. pos.	Anz.	Benennung description		Zeichnungs-Nr. drawing No.	Abmessung dimension	Werkstoff material DIN 17007	Werkstoff material DIN 17006	Bemerkung remark	Werkstoffabnahme material accep.condition Prüfungen	Belegung DIN EN10204
56		Spannmutter	compression nut	4D80.050.01-53	Ø74,8x50	X10Cr13	1.4006			
57	1	Stift	pin	4N6.33-46	Ø6x33	X5CrNi189	1.4301			
58.0	1	Einsatz	insert	4DK10A-58.0	Ø14x13,4	X5CrNi189	1.4301			
58.1	3	Einsatz	insert	4DK10A-58.1	Ø14x13,4	X5CrNi189	1.4301			
58.2	1	Einsatz	insert	4DK10A-58.2	Ø14x13,4	X5CrNi189	1.4301			
58.3	6	Einsatz	insert	4DK10A-58.3	Ø14x13,4	X5CrNi189	1.4301			
58.4	1	Einsatz	insert	4DK10A-58.4	Ø14x13,4	X5CrNi189	1.4301			
59.0	2	Düse	nozzle	4DK10A-59.0	Ø18x13,5	X5CrNi134	1.4313			
59.1	1	Düse	nozzle	4DK10A-59.1	Ø18x13,5	X5CrNi134	1.4313			
59.2	1	Düse	nozzle	4DK10A-59.2	Ø18x13,5	X5CrNi134	1.4313			
59.3	2	Düse	nozzle	4DK10A-59.3	Ø18x13,5	X5CrNi134	1.4313			
59.4	6	Düse	nozzle	4DK10A-59.4	Ø18x13,5	X5CrNi134	1.4313			
61	3	Kolbenring	piston ring	R001E	Ø40/36,6x3,5	X22CrMoV121	1.4923			
70	1	Hubanzeige	Stroke index	4N25.75-70	25x70x					
121	1	Anbauflansch	flange	4N60.157.30-21	Ø157x20	C22.8	1.0460	*		

Kunde: customer:
SAMSOMATIC GmbH

Anlagenkennzeichen: identification note:
FV150636 / 150-04

Bestell-Nr.: order No.:
820 448

Zulässiger Betriebsüberdruck: allowable working pressure:
54 bar 98 bar

Zulässige Betriebstemperatur: allow. Working temperature:
500 °C 160 °C

Spezifikation: spezification:

Anforderungsstufe: valve class:

Prüfvermerk: test mark:

Prüfvermerk: test mark:

Zugehörige Zeichnungs-Nr.: belonging drawing No.:
1DKVP088/117U-0

* Verzinkt und olivchromatiert
zink galvanized and olivchromatized

Prüfungen:

C	= Chemische Analyse	chemical analysis -
M	= Mechanische Erprobung	destructive testing -
US	= Ultraschallprüfung	ultrasonic examination -
MP	= Magnetpulverprüfung	magnetic particle inspection -
H	= Härteprüfung	hardeness traverse -
B+M	= Besichtigung und Maßkontrolle	approval and dimension test -
W	= Wärmebehandlung	heat treatment for properties -

⑧ ⑦ ⑥ ⑤ ④ ③ ② ①

Dateiname: K03-0227-6.doc

	Datum/date	Name/name
Bearbei.: wrought:	28.06.03	Giebeler
Geprüft: checked:	03.07.2003	Stübl

SCHROEDAHL-ARAPP
Spezialarmaturen GmbH & Co. KG
51580 Reichshof - Mittelagger

Stückzahl: 1 quantity:
Kom.-Nr.: K03-0227.6 Com. No.:

Stückliste / Item List

Typ: DKVP088/117U

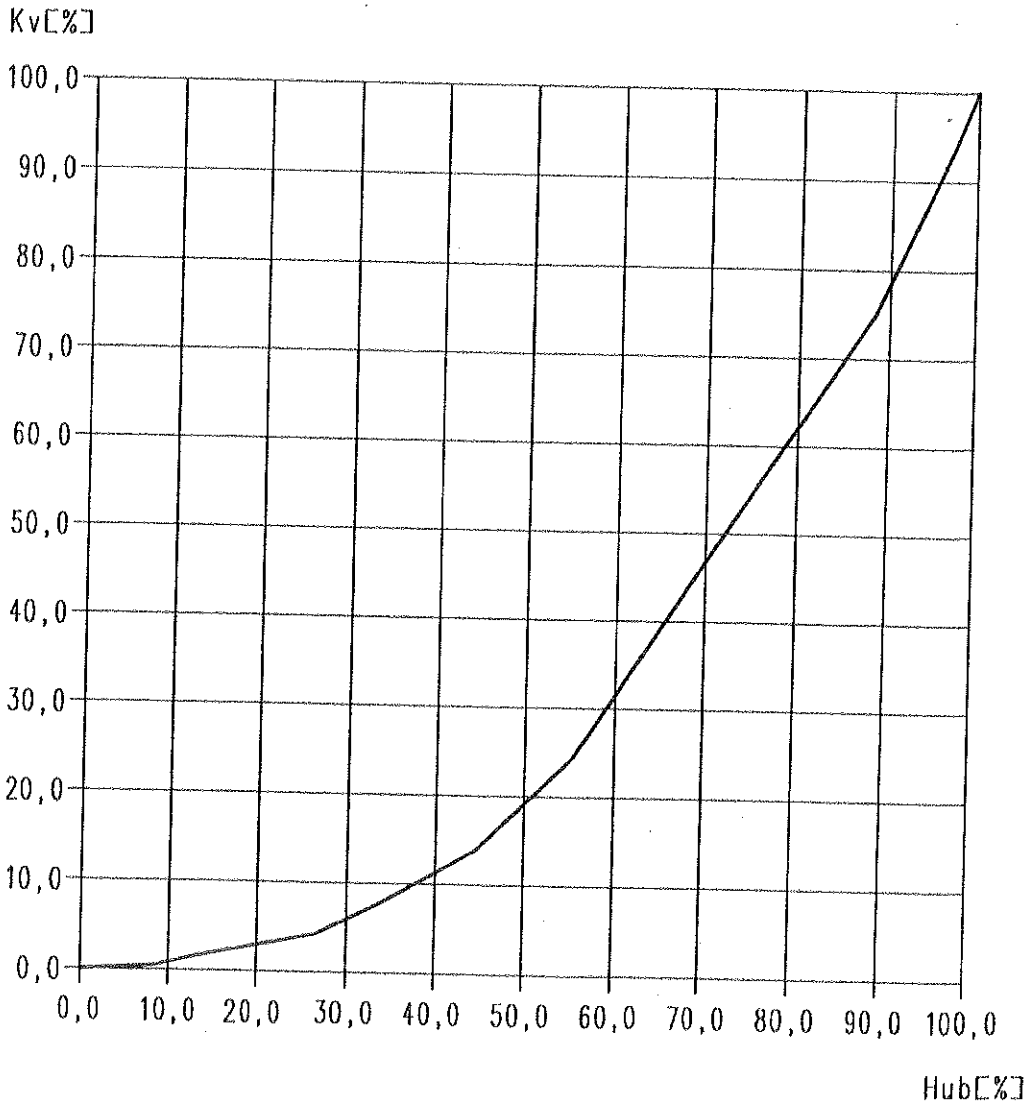
2"/4" 1500/900 lbs

3DKVP088/117U-St

Blatt 2 von 2

ARAPP - REGELVENTIL BAUGRUPPE
ARAPP - CONTROL - VALVE COMPONENT - GROUP

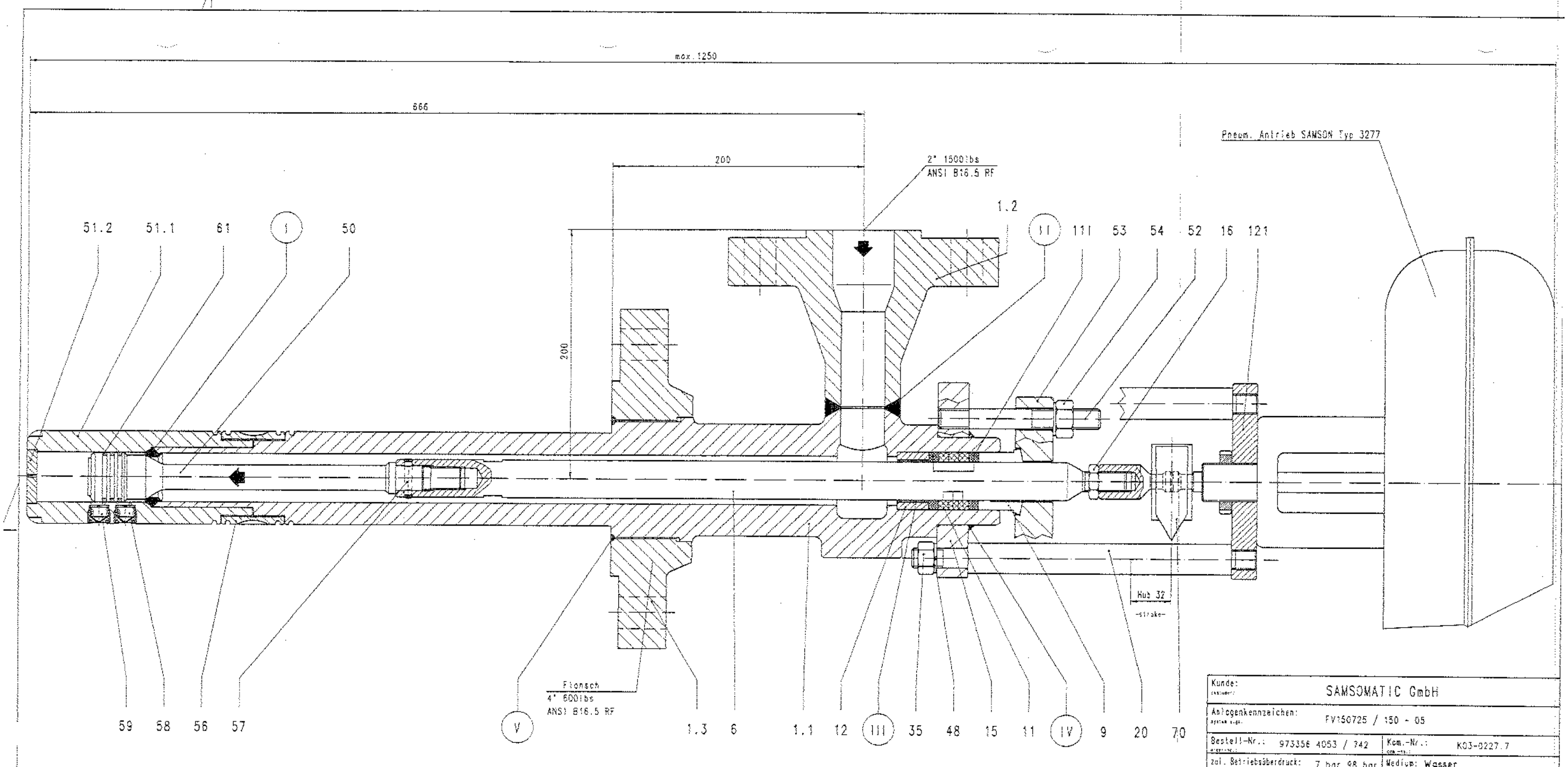
Kunde: customer: SAMSOMATIC GmbH	Kom.: work-no.: K03-0227.6 Stück: quantity: 1
Anlagengruppe: project-group:	Type: type: DKVP088/117U DN: 2"/4" PN: 1500/900lbs
Anlagenkennzeichen: project-charecteristic: FV150636 / 150-04	Hub: stroke: 80 mm
	Kvs: kvs: 5,7 m^3/h



Zust Index	Änderung revision	Datum date	Bearb. draw.	Gepr. checked
4				
3				
2				
1				
0	Erstellung	30.06.03	Giebel	

Schroedahl-Arapp Spezial-Armaturen GmbH & Co KG - Postfach 10 08 44 - D-51608 Gummersbach
Hausanschrift: Schönenbacher Str.4 - 51580 Reichshof Mittelagger
Telefon (0 22 65) 99 27-0 - Telefax (02265) 99 27 27

SCHROEDAHL
Spezial-Armaturen



Kunde: customer	SAMSOMATIC GmbH		
Anlagenkennzeichen: system sign	FV150725 / 150 - 05		
Bestell-Nr.: order no.	973356 4053 / 742	Kom.-Nr.:	K03-0227.7
zul. Betriebsüberdruck: allowable working pressure	7 bar 98 bar	Medium: medium	Wasser water
zul. Betriebstemperatur: allowable working temperature	380°C 160°C	Gesamtgewicht inkl. Antrieb:	ca. 90kg
Prüfdruck Pe: test pressure			
Spezifikation: specification		Anforderungsstufe:	
Prüfvermerke: test certificate		Prüfvermerke:	

Zugehörige Unterlagen belonging documents

Stückliste:	5DKVP088-116U-S1	Bauprüfplan:	
Schweißnahtspezifikation: welding specification	SP-0227.2	Berechnung:	
Für diese Zeichnung behalten wir uns alle Rechte vor! All rights reserved!	Allgemeintoleranzen general tolerance ISO 2768 - m	Maßstab scale 1:2,5	Komm-Nr. K03-0227.7
		Werkstoff material	Stückzahl quantity
Datum date / Name name	Bearb. 26.06.2003 / Geprüft 03.07.2003 Stöhl	Heißdampfkühler desuperheater 2"/4" 1500/600lbs ASME B16.5	
Zust. Änderung	Datum	Name	SCHROEDAHL - ARAPP	1DKVP088/116U-0	

Pos. pos.	Anz. que	Benennung description		Zeichnungs-Nr. drawing No.	Abmessung dimension	Werkstoff material DIN 17007	DIN 17006	Bemerkung remark	Werkstoffabnahme material accep.condition ...ungen	Belegung DIN EN10204
1	1	Gehäuse kpl.	case cpl.	2DKV088/116U.01-1		15Mo3	1.5415			
1.1	1	Gehäuse	case	2DKV088/116U.01-1.1	Ø125x681	15Mo3	1.5415			
1.2	1	Flansch	flange	4DKV088U-1.2	Ø215,9x152,5	15Mo3	1.5415			
1.3	1	Flansch	flange	4DKV116U.01-1.4	Ø273,1x65,5	15Mo3	1.5415			
6	1	Ventilspindel	valve spindle	3DN80.583.01-6	Ø30x583	X22CrNi17	1.4057			
9	1	Stopfbuchsendrücker	packing-follower	4N30.46.35-9	Ø52x35	X35CrMo17	1.4122	vergütet/quenched		
11	3	Packungsring	packing	Art. 901/B6	Ø46/30x8		Grafit			
11l	2	Packungsring	packing	Art. 6011A	Ø46/30x8		Grafit			
12	1	Grundring	base ring	4N30.46.25-12/1	Ø46x25	X6CrNiNb1810	1.4550	Vordrehmaß:Ø70x33		
15	1	Anbauflansch	flange	4N70.157.25-21	Ø157x25	15Mo3	1.5415			
16	1	Sechskantmutter	hexagon nut	DIN 439	M16x1,5		8	*		
20	2	Distanzbolzen	distance bolt	4N16.25.275.03-20	Ø25x275	Ck35	1.1181	*		
35	2	Sechskantmutter	hexagon nut	DIN 934	M16		8	*		
48	2	Sicherungsscheibe	lock washer	VS 16	Ø24/17x2	50Cr4	1.8159	*		
50	1	Regelkolben	control piston	4D80.297.01-50	Ø39,8x297	X35CrMo17	1.4122			
51	1	Sprühkopf kpl.	spray head cpl.							
51.1	1	Sprühkopf	spray head	3D80.180.14-51.1	Ø74,5x180	X10Cr13	1.4006			
51.2	1	Einsatz	insert	4D80.043.01-51.2	Ø43x8	X10Cr13	1.4006			
52	2	Stiftschraube	stud bolt	4N16.130-52	Ø16x130	21CrMoV57	1.7709	*		
53	1	Stopfbuchsenscheibe	gland	4N32.53.30.04-53	30x60x135	15Mo3	1.5415	*		
54	2	Sechskantmutter	hexagon nut	DIN 2510	NF M16	24CrMo5	1.7258	*		

Kunde: customer:
SAMSOMATIC GmbH

Anlagenkennzeichen: identifikation note:
FV150725 / 150 - 05

Bestell-Nr.: order No.:
820 448

Zulässiger Betriebsüberdruck: allowable working pressure:
7 bar 98 bar

Zulässige Betriebstemperatur: allow. Working temperature:
380 °C 160 °C

Spezifikation: spezification:

Anforderungsstufe: valve class:

Prüfvermerk: test mark:

Prüfvermerk: test mark:

Zugehörige Zeichnungs-Nr.: belonging drawing No.:
1DKVP088/116U-0

* Verzinkt und olivchromatiert
zink galvanized and olivchromatized

Prüfungen:

C	= Chemische Analyse	chemical analysis -
M	= Mechanische Erprobung	destructive testing -
US	= Ultraschallprüfung	ultrasonic examination -
MP	= Magnetpulverprüfung	magnetic particle inspection -
H	= Härteprüfung	hardeness traverse -
B+M	= Besichtigung und Maßkontrolle	approval and dimension test -
W	= Wärmebehandlung	heat treatment for properties -

⑧ ⑦ ⑥ ⑤ ④ ③ ② ①

Dateiname: K03-0227-7.doc

	Datum/date	Name/name
Bearbei.: wrought:	30.06.03	Giebeler
Geprüft: checked:	03.07.03	Seidel

SCHROEDAHL-ARAPP
Spezialarmaturen GmbH & Co. KG
51580 Reichshof - Mittelagger

Stückzahl: 1 Quantity:
Kom.-Nr.: K03-0227.7 com. No.:

Stückliste / Item List

Typ: DKVP088/116U

2"/4" 1500/600 lbs

3DKVP088/116U-St

Blatt 1 von 2

Pos. pos.	Anz. qua	Benennung description		Zeichnungs-Nr. drawing No.	Abmessung dimension	Werkstoff material DIN 17007	DIN 17006	Bemerkung remark	Werkstoffabnahme material accep.condition ungen	Belegung DIN EN10204
56	1	Spannmutter	compression nut	4D80.050.01-53	Ø74,8x50	X10Cr13	1.4006			
57	1	Stift	pin	4N6.33-46	Ø6x33	X5CrNi189	1.4301			
58.0	1	Einsatz	insert	4DK10A-58.0	Ø14x13,4	X5CrNi189	1.4301			
58.1	2	Einsatz	insert	4DK10A-58.1	Ø14x13,4	X5CrNi189	1.4301			
58.2	2	Einsatz	insert	4DK10A-58.2	Ø14x13,4	X5CrNi189	1.4301			
58.3	1	Einsatz	insert	4DK10A-58.3	Ø14x13,4	X5CrNi189	1.4301			
59.0	1	Düse	nozzle	4DK10A-59.0	Ø18x13,5	X5CrNi134	1.4313			
59.1	1	Düse	nozzle	4DK10A-59.1	Ø18x13,5	X5CrNi134	1.4313			
59.3	2	Düse	nozzle	4DK10A-59.3	Ø18x13,5	X5CrNi134	1.4313			
59.4	2	Düse	nozzle	4DK10A-59.4	Ø18x13,5	X5CrNi134	1.4313			
61	3	Kolbenring	piston ring	R001E	Ø40/36,6x3,5	X22CrMoV121	1.4923			
70	1	Hubanzeige	Stroke index	4N25.75-70	25x70x					
121	1	Anbauflansch	flange	4N30.157.20-21	Ø157x20	C22.8	1.0460	*		

Kunde: customer: SAMSOMATIC GmbH

Anlagenkennzeichen: identification note: FV150725 / 150-05

Bestell-Nr.: order No.: 820 448

Zulässiger Betriebsüberdruck: allowable working pressure: 7 bar 98 bar

Zulässige Betriebstemperatur: allow. Working temperature: 380 °C 160 °C

Spezifikation: specification:

Anforderungsstufe: valve class:

Prüfvermerk: test mark:

Prüfvermerk: test mark:

Zugehörige Zeichnungs-Nr.: belonging drawing No.: 1DKVP088/116U-0

* Verzinkt und olivchromatiert
zink galvanized and olivchromatized

Prüfungen:

C	= Chemische Analyse	chemical analysis -
M	= Mechanische Erprobung	destructive testing -
US	= Ultraschallprüfung	ultrasonic examination -
MP	= Magnetpulverprüfung	magnetic particle inspection -
H	= Härteprüfung	hardeness traverse -
B+M	= Besichtigung und Maßkontrolle	approval and dimension test -
W	= Wärmebehandlung	heat treatment for properties -

⑧ ⑦ ⑥ ⑤ ④ ③ ② ①

Dateiname: K03-0227-7.doc

	Datum/date	Name/name
Bearbei.: wrought:	30.06.03	Giebeler
Geprüft: checked:	03.07.03	Sichl

SCHROEDAHL-ARAPP
Spezialarmaturen GmbH & Co. KG
51580 Reichshof - Mittelagger

Stückzahl: 1 quantity:

Kom.-Nr.: K03-0227.7 Com. No.:

Stückliste / Item List

Typ: DKVP088/116U

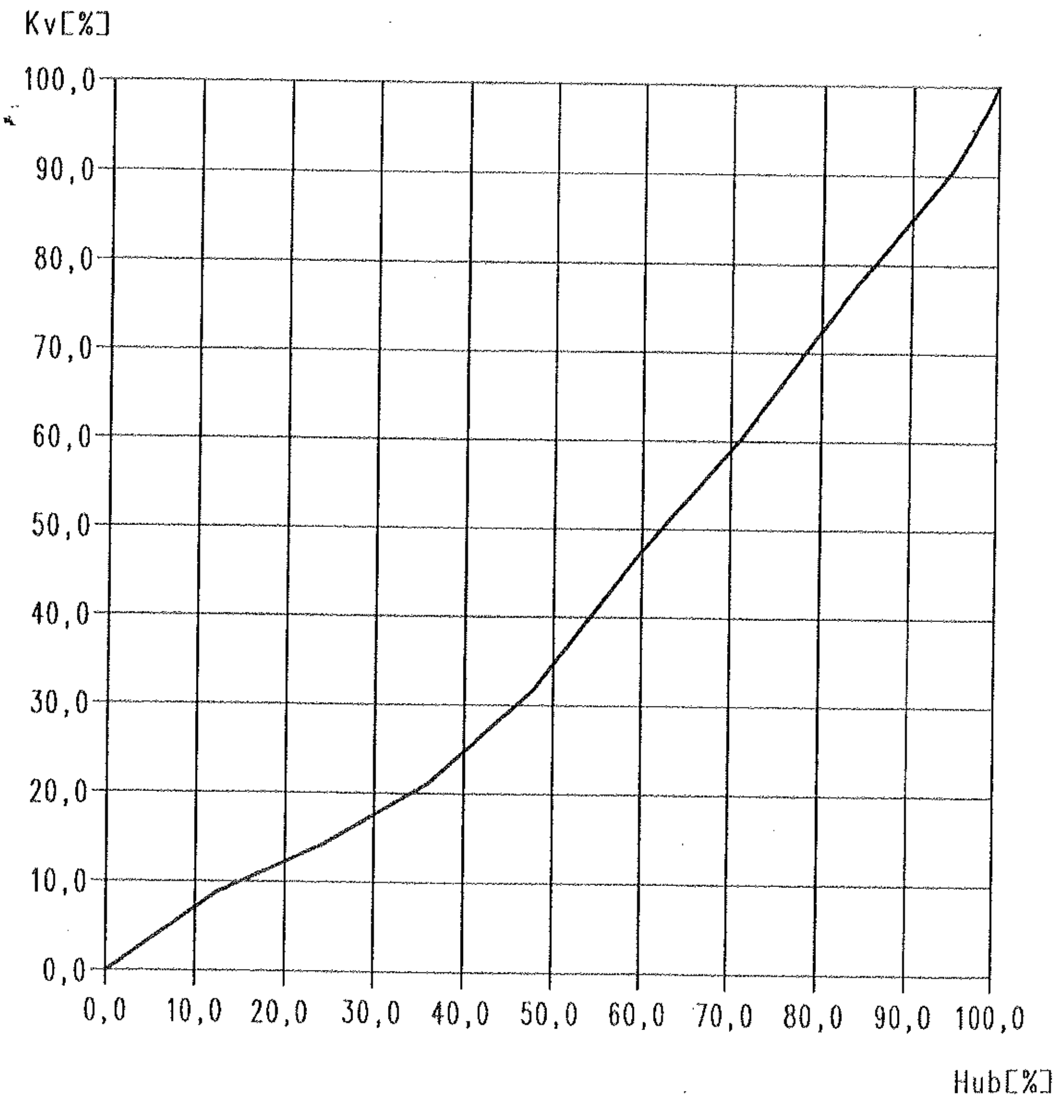
2"/4" 1500/600 lbs

3DKVP088/116U-St

Blatt 2 von 2

ARAPP - REGELVENTIL BAUGRUPPE DKV
ARAPP - CONTROL - VALVE COMPONENT - GROUP

Kunde: customer: SAMSOMATIC GmbH	Kom.: work-no.: K03-0227.7 Stück: quality: 1
Anlagengruppe: project-group:	Type: type: DKVP088/116U DN: 2"/4" PN: 1500/600lbs
Anlagenkennzeichen: project-charecteristic: FV150725 / 150-05	Hub: stroke: 32 mm
	Kvs: kvs: 2,3 m^3/h



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⓪	Erstellung	30.06.03	Gi...	Seidel
Zust. Index	Änderung revision	Datum date	Bearb. draw.	Gepr. checked

Schroedahl-Arapp Spezial-Armaturen GmbH & Co KG - Postfach 10 08 44 - D-51608 Gummersbach
Hausanschrift: Schönenbacher Str.4 - 51580 Reichshof Mittelagger
Telefon (0 22 65) 99 27-0 - Telefax (02265) 99 27 27

SCHROEDAHL
Spezial-Armaturen

Operating instruction

Installing, maintenance and assembly

instructions for

Schroedahl desuperheater

Type DKV

with

pneumatic actuator

Rev.	Page	written	checked	Remarks
0		08.04.1999 Seidel	05.05.1999 Peterson	first edition

Index

Validity

This statement is valid for all Schroedahl desuperheaters, type *„DKV“* with pneumatic actuator.
Possible special features are handled in the "appendix"

Dangers and warnings

Control valves are to be compared with pressure vessels concerning their danger potential. The corresponding accident prevention rules and the responsible systems of rules are therefore to be considered for the planning, the mounting, the working and the maintenance.

Dangers for persons and objects

- Only operate control valves in accordance with planning and permissible operation limits.
- Make no changes without our approval.
- Only use original spare parts.
- Consider accident prevention rules, site regulations and system-specific safety adjustments.
- Please follow the instructions as given in this "operating instruction".

Avoid dangers

- Only employ trained and involved personnel during maintenance on the control valve.
- Before disassembly the installation has to be shut off and the valve should be pressureless and cooled down. The actuator should be disconnected, or should be secured against unauthorized functioning.
- It must be guaranteed that the previously mentioned measures are cancelled only again at the completion of assembly works.
- Note that medium can be too in the pressure-less valve.
- Wear protective clothing.

Caution!

Dismantling and assembly works on the control valve should only be carried out by Schroedahl-personnel during the guarantee period. In exceptions, qualified specialists of the customer can also, according to previous consultation of Schroedahl, be employed. Maintenance operations are excluded. For example, changing of the packings is allowed without approval from Schroedahl.

Description and operation

The standard-desuperheater is available for a max. pressure rating of PN 250 (900lbs.). The spray water flange has a size DN 25 (1“) or DN 40 (1,5“).
To install the desuperheater, a mouting flange (hub) is required, on the steampipe, of DN 80 (3“). (However, the internal diameter should always be 76 mm minimum!)
The standard stroke is 32, 55 or 80 mm (depending on the operating requirements).

The desuperheater is designed for the requirements as per customer data sheet. The permissible working and design data are indicated on the sectional drawing or to be taken from the associated documents.

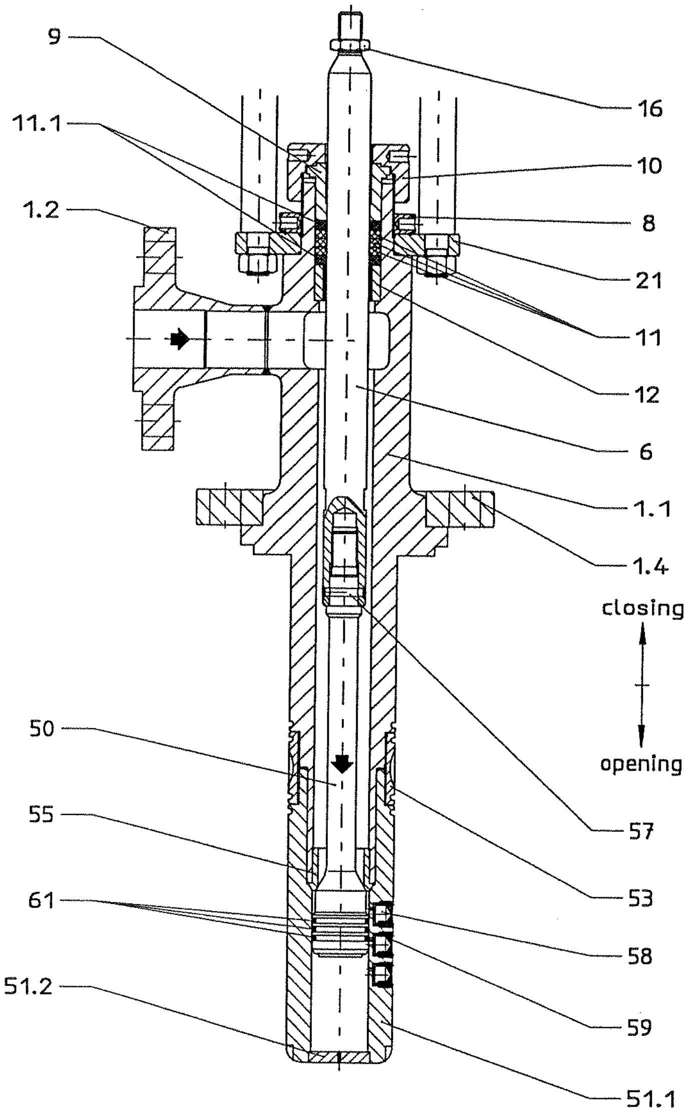


figure 1: desuperheater, type „*DKV*"

Installation

Install the desuperheater in such a way, that the cooling fluid (water) is injected into the flow direction of the steam.
The DKV-desuperheater is mounted on a stub which is provided for the steampipe on the jobside (see figure 2). A minimum height of 150mm between flange and steampipe should be observed.
We recommend a straight pipeline of approx. ten times of the nominal diameter before and above all after the desuperheater. There should be no inserts or discharges in this part of the line.

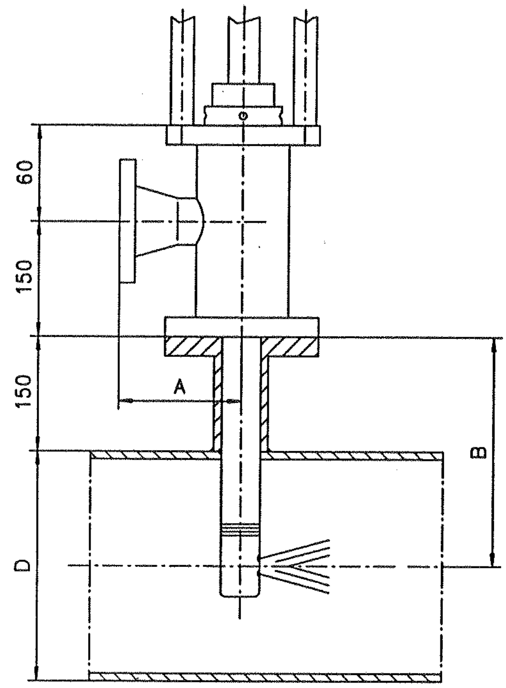


figure 2: mounting-dimensions

table 1 (acc. figure 2)

D	B	stroke [mm]		
[mm]	[mm]	32	55	80
150	225	■		
200	250	■	■	
250	275	■	■	■
300	300	■	■	■

For larger steampipe size D (max. 700 mm): B = ½ D + 150

Dimension A:
For pressure ratings ≤ PN 100 (600 lbs) dimension A = 150 mm
For pressure ratings = PN 160 (900 lbs) dimension A = 175 mm
For pressure ratings = PN 250 dimension A = 200 mm

The position of the water inlet flange can be selected as indicated (see figure 3).

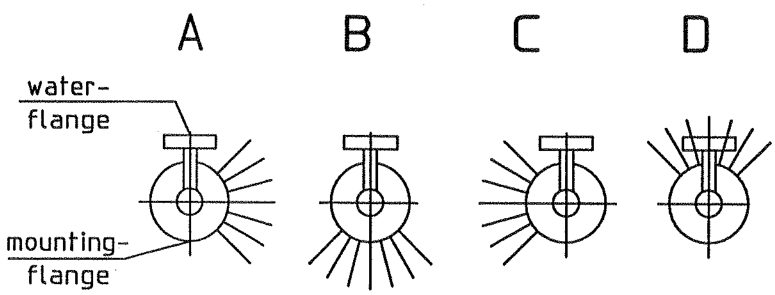


figure 3: water connection flange options

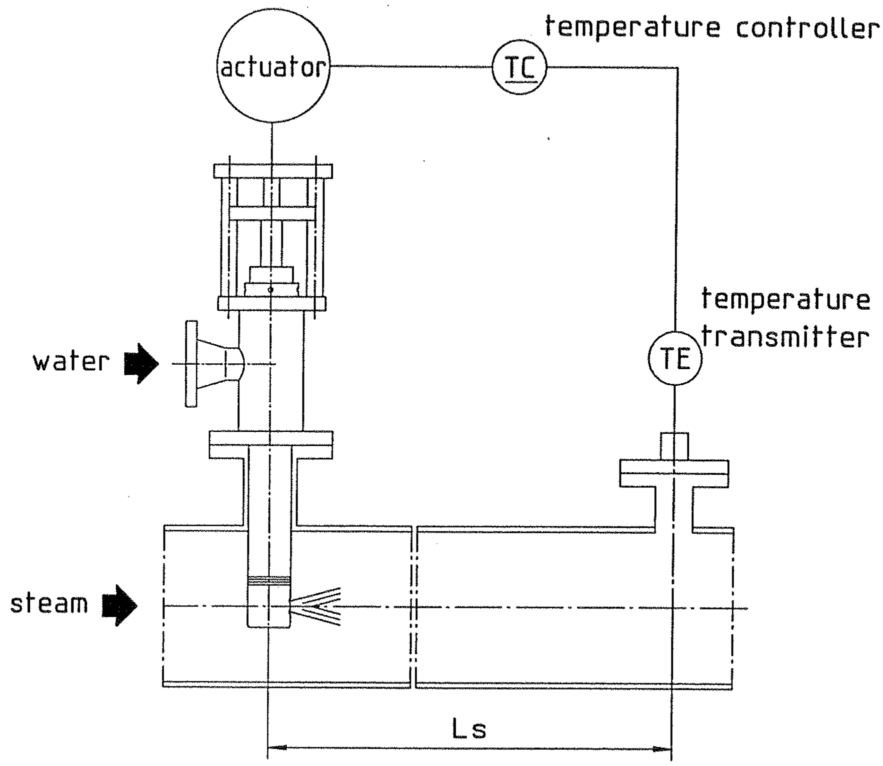


figure 4: mounting schedule

The diameter of the steampipe should not be smaller than DN 150 (6“). The required minimum distance -LS- (figure 4) between the desuperheater and the temperature sensor depends on the operating conditions and can be read from with diagram 1.

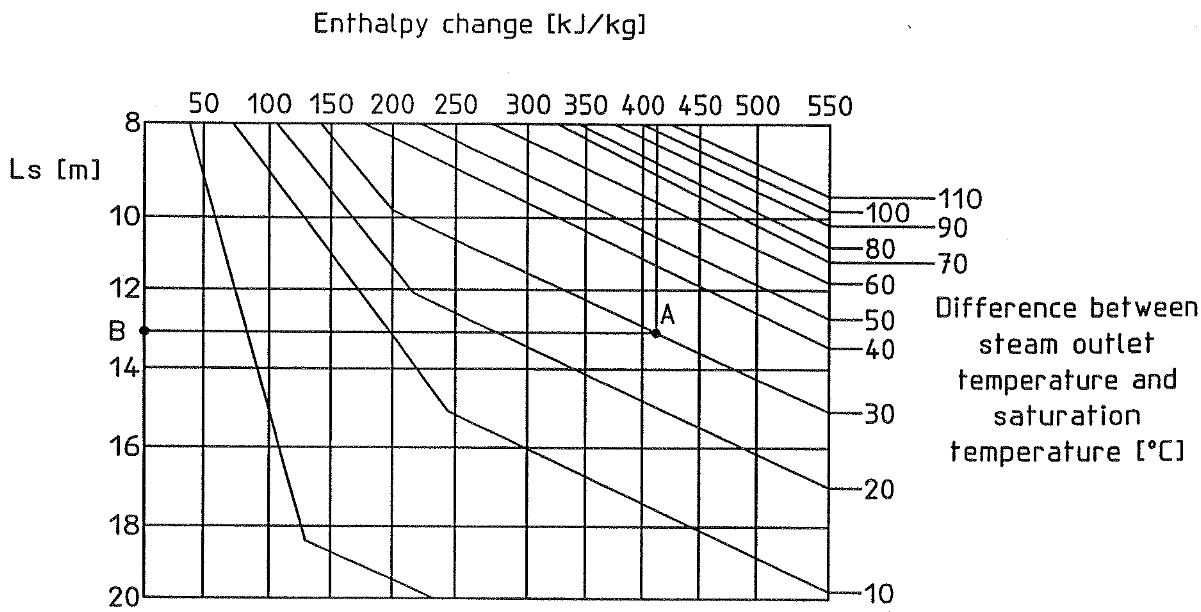


diagram 1: distance between desuperheater and temperature senor

Caution!

Above values are for DN 300 pipe sizes. For other pipe sizes multiply distance by 0,06 * √D (D = pipe diameter).

Example:
*Enthalpy change between inlet- and outlet steam amounts 420 kJ/kg. Temperature of outlet is 30 degr. C above saturation temperature. Draw a vertical line from 420 kJ/kg until it intersects the 30 degr. superheat line (graph-point A). Draw a horizontal line from point A and read required distance of 13 m at B (Ls = 13 m). Above values are for DN-300 pipe sizes. For other pipe sizes multiply distance by 0,06 *√D (D = pipe diameter) .*

The desuperheater must not serve as a support of the pipeline. Only the pipeline should be supported/ fixed, preferably close to the control valve.

The valve should be installed free of tensions. Excessive tensions can possibly increase the danger of malfunctions or in extreme cases of cracking.

In case the weight of the desuperheater needs to be supported, this should be done in such a way that the forces of the pipeline are absorbed.

If no installation position was agreed, the desuperheater must be installed with the spindle vertically upwards. Please contact Schroedahl in case another installation is required.

In case of desuperheater planned with horizontal built-in position, the actuator should be supported. It normally is sufficient to support the dead weight of the actuator. See also, the operating instruction of the actuator manufacturer. The supports should be shockabsorbing in order to cope with the thermal expansion of the pipeline. The construction of the supports should be done according the piping plan. Swinging of the actuator should be avoided and where applicable be stopped by means of a dampening system.

Also note:

- The valve and the actuator should be easy accessibly, a service platform may be installed.
- Secure the service platform by rails - danger of accident!
- Sufficient free space during assembly and dismantling is to be guaranteed.
- A fixing for putting on of a chain hoist may be installed. If possible it's even better to install a swivel arm with hoist installation. This is essential with horizontal installation of the valve.
- Possible isolation must be easily removable.
- The ambient temperature on the installation site shall not be higher than + 60°C. The instructions of the actuator manufacturer are to be considered.

Pickle and rinse

The materials used in the desuperheater are in general pickle resistant. From experience, impurities and foreign particles flow through the valves while pickling and rinsing. These can lead to damages of the internals.

We therefore recommend, to remove the valve stem and spray head before rinsing (pickling) the system. The packing area should be sealed temporarily (see figure 5).

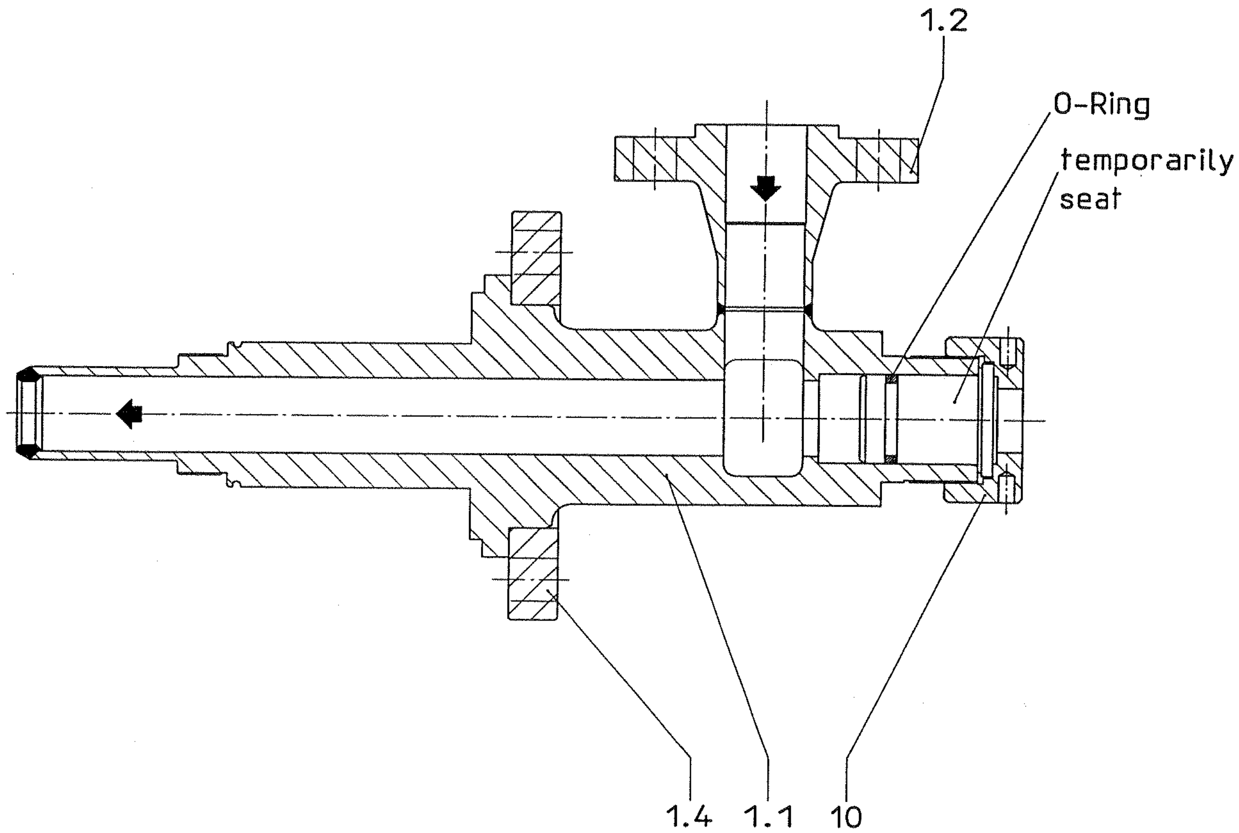


figure 5: rinsing scheme

After pickling and rinsing, the valve must always be cleaned, and the seals must be renewed.

Caution!

Every foreign particle which remains in the valve after cleaning leads to damage of the desuperheater. Pickle which remains in the valve can lead to damages on a long term basis.

Commissioning

Before commissioning the material, the pressure and the temperature data of the desuperheater must be compared with the design data of the pipeline.

The valve and the pipeline must be free from impurities.

During commissioning, extreme strains occur in the entire system. Pipelines and desuperheater are subjected to the working pressure and to the thermal expansion, therefore increase pressure and temperature slowly.

Leaks at the packings should be shut off quickly. (Leakings means damage of the seal faces).
From experience it shows that one might still expect foreign particles during the commissioning. It is to from experience be calculated, also during the initiation stage of the system, with the fit from impurities. We therefore recommend, before beginning continuous operation, a final inspection of the valve by our service engineers. The costs are very small, measured by the costs of a mandatory standstill of the entire plant!

Pneumatic actuator

The pipe and the electric connection must be in accordance with the instructions of the actuator manufacturer. Pre-tensioned springs must be observed.

The stop should occur in close direction in the seat of the valve and in open direction in the actuator.

Observe the closing direction! (see figure 1)

Maintenance

The valves leave the factory in dry and perfect state.

The connections are protected by plastic caps. We recommend to take out the packing during longer storage times (POS. 11 and 11I) in order to avoid corrosion between cover and spindle caused by humidity. This is not necessary if the complete valve has been conserved and packed.

The packing is to be checked regularly for leakiness. This is always required immediately after the first initiation.

Leakiness on the packing is to be eliminated first by tighten up of the packing nuts by experts (POS. 54), or the union nut (POS. 10). If the leakiness remains, a packing ring must be inserted or the packing should be installed again. See chapter "packing".
Except for the packing the desuperheater is maintenance-free .

Caution!

Consider the maintenance instructions of the actuator manufacturer.

Assembly and disassembly

Please refer to the sectional drawing.

During all maintenance etc. the following should be observed:
- The valve must be pressure-less and in emptied state.
- The actuator must be disconnected from the supply network and/or must be protected against unauthorized switch-on - where appropriate, pull the connector!
- With respect to the great precision and small tolerances, the highest cleanness and proper handling should be respected. Dirt or damage questions the perfect operation.
- New seals and packings must be inserted.

Actuator, disassembly

Hang up actuator with suitable pull at hoisting device (do not lift).

Caution!

Pre-tensioned springs are to be observed. Where appropriate, the spindle of the valve may be tensioned in rest positioning.

- In case the spindle moves in by means of the springs, the spindle will be tensioned when the *valve* is in *closed position*.

- In case the spindle moves out by means of the springs, the spindle is not under tension when the *valve* is in *open position*.

There are different possibilities to fix the actuator (bracket, bolts and so on). Therefore the sectional drawing and the operating instructions of the actuator manufacturer must be observed. (Parts, which belong perhaps to the supply of the actuator manufacturer, have no position-number in the sectional drawing)
The connection between valve and actuator is normally supplied by the actuator manufacturer, therefore, consider the operating instructions of the actuator manufacturer during the assembly of the coupling.
After removing the coupling, the actuator can be lifted with brackets/clamps or bolts.

Actuator, assembly

Assembly to be done in reverse order.

Internals disassembly

- Remove the actuator
- Remove the desuperheater out of the piping

Caution!

Before the disassembly of the desuperheater, it is to test wether the pipeline is really pressure-less and without accummulation of medium.

- Remove the tagwelds between spray head (POS.51.1) - adjusting nut (POS.56) and between adjusting nut (POS.56) - body (POS.1.1) by grinding disk
- Lock sprayhead (POS.51.1, SW 65) and unscrew adjusting nut (pos.56) with a hooked wrench (DIN1810 - Ø 68 - 75) by turning anti-clockwise (direction closing, figure 1)
- Remove sprayhead (POS.51.1)
- Remove stem assembly (POS.6, POS.50 and POS.57), extract downwards
- Remove union nut (POS.10), packing disk (POS.53) and packing follower (pos.9)
- Remove packing rings (POS.11) and (POS.11.1)
- For further disassembly of the stem assembly: remove the pin (POS.57, Ø 6) by drilling and knocking-out
- Turn control piston (POS.50, SW22) anti-clockwise (direction closing, figure 1) from stem (POS.6, SW27)
- Remove piston rings (POS.61)

When removing nozzles (POS.59), be aware that these were locked against rotation by calking!
The nozzles can be removed by rotating the nozzles anti-clockwise with a fronthole wrench (see figure 6).

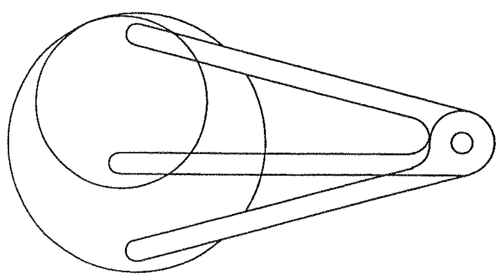


figure 6: fronthole wrench

Caution!
Be sure to replace the insert (POS.58) and the nozzle (POS.59) in the corresponding nozzle hole. Record before removing the nozzle! If not replaced correctly, the characteristic of the valve will be incorrect!

Internals assembly

Assembly can be done in the reversed order; the following instructions should be observed:

- Control piston (POS.50) must be lapped into the seat
- the nozzles (POS.59) must be caulked again against rotation after replacement
- When assembling the stem, the control piston (POS.50) should be screwed until it contacts the valve stem (POS.6), than unscrewed until there is a space of approx. 0,1 mm between POS.50 and POS.6. If required, drill a new hole Ø 6 H7.

- Unscrew control piston (POS.50) completely and drill a new hole in the control piston Ø6,1 mm.
- Connect both parts again, insert pin (POS.57) and secure by caulking (riveting) on both sides. The connection should be flexible however.
- Insert piston rings (POS.61), make sure that these are not over-expanded when fitted. (The piston rings should only be expanded as required to slipp across the control piston and placed in the grooves.)
- The piston rings (POS.61) should be fitted with the mark „top" on the front towards the gland.
- Compress the piston rings (POS.61) by means of half plastic shells and insert control piston (POS.50) into sprayhead (POS.51).
- Apply tagwelds between spray head (POS.51.1) - adjusting nut (POS.56) and adjusting nut (POS.56) - body (POS.1.1).

Caution!

Observe the correct spray direction!

- Fit new packing rings (POS.11) and (POS.11.1)
- The stem should move smoothly
- Ensure that, when mounting the actuator, the actuator shaft and valve stem (POS.6) are in line
- Carefully operate the valve now with the actuator (travel range 0% to 100%), prior to commissioning

Lapping the seat

If required the seat should be lapped again, before assembly of the desuperheater.
For this purpose insert the stem assembly, without piston rings, downwards into the dismantled body.
At first use an abrasive compound of grit 400 for lapping the seat. The finishing is done with grit 800. The seating area must reflect equally. A correctly lapped seat glimmers grey over the entire area.

We recommend to have this work done by Schroedahl personnel, since for this purpose some experience is required. After lapping, no residues may remain in the valve.

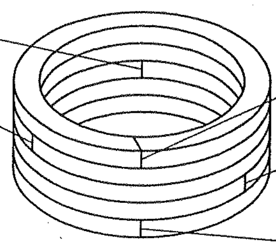
Packing

In case the actuator must be disassembled, refer to the chapter „disassembly of the actuator"

For disassembly of the packing, remove the coupling (see chapter „disassembly of the actuator"), the packing disk (POS. 53) or the union nut (POS. 10).

The packing can now be removed with a packing snag. The packing room is to be cleaned thoroughly now.

The spindle (POS. 6) and the installation area must be in a perfect state, when installing the packing. The number and arrangement of the package rings (POS. 11+ 11l) is pre-set by the parts list in connection with the sectional drawing. The package ring POS. 11l forms the locking as a basic and deck ring in each case. In case of sectional rings, the joints are to be displaced around 90°. The packing rings (POS. 11 and 11l) may look all the same, however they are not.



Use a package tube (at the diameter of the packing) for the assembly of the package rings. To avoid damages, the package tube should be of plastic. Every package ring is to be pressed in during assembly.
During the installation of the packing (POS. 9), pay attention to sufficient guidance in the cover. The guidance should correspond to the width of the package ring.

After the packing (POS. 9), the packing disk (POS. 53), the screws (POS. 52), the nuts (POS. 54) or the union nut (POS. 10) are assembled, the spindle should be moved into the "valve closed" position (position A).

Grouting the packing

Measure the **distance** Z between packing disk and cover (see figure), at aligned parallel packing disk (POS. 53). In case of an union nut measure the corresponding **distance Z.** After this, the packing parcel is to be pre-pressed by uniform and crosswise tightening of the nuts (max. 0,5 rotation per nut) on ¾ of the required length L. Please ensure a right-angled and central position of the packing disk. Proceed correspondingly in case of an union nut. Now move the spindle into the position "valve open" (position B) and apply the residual grouting for the operating state.

The necessary compression lenght L depends on different factors:
1. Packing material.
2. Gap between packing and spindle as well as the gap between packing and cover.
3. Length of the packing.

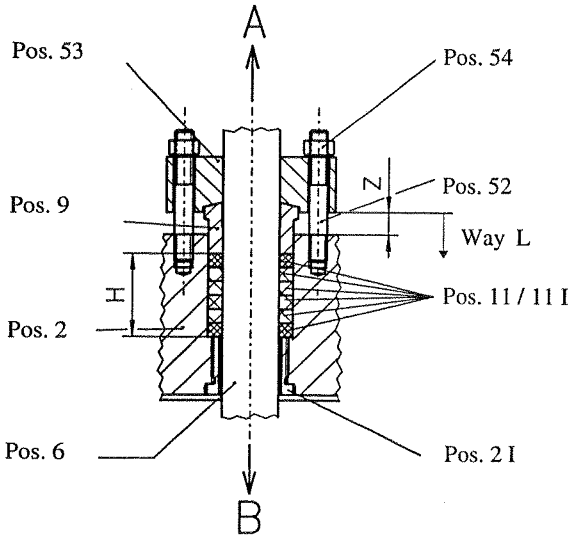
Normally, the necessary compression length L = 0,05 * h (see figure).

For a fast repair of the packing the possibility exists, to renew only a part of the package rings. A minimum of three packing rings shall however be renewed.

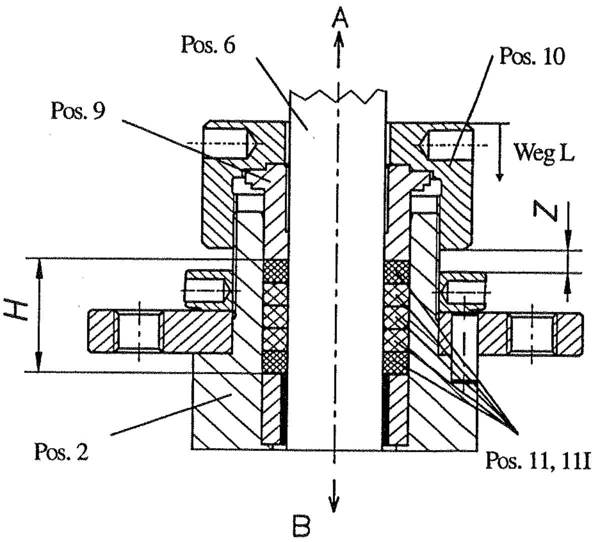
The previous notes and instructions must also be considered, however grouting of the packing is in accordance with the ratio:

Z_{Pre} = Z - (N_{new} / I) x ¾ x L during pre-pressing and
Z_{End} = z - (N_{new} / I) x L reduction for the operating state.

N_{new} = number of new packing rings
I = total number of packing rings (POS. 11 and 11I) according to parts list/item list.



Basic packing construction
Construction with packing disk



Basic packing construction
Construction with union nut

This procedure of pre-pressuring of the packing only reflects the specifications of the packing manufacturer. If necessary for thigtness, the packing must be compressed more. If the valve moves heavy, the packing can be lesser pressed. Tightness, is however always to be respected!

Finally the movement of the valve spindle is to be checked by repeated moving of the spindle.

Malfunctions and its elimination

Leakage of the valve seat

Possible causes of the leakage of the valve seat might be:
- A damage of the valve seat due to impurities.
- A deformation of the seat due to an operating error.
- A malfunction of the supply system of the actuator.

Elimination:
- With simple damages of the valve seat, for example if there's only an unevenness in the reflection picture (maximum of 1/10 mm), it's sufficient to lap the valve seat again. For

lapping the seat see chapter "lapping the seat". In other cases the seat area must be remachined and subsequently lapped.
- If the damages are more severe, new spare parts must be installed, observe the corresponding seals.
- In case of pneumatic actuator, the end position can only be checked manually if the actuator has a handwheel. The springs (pre-tensioned!) are to be considered, in case of a spring-loaded actuator.
- Check the supply system.

Leakage of the packing

- Possible causes are for example:
- Neglected tracing of the packing nuts (POS. 54), or the union nut (POS. 10), after commissioning.
- Lacking maintenance.
- Wear of the packing material.

Elimination:
- Tracing the packing nuts (POS. 54), or tracing the union nut (POS. 10).
- Add a packing ring, or re-pack the packing, see chapter "packing".

Heavy operation of the valve

Possible causes are:
- Packing compressed too firm.
- Blocked valve internals due to impurities.
- Inappropriate handling of the valve or general lacking of maintenance.
- Insufficient support of the actuator, in case of horizontal installation.
- Wear or damages in the actuator.

Elimination:
- Slight dissolution of the packing nuts (POS. 54), or union nut (POS. 10), however only so far, that further seal off still exists, see chapter "packing".
- Clean, or - when required - replace the internals. Please observe the gaskets.
- In the case of horizontal installation: check whether the actuator support is sufficient. The support may not lead to an impairment of the function of the valve, this due to warm pipelines.
- Inspection of the actuator, see operating instructions of the actuator manufacturer.

Malfunctions of the actuator

Possible causes and elimination are stated in the operating instructions of the actuator manufacturer.

Procedure Nr. 19.05
Maintenance instructions

Trunnion Mounted Ball Valves
6" and larger.
Class 150# - 2500#.

Drawing: MM 0003

Disassembly procedure.

1. If the valve is installed, make sure to release the pressure from the line.
2. Loosen the drain plug (700) to release any residual pressure from the body cavity.

ATTENTION

DO NOT REMOVE THE VENT PLUG (701) WITHOUT HAVING PREVIOUSLY COMPLETELY RELEASED THE BODY CAVITY PRESSURE THRU THE DRAIN PLUG.

3. Remove the valve from the line and position the same so that the top is easily accessible.
4. Rotate the ball (200) in the fully closed position.
5. Remove the nuts (615) and lift the gear box (801), being careful not to damage the stem key (402) and the reference pins (109) which shall not be removed from the gear box housing.
6. Remove the stem key (402).
7. Remove the cap-screw (610) and the reference pin (108).
8. Remove the adaptor flange (106).
9. Remove the capscrew (611).

10. Remove the gland plate (105) and the stem (400), at this point it is possible to remove:

    - the stem gasket (511)
    - the gland plate gasket (512)
    - the stem O-Rings (502)
    - the gland plate O-Ring (503)
    - the stem thrust washer (406).

11. Position the valve on one closure (102), being careful not to damage the flange surface for flanged ends valves or the weld bevel for welding ends valves.

12. Remove the nuts (601).

13. Remove the lifting lugs (110) and the supporting feet (111).

14. Lift the closure (102), and position the same on the external face.

15. Remove the capscrew (613) and the seat holding washers (306), at this point it is possible to remove:

- the body gasket (510).
- the body O-Ring (500).
- the seat ring (300).
- the seat O-Ring (501).
- the springs (305).

16. Remove the nuts (601) and lift the body (100).

17. Lift the ball (200) and the ball bearing retainers (201).

18. Remove the ball bearing retainers (201) from the ball (200).

19. Remove the trunnion bushings (405) and the thrust washer (408).

20. Repeat the operations described at points 14 and 15 and remove the second seat.

Inspection and maintenance procedure.

1. **Wipe all the metal part with a petroleum solvent, using a soft cloth.**

2. **Wipe all the O-Rings and gaskets using a clean soft cloth.**

3. **Inspect the O-rings, the gaskets, the ball, the stem and the seat rings for damages.**

4. **Replace the defective parts.**

Notes:

- **After having disassembled a valve it will be always advisable to replace all the O-rings and the gaskets.**

- **O-Rings require a certain tension to be inserted in their shoulders, be careful not to cause cutting during re-assembling.**

- **Do not use O-rings with dimension different from the original ones.**

Re-assembly Procedure.

1. **Position the closure (102) on the external face, being careful not to damage the flange surface for flanged end valves or the weld end bevel for welding ends valves.**

2. **Insert the springs (305).**

3. **Assembly the seat ring (300) positioning:**

- **the seat ring (300)**
- **the seat O-Ring (501)**
- **the body O-Ring (500)**
- **the body gasket (510)**

4. **Insert the seat ring sub assembly in the closure recess.**

5. **Insert the seat holding washers (306) and tighten the capscrews (613).**

6. **Insert the trunnion bushing (405) in the ball bearing retainers (201).**

7. **Insert the thrust washer (408).**

8. Position the ball (200) in the ball bearing retainers (201) with the bore perpendicular to the same.

9. Position the sub-assembly ball–bearing retainers on the closure (102).

10. Lift the body (100) and position the same on the closure (102).

11. Position the other closure (102) on one end, being careful not to damage the flange surface for flanged end valves or the weld end bevel for welding end valves.

12. Assembly the seat ring (300) positioning:

- ❑ **the seat ring (300)**
- ❑ **the seat O-Ring (501)**
- ❑ **the body O-Ring (500)**
- ❑ **the body gasket (510)**

13. Insert the seat ring sub assembly in the closure recess.

14. Insert the seat holding washers (306) and tighten the capscrews (613).

15. Position the closure sub assembly over the primary body, being careful not to damage the studs (600).

16. Tighten the bolts (601).

17. Insert in the gland plate (105):

- ❑ **the stem O-rings (502)**
- ❑ **the stem gasket (511)**
- ❑ **the glad plate O-Ring (503)**
- ❑ **the gland plate gasket (512)**

18. Insert the thrust washer (406) in the stem.

19. Make sure that the stem cavity in the ball, is perpendicular to the flow line.

20. Position the stem (400) in the ball stem cavity.

21. Insert the gland plate-stem sub assembly in the body being careful not to damage the gland plate O-Rings.

22. Insert the reference pins (108).

23. **Tighten the capscrews (611).**

24. **Insert the adaptor flange (106) and tighten the capscrews (610).**

25. **Insert the stem key (402) and the gear box (801) being careful not to damage the stem key and the reference pins (109).**

26. **Tighten the nut (615).**

27. **Without readjusting the sop screw in the gear box housing check the in the fully open position, the ball bore coincide with the seat bore.**

Neuss: April 20, 1998.

	MANUAL OVERRIDE MH SERIES FOR SINGLE ACTING ACTUATOR OPERATION DESCRIPTION	

MECHANICAL MANUAL OVERRIDE WITH STANDARD HANDWEEL

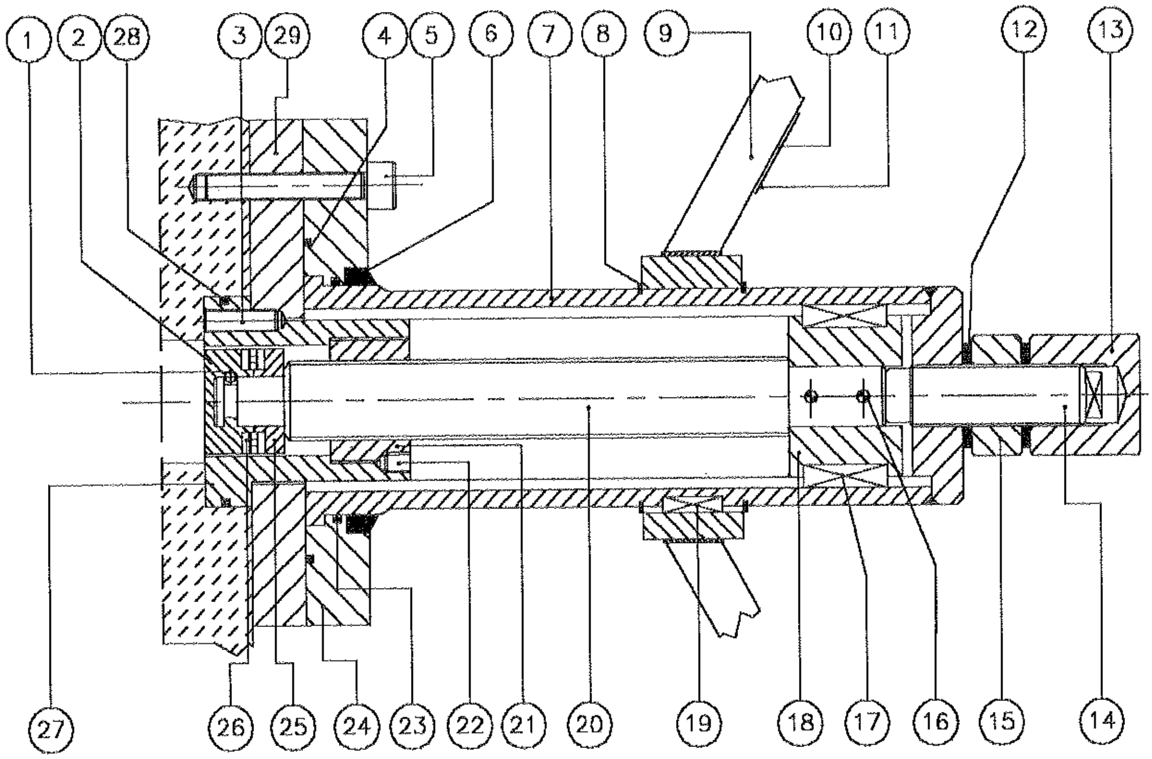
The emergency mechanical manual override (see table DSGD013) allows the manual operation in the case of air supply failure. It consists of a screw device with handwheel.
In order to operate the mechanical manual override, make sure that the cylinder is not fed with pneumatic supply then proceed as follows:

1 PNEUMATIC ACTUATOR SPRING TO OPEN :

- Rotate the handwheel in clockwise direction in order to close the valve.
- Before moving the actuator again by the air supply, rotate the handwheel again in order to put the actuator in the original position.

2 PNEUMATIC ACTUATOR SPRING TO CLOSE :

- Rotate the handwheel in counterclockwise direction in order to open the valve.
- Before moving the actuator again by the air supply rotate the handwheel again in order to put the actuator in the original position.



Item	Q.ty	Description	Material	Code
1	1	Pin	Carbon steel	
2	1	Front plate	Carbon steel	
3	1	Dowel	Alloy steel	
4	1	O-ring	Buna-N	●
5	8	Screw	Carbon steel	
6	1	Scraper ring	Steel+Buna-N	●
7	1	Tube	Carbon steel	
8	2	Snap ring	Spring steel	
9	1	Handwheel	Carbon steel	
10	1	"Open-Close" plate	Plastic material	
11	4	Rivet	Stainless steel	
12	2	Seal washer	Steel + Buna-N	
13	1	Cap nut	Carbon steel	
14	1	Stop screw	Alloy steel	
15	1	Fixing nut	Carbon steel	
16	2	Parallel pin	Alloy steel	
17	2	Key	Carbon steel	
18	1	Bushing	Carbon steel	
19	1	Key	Carbon steel	
20	1	Manual override screw	Alloy steel	
21	1	Lead screw	Bronze	
22	1	Dowel	Alloy steel	
23	1	O-ring	Buna-N	●
24	1	Flange	Carbon steel	
25	1	Back plate	Carbon steel	
26	1	Bearing	Alloy steel	
27	1	Ring nut	Carbon steel	
28	1	O-ring	Buna-N	●
29	1	Adaptor flange	Carbon steel	

● Recommended spare parts

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rotork fluid system

MANUAL OVERRIDE – MH –
FOR SINGLE ACTING ACTUATOR
–ASSEMBLY DRAWING–

TABLE–D

DSGD013

File: DSGD013

INSTALLATION & MAINTENANCE MANUAL

MM-GP-E

SINGLE & DOUBLE ACTING PNEUMATIC ACTUATORS

GP/S – GP/D SERIES

rotork fluid system

MM-GP-E

INDEX

I. INSTALLATION INSTRUCTIONS

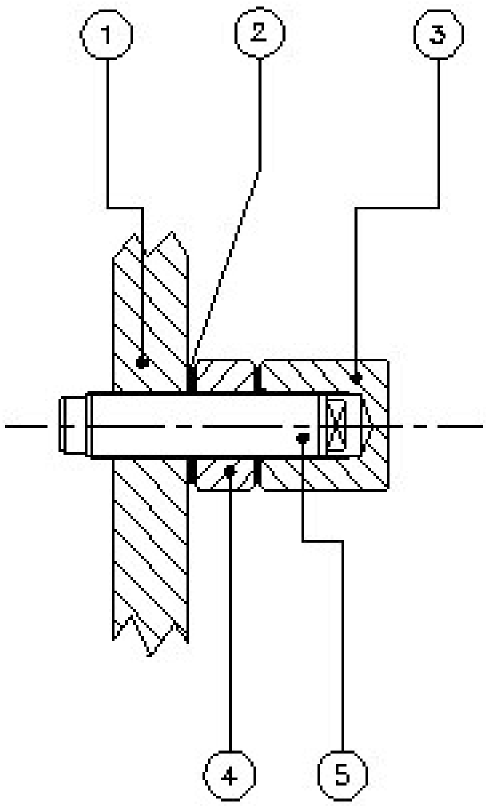
1.1 It is recommended that before lifting an actuator onto a valve, great care is taken to ascertain the position of the valve and orientate the actuator accordingly.

1.2 Rotork actuators can be mounted on valves in almost any desired position. It is usual however to align the centreline of the cylinder to the centreline of the associated pipe work.

1.3 When the actuator has been bolted to the flange or adapter and the keys inserted, the position of the stop bolts should be checked to ensure full opening and closing of the valve.
If these end positions are not suitable, the stop bolts may be adjusted by first loosening the fixing nut (item 4) and screwing the bolts in or out until desired position is obtained. Stroke the yoke away from the stop bolt when adjusting, then return it to check position. When the correct positioning is obtained, retighten the fixing nut (item 4) and reassemble the cap nut (item 3).

1.4 Certain valves incorporate their own stops. Such, it is recommended that the actuator stop bolt positions coincide with the valve stop positions.

1.5 Once in position, the actuator should operate the valve with a smooth continuous action.
If jerky operation occurs, the Hydraulic/gas supply should be checked for correct pressure and volume flow. Flow may be restricted by undersize pipe or fittings - these could throttle the flow thus reducing the air pressure at the actuator and causing intermittent motion. All Rotork actuators are tested prior to dispatch and copies of the test certificates are available on request.



Pos.	Q.ty	Description
1	1	Flange
2	2	Seal Washer
3	1	Cap nut
4	1	Fixing Nut
5	1	Stop screw

II. PERIODIC MAINTENANCE

As the actuators have been designed to work for long periods in the most severe conditions, they do not need any specific maintenance.
However, we recommend the following periodic checks:

- The actuators operate the valve correctly and with the required operating time.
  Carry out some opening and closing operations with all the existing controls (such as remote control - local control - emergency control). If the working conditions of the plant allow to do this and if the actuator is not frequently operated.
- The signalings to the control board are correct.
- The fluid supply pressure value is within the required range.
- The external components of the actuator are in good condition.
  This control can be carried out visually.
- The hydraulic/pneumatic connections do not show any leakage.
  If necessary, tighten the nuts of the pipe fittings.
- The painting work of the actuator has not been damaged. It is possible that some areas may need a touch-up according to the applicable painting specifications.

III. REPLACEMENT OF CYLINDER SEALS

When the cylinder seals must be replaced, either because of a leakage or a preventive scheduled maintenance, proceed as described below (see drawing) :
- Unscrew the nuts (item 33) from the tie rod (item 21).
- Remove the bottom flange (item 20).
- Remove the cylinder tube (item 18).
- Unscrew the screws and the cover of the mechanism (nb for a double acting actuator only)
- Slide the rod (item 19) together with the piston of the head flange (item 17).
- Stops from the inside of the housing the stem, by using a fork wrench (nb for a double acting actuator only).
- Unscrew the nut (item 34).
- Remove the piston (item 22) together with the shoulder washer (item 29).
- Unscrew the screw (item 13).
- Remove the head flange (item 17).
- Unscrew the screws (item 37).
- Remove the gasket retaining flange (item 36).
- Remove the o-rings (items 24-25-28-35), the gaskets (items 16-36) and the guide sliding ring (item 23).
  Carefully clean the relative grooves.
  Replace all the above mentioned seals and lubricate them with a grease film.

Taking care not to damage the seals, proceed with the reassembling as follows:
- Reassemble the gasket retaining flange (item 36) and screw the screws (item 37).
- Reassemble the head flange (item 17) and screw the screws (item 13).
- Reassemble the piston (item 22) and the shoulder washer (item 29).
- Stop from the inside of the container the stem by using a fork wrench (nb for a double acting actuator only).
- Screw the nut (item 34).
- Insert the rod (item19) into the head flange (item 17).
- Reassemble the cylinder tube (item 18) and the bottom flange (item 20).
- Uniform screw the nuts (item 33) on the tie rod (item 21).
- Replace the gasket of the mechanism cover (item 14) and reassemble the cover of the mechanism (nb
for a double acting actuator only)
- Carry out a few operations with the actuator, in order to check that the movement is regular and that the seals show no leakages.

Check that the painted parts have not been damaged during the operations of disassembly and of reassembly. If necessary repaint them in according to the applicable painting specification.

IV. LUBRICATION & HYDRAULIC OIL FEATURES

Usually the actuator will not require additional lubrication, because its mechanism is lubricated for life.
However, the following grease is used by Rotork Fluid System to lubricate the mechanical components and is recommended for any necessary lubrication:

MANUFACTURER:	MOBIL
TRADE NAME:	MOBILTEMP 78
COLOR:	GRAY/BLACK
SOAP TYPE:	INORGANIC
OIL TYPE:	MINERAL
CONSISTENCY (NLGI GRADE)-ASTM D217:	1
WORKED PENETRATION AT 25°C-ASTM D217:	295/325 dmm
DROPPING POINT–ASTM D2265	260°C
VISCOSITY OF BASE OIL AT 40°C-ASTM D445:	485 cSt
VISCOSITY OF BASE OIL AT 100°C-ASTM D445:	32 cSt

Note:
The above described grease type is the Rotork Fluid System standard for lubrication of scotch yoke actuators. In case a different grease type has been requested, see the description in the instruction manual.

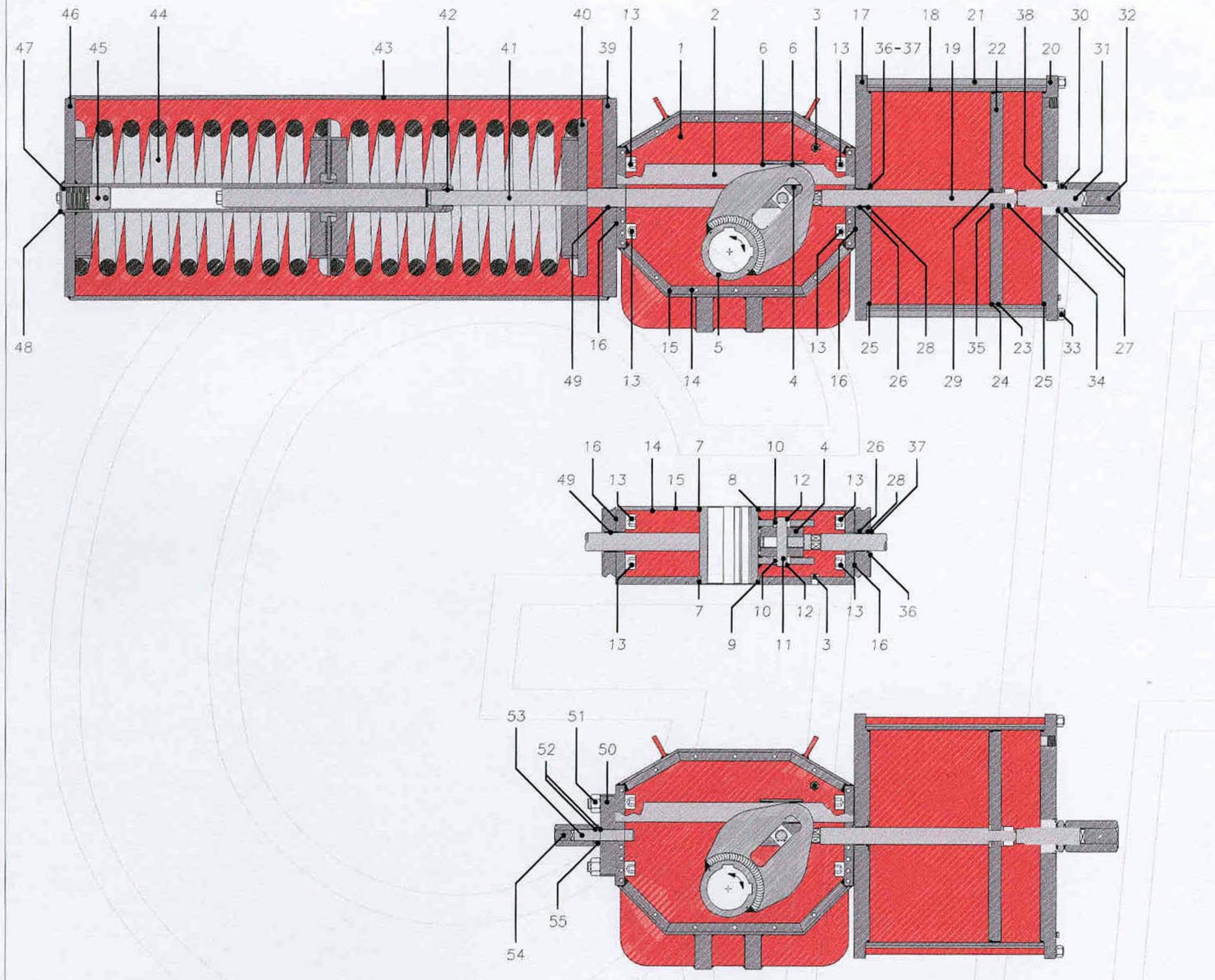
MANUFACTURER:	MOBIL
TRADE NAME:	DTE 11
VISCOSITY AT 40°C:	16,5 cSt
VISCOSITY AT 100°C:	4,2 cSt
VISCOSITY INDEX ASTM:	168
ISO GRADE:	16
POUR POINT:	-42 °C
SPECIFIC WEIGHT AT 15°C:	0,85 kg/dm^3
EQUIVALENT TO:	STATOIL - HYDRAWAY HVX-A15

Note:
The above described oil type is the Rotork Fluid System standard. In case a different oil type has been requested, see the description in the instruction manual.

V. FAULT LOCATION

In the unlikely event of a fault developing, the following Fault Location table is provided to assist the maintenance technician.
This Fault Location Table is designed to cover as wide a range of Rotork Fluid System actuators as possible. Reference to equipment not supplied should be ignored.

SYMPTOM	CAUSE	REMEDY
1.Erratic movement	1.1 Irregular supply of operating medium. 1.2 Poor lubrication. 1.3 Worn parts / scuffing ect. 1.4 Defective valve.	1.1.1 Check operating medium supply and correct as necessary. 1.2.1 Dismantle, relubricate and reassemble. 1.3.1 Dismantle, remove any roughness, lubricate and reassemble. 1.4.1 Consult the valve manufacturer's documentation.
2. Short stroke	2.1 Incorrectly set stops (valve and /or actuator). 2.2 Worn parts / scuffing ect. 2.3 Hard grease. 2.4 Debris left in the cylinder or housing during overhaul. 2.5 Defective valve. 2.6 Valve seized.	2.1.1 Check the position of the stops and readjust as necessary. 2.2.1 Dismantle, remove any roughness, lubricate and reassemble. 2.2.2 Dismantle, replace worn parts, lubricate and reassemble. 2.3.1 Dismantle, remove old hard grease, relubricate and reassemble. 2.4.1 Disassemble cylinder assembly to remove debris. Reassemble cylinder assemble as necessary. 2.5.1 Consult the valve manufacturer's documentation. 2.6.1 Remove the actuator from the valve, paying particular attention to procedure if the actuator is in a spring compressed position.
3.Apparent lack of power.	3.1 Low supply pressure. 3.2 Incorrect speed control settings. 3.3 Exhaust ports choked. 3.4 Pipe work blocked, crushed or leaking. 3.5 Defective controls. 3.6 Defective piston seal. 3.7 Defective rod seal. 3.8 High valve torque or valve seized.	3.1.1. Check the supply pressure and restore to the normal operating pressure. 3.2.1 Adjust the speed controls to give the correct speed. 3.3.1 Remove and clean the exhaust port silencers and replace. 3.3.2 Remove the exhaust port silencers and replace with new. 3.4.1 Examine the pipe work for blockage, crushed pipe work and leakage. Clear and / or make good as necessary. 3.5.1 Examine the controls, refurbish or renew as necessary. Refer to manufacturer's documentation. 3.6.1 Dismantle the cylinder assembly, remove the defective piston seal and fit new, reassemble the cylinder assembly. 3.7.1 Dismantle the cylinder assembly, remove the defective rod seal and fit new, reassemble the cylinder assembly. 3.8.1 Consult the valve manufacturers documentation. 3.8.2 Remove the actuator from the valve (see 2.6.1 above).



NOTE:
The quantities which are not indicated on the drawing, depend on the type of actuator.

HOUSING

DESCRIPTION	Q.ty	MATERIAL
1 Housing	1	Carbon steel
2 Guide bar	1	Alloy Steel+Chrom. plating
3 Safety valve	1	Brass+Stainless steel
4 Guide block	1	Carbon steel
5 Yoke	1	Carbon steel
6 Bushing	2	Steel+Bronze+PTFE
7 O-ring	2	Buna-n
8 Upper bushing	1	Bronze
9 Lower bushing	1	Bronze
10 Sliding block	2	Bronze
11 Bar pin	1	Alloy steel
12 Snap ring	2	Spring steel
13 Screw	8	Carbon steel
14 Gasket	1	Vaporflex/SA
15 Cover	1	Carbon steel

CYLINDER

DESCRIPTION	Q.ty	MATERIAL
16 Gasket	2	Buna-n+PTFE+Graphite
17 Head flange	1	Carbon steel
18 Cylinder tube	1	Carbon steel+Nickel plating
19 Piston rod	1	Carbon steel+Chrom. plating
20 Bottom flange	1	Carbon steel
21 Tie rod	–	Alloy steel
22 Piston	1	Carbon steel
23 Sliding ring	–	PTFE+Graphite
24 O-ring	–	Buna-n
25 O-ring	2	Buna-n
26 Bushing	1	Steel+Bronze+PTFE
27 Gasket	2	Buna-N+PTFE+Graphite
28 O-ring	1	Buna-n
29 Shulder washer	1	Alloy steel
30 Fixing nut	1	Carbon steel
31 Stop screw	1	Alloy steel
32 Cap nut	1	Carbon steel
33 Nut	–	Carbon steel
34 Nut	1	Carbon steel
35 O-ring	1	Buna-n
36 Gasket flange	1	Stainless steel
37 Screw	2	Stainless steel
38 Flange	1	Carbon steel

SPRING

DESCRIPTION	Q.ty	MATERIAL
39 Head flange	1	Carbon steel
40 Driving flange	1	Carbon steel
41 Rod	1	Carbon steel+Chrom. plating
42 Bushing	1	Steel+Bronze+PTFE
43 Enclosure	1	Carbon steel
44 Spring	–	Steel for spring
45 Stop screw	2	Carbon steel
46 Bottom flange	1	Carbon steel
47 Protection plug	1	Carbon steel
48 O-ring	1	Buna-n
49 Bushing	1	Steel+Bronze+PTFE

CLOSURE

DESCRIPTION	Q.ty	MATERIAL
50 Flange	1	Carbon steel
51 Nut	4	Carbon steel
52 Gasket	2	Buna-n
53 Stop screw	1	Alloy Steel
54 Cap nut	1	Carbon steel
55 Nut	1	Carbon steel

rotork fluid system

GENERAL SECTIONAL DRAWING OF GP

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MSG1001

Positioner with HART Communication
Type 3780

Fig. 1 · Type 3780

Mounting and Operating Instructions

EB 8380-1 EN

Firmware R 2.22/K 2.23

Edition June 2004

Contents **Page**

- *Assembly, commissioning and operation of the device may only be performed by trained and experienced personnel familiar with this product. According to these mounting and operating instructions, trained personnel is referred to persons who are able to judge the work they are assigned to and recognize possible dangers due to their specialized training, their knowledge and experience as well as their knowledge of the relevant standards.*
- *Explosion-protected versions of this device may only be operated by personnel who have undergone special training or instructions or who are authorized to work on explosion-protected devices in hazardous areas. See section 6 for more details.*
- *For devices in type of protection EEx nA, the following applies: live circuits may only be connected, interrupted, and switched for installation, maintenance or repair purposes.*
- *Devices that have already been used outside of hazardous areas and are intended for use in hazardous areas in future shall comply with the safety demands placed on serviced devices. Prior to operation, they shall be tested according to paragraph 26 "Repairing explosion-protected devices" of EN 50014:2000 to meet the safety requirements specified in this standard.*
- *Any hazards which could be caused by the process medium, the signal pressure and moving parts of the control valve are to be prevented by means of appropriate measures.*
  If inadmissible motions or forces are produced in the actuator as a result of the level of the supply air pressure, this must be restricted by means of a suitable pressure reducing station.
- *Proper shipping and appropriate storage are assumed.*

Note: *Devices with the CE mark meet the requirements specified in the Directive 94/9/EC and the Directive 89/336/EEC.*
The Declaration of Conformity can be viewed and downloaded on the Internet at http://www.samson.de.

Modifications of positioner firmware in comparison to previous version	
Former	**New**
	For more details on the listed parameters, please also refer to the list of parameters in section 8.
Positioner R 1.41	**R 2.01**
Parameters: **Operating direction**	**Direction of action** The reference variable (w) is not assigned to the output signal pressure (y) anymore, but to the travel/angle of rotation (x). >> increasing/increasing, valve opens with increasing reference variable. <> increasing/decreasing, valve closes with increasing reference variable.
Minimum transit time filling/venting	**Minimum transit time open/closed** The measured time is not referenced to filling/venting the actuator, but to the opening and closing the valve.
Required transit time filling/venting	**Required transit time open/closed** The actuating time is not referenced to filling/venting the actuator, but to the opening and closing the valve.
Cycle time factor K_IS	Omitted
Initialization	For version **R2.02** or higher, an alarm message is generated for deviations larger than 10 % when the type of initialization is maximum range. It is for the user to decide if he wants to tolerate the deviation.
Tolerated overshoot	If overshoot and dead band are exceeded by the negative deviation value, the pulse is adapted.
Text field	Free space for storing information text in the field device.

Former	New
Positioner 2.02	**R 2.11**
Parameters: **Minimum pulse filling/venting**	The minimum pulses for filling and venting are determined for the travel ranges 0 to 20 %, 20 to 80 % and 80 to 100 %. The minimum pulses are no longer determined during initialization.
Proportional-action coefficient KP_Y1 and KP_Y2 **Gain factor KD**	These factors are adapted to the actuator type selected and to the transit times measured.
Initialization	"Air leakage of pneumatic system" is displayed as alarm message, but does not cause abortion of initialization anymore. Upon initialization in the "nominal range", the positioner assumes only 100 % travel (no overtravel). "Wrong selection of rated travel/angle of rotation or transmission" is displayed as alarm message, but does not cause abortion of initialization anymore.
Positioner 2.11	**R 2.21**
Type of actuator	Change over type of actuator from "linear actuator" to "rotary actuator" Initialization type ....Based on maximum range Transmission code ....S90 Nominal angle....................90° End position when w < ....1 % End position when w > ....99 % Rotational angle range start ..0° Rotational angle range end ...90°
	Change over type of actuator from "rotary actuator" to "linear actuator" **Attachment** ....**Integral**..............................**Acc. to NAMUR** Initialization type ....Based on nominal range ....Based on nominal range Mounting position ....Arrow towards actuator........Arrow away from actuator Transmission code ....D1 ....– Pin position.........................– ....A Rated travel ....15 mm ....15 mm End position when w < ....1 % ....1 % End position when w > ....125 % ....125 % Travel range start.................0 mm ....0 mm Travel range end ....15 mm ....15 mm Length of lever.....................– ....42 mm

End position when w </>	Changing the type of initialization from "maximum range" to "nominal range" causes: End position at < 1 % End position at > 125 % Changing the type of initialization from "nominal range" to "maximum range" causes: End position at < 1 % End position at > 99 %
Extended valve diagnostics	Supports TROVIS-EXPERT in version 1.0 or higher
Required transit time open/closed	The adjustment range for the required transit times has been limited to 75 s. Safe functioning can only be guaranteed up to this limit value.
Initialization	During initialization, the minimum control pulses for the range 20 % to 80 % of the range of the manipulated variable are determined and saved in the EEPROM.
Proportional-action coefficient KP_Y1 and KP_Y2	These factors are adapted to the type of actuator chosen and the transit times measured.
Positioner 2.21	**R 2.22**
	Correction in "manual" operating mode and direction of action Correction in zero calibration started via communication
Communication K 1.00	**K 2.01**
Characteristic type	Free space for entering information on the description of the user-defined characteristic saved in the device. Can be stored in the field device. For version K 2.02 or higher, when selecting [equal percentage] or [equal percentage reverse], the description text in parameter characteristic type of the device is automatically set to the selection made.
Communication K 2.02	**K 2.11**
	Supports all functions of R 2.11
Type of initialization	For K 2.11 or higher, the default value is "maximum range"
End position when w >	For K 2.11 or higher, the default value is 99 %

Former	New
Communication K 2.13	**K 2.21**
	Supports all functions of R 2.21 as well as TROVIS-EXPERT in version 1.0 or higher
Communication K 2.21	**K 2.22**
	Supports all functions of R 2.21 as well as TROVIS-VIEWin version 2.0 or higher

New for model index **3780-**x...x. **01** or higher: **Write protection switch**
If this option is activated using the switch, the positioner settings cannot be written over by HART communication. See section 4.1 for more details on the write protection switch.

Model index **3780-**x...x. **03** or higher are suitable for the extended valve diagnosis using the TROVIS-EXPERT software.

Positioner versions

Model			**3780 -**	X	X	X	X	X
Explosion protection	Without			**0**				
	Ex II 2 G EEx iA IIC T6 as per ATEX			**1**				
	CSA/FM			**3**				
	Ex II 3 G EEx nA II T6 as per ATEX			**8**				
Additional accessories	Limit switches	Without			**0**			
		2 inductive			**2**			
		2 software			**3**			
	Forced venting	Without				**0**		
		With				**1**		
	Position transmitter	Without					**0**	
		4...20 mA					**1**	
Pneumatic connections	NPT 1/4-18							**1**
	ISO 228/1-G 1/4							**2**

Positioner	
Rated travel, adjustable	Direct attachm. 5 to 30mm Attachment acc. to IEC 60534-6 (NAMUR), 5 to 255 mm or 30 to 120° C
Reference variable	Two-wire connection, signal range 4 to 20 mA, span 4 to 16 mA Min. current = 3.6 mA, load ≤10.8 V (corresponding to 540 Ω at 20 mA), static destruction limit 500 mA
Supply	Supply air from 1.4 to 6 bar (20 to 90 psi)
Signal pressure (output)	0 bar to pressure of supply air
Characteristic, adjustable	Linear, equal percentage, reverse equal percentage, user-programmable Deviation from characteristic ≤1 %
Dead band	Adjustable from 0.1 to 10 %, default 0.5 %
Resolution	≤0.05 %
Transit time to travel	Up to 75 s, separately adjustable for exhaust and supply air
Moving direction	Reversible, adjustment via software
Air consumption	Independent of supply air <90l_n/h
Air delivery	Actuator filled: for Δp = 6 bar 9.3 m_n^3/h, for Δp = 1.4 bar 3.5 m_n^3/h Actuator vented: for Δp = 6 bar 15.5 m_n^3/h, for Δp = 1.4 bar 5.8 m_n^3/h
Perm. ambient temperature	– 20 to 80 °C, with metal cable gland – 40 to 80 °C Devices with position transmitter only – 20 to 80 °C For explosion-protected devices, see type examination certificate in appendix
Effects	Temperature: ≤0.15 %/10 K, supply: none, vibrations: none up to 250 Hz and 4 g
Explosion protection	EEx ia IIC T6, see type examination certificate
Degree of protection	IP 65 by using the filter check valve included
Electromagnetic compatibility	Requirements stipulated in EN 61000-6-2, EN 61000-6-3 as well as NAMUR Recommendation 21 have been met
Electrical connections	1 cable gland M20x1.5, black plastic; other threaded hole M20x1.5 available
Fault message output	For connection to switching amplifier acc. to EN 60947-4-6, static destruction limit 16 V
Forced venting (model index .03 or higher)	Activated/deactivated by a switch inside case Input: 6...24 V DC, R_i approx. 6 kΩ, at 24 V DC (depending on voltage), switching point for "1" signal at ≥ 3 V, signal "0" only at 0 V, K_V value 0.17; static destruction limit 45 V

Communication	
Hardware requirements	SAMSON's TROVIS-VIEW Operator Interface (see Data Sheet T 6661 EN) or handheld communicator, e.g. Type 275 by Rosemount Integration of other operator interfaces, e.g. DTM, are available
Data transmission	HART Field Communication Protocol Impedance in HART frequency range: receive: 350 to 450 Ω; send: approx. 115 Ω
Accessory equipment	
Inductive limit switches	Two Type SJ 2 SN Prox. Switches for connection to switching amplifier acc. to EN 60947-5-6
Software limit switches	Two configurable limit values for connection to switching amplifier acc. to EN 60947-5-6 Switching hysteresis 1%, static destruction limit 16 V
Analog position transmitter	Two-wire transmitter, output 4 to 20 mA Supply: terminal voltage 12 to 35 V DC, static destruction limit 40 V Direction of action reversible, characteristic linear, operating range: –10 % to + 114 % DC current signal ripple content: 0.6 % at 28 Hz/IEC 381 T1 Resolution ≤0.05 % HF influence <2 % with f= 50 to 80 Mhz Influence aux. supply: none; temperature influence: same as positioner
Materials (WN numbers according to DIN)	
Case	Die-cast aluminum, chromed and plastic-coated External parts: stainless steel 1.4571 and 1.4301
Weight	Approx. 1.3 kg

1. Design and principle of operation

The positioner essentially consists of an inductive, non-contact travel measuring system and an electrically controlled valve block comprising two 2/2-way on-off valves and an electronic unit. This unit contains two microcontrollers for processing the control algorithm and managing the communication.
Whenever a deviation between the actual valve travel (actual value) and the reference variable (set point) occurs, the microcontroller produces binary pulse-pause modulated signals to control the two 2/2-way on-off valves, each of which is assigned an amplifier. One of these valves controls the exhaust air, and the other one controls the supply air.
The supply air valve (3) switches the supply air (7, supply air pressure 1.4 to 6 bar) to the actuator (filling). The exhaust air valve (4) controls the air exhausted from the actuator to the atmosphere (venting). These on-off valves can either have the switching states - permanently open, permanently closed - or generate single pulses of changing widths. With the two valves being controlled, the plug stem moves to a position corresponding to the reference variable. If there is no system deviation, both the supply air and the exhaust air valve are closed.

As a standard feature, the positioner is equipped with a fault message output (binary output according to EN 60947-5-6) used to signalize a fault to the control room.

Activating the write protection switch located in the hinged cover prevents the positioner settings from being overwritten by the HART protocol.

Forced venting function

The positioner is controlled via a 6 to 24 V signal, causing the signal pressure to be applied to the actuator. If this voltage signal decreases, the signal pressure is shut off and the actuator is vented. The springs contained in the actuator move the valve to its fail-safe position.
The forced venting function is installed in all positioners from model index .0**3** or higher. The function can be activated or deactivated by a switch. See section 4.2 (page 34) for more details.

1.1 Options

As a supplement to the standard positioner version, there are several additional options to extend the positioner functions.

Limit switches

To signalize the valve's end positions in fail-safe circuits, either two software limit switches or two proximity switches can be used.

Position transmitter

The position transmitter is an intrinsically safe 2-wire transmitter controlled by the microcontroller of the positioner. It serves to assign the valve position with the 4 to 20 mA output signal. The position transmitter signalizes both end positions, "valve closed" or "valve fully open", as well as all intermediate positions. Since the valve positions are signalized to the positioner independently of the input signal (minimum current must be observed), the position transmitter is a suitable option for checking the current valve position.

1.2 Communication

For communication, the positioner is equipped with an interface for the HART protocol (Highway Addressable Remote Transducer). Data transmission is accomplished by superimposing an FSK signal (FSK = Frequency Shift Keying) over the existing 4 to 20 mA signal lines for the reference variable.

You can configure and operate the positioner either via HART-compatible, hand-held communicator or via PC, using an FSK modem and an RS-232 interface.

After mechanically resetting the positioner to zero, it can be automatically started up via initialization procedure. During this initialization procedure, zero is automatically adjusted, and the preset span is checked.

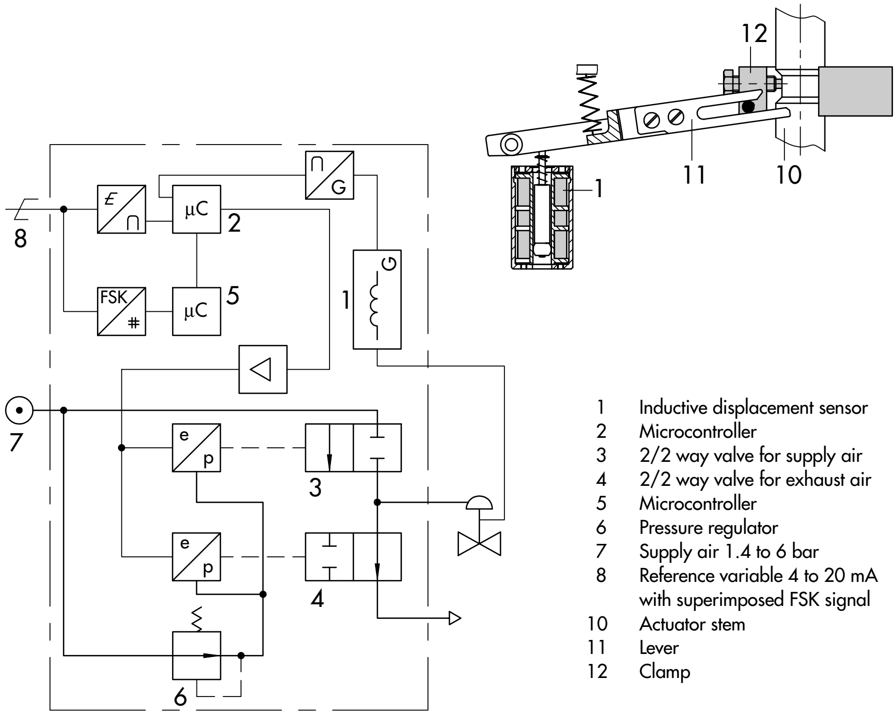


Fig. 2 · Functional diagram

The positioner is supplied with a standard configuration applying to a valve with 15 mm rated travel, which is designed for integrated positioner attachment.

An individual configuration needed to adapt the positioner to deviating actuators can only be carried out by means of a communicator or a PC with a connected FSK modem, using the HART protocol.

You can enter the following parameters: control characteristic, direction of action, limitation of travel, travel range, transit time to travel and fault messages.

Operating software

- TROVIS-VIEW
  for devices with firmware K 2.11 or higher, Data Sheet T 6661 EN
- IBIS
  (DOS-based, no longer runs on Windows 2000/ME/XP/NT),
  see EB 8380-2 EN for more details
- DMT 1.2 and PACTware
- Integration
  e.g. Fisher AMS, Siemens PDM, etc.

Handheld communicator
DD-based handheld communicators,
e.g. Fisher-Rosemount HART Communicator.

2. Attachment to the control valve

The positioner can be attached either directly to a SAMSON Type 3277 Actuator, or according to Namur (IEC 60534-6), to control valves with cast yokes or rod-type yokes.

In combination with an intermediate piece, the device can also be attached as rotary positioner to rotary actuators.

Since the standard positioner unit is delivered without accessories, the required mounting parts and their order numbers have to be derived from the tables.

Note!
For quick-acting control valves with a small travel volume (transit time < 0.6 s), it might be necessary to replace the filter installed in the output pressure bore with a screw-in throttle to obtain good control properties.
For further information, refer to sections 2.1, 2.2 and 2.3.

Caution!
The positioner does not have a venting plug. Instead the air is exhausted via venting plugs on the mounting parts (see also Fig. 3, 5 and 7).
A filter check valve for the exhaust air is supplied with every positioner (located underneath a transparent cover at the back of the positioner). Use this filter check valve in place of the standard venting plug included in the accessories. The IP 65 degree of protection to prevent dirt and moisture entering the device is only achieved when this filter check valve is used.

2.1 Direct attachment to Type 3277 Actuator

For the selection of the required mounting parts, refer to Tables 1, 2 and 3 (page 17).

When looking at the signal pressure connection or the switchover plate (Fig. 3) from the top, the positioner must be attached to the left side of the actuator. The **arrow** on the black case cover (Fig. 12) should then point **towards** the **diaphragm chamber.**

Exception: Control valves in which the plug closes the seat area when the actuator stem retracts. In this case, the positioner has to be attached to the right side of the yoke, i.e. with the arrow pointing away from the diaphragm chamber).

1. First screw the clamp (1.2) to the actuator stem. Make sure the fastening screw is located in the groove of the actuator stem.
2. Screw the associated lever D1 or D2 to the transmission lever of the positioner.
3. Fasten distance plate (15) with seal towards the actuator yoke.
4. Place positioner on the plate (15) so that the lever D1 or D2 will slide centrically over the pin of the clamp (1.2). Then screw on to distance plate (15).
5. Attach cover (16).

Note!
For quick-acting control valves (transit time < 0.6 s), it is necessary to replace the filter installed in the output pressure bore (Output 38) with a screw-in throttle (accessories specified in Table 3).

Actuator with 240, 350 and 700 cm^2

6. Check whether the tongue of the seal (17) is aligned on the side of the connection block such that the actuator symbols for "Actuator stem extends" or "Actuator stem retracts" match the actuator design.
   Otherwise, remove the three fixing screws, remove the cover plate (18) and reinsert the seal (17) turned by 180°.
   When using an **old** connection block, turn the switch plate (19) such that the corresponding actuator symbol is aligned with the arrow.
7. Place connection block with the associated sealing rings against the positioner and the actuator yoke and screw it tight, using the fastening screw.
   For actuators with fail-safe action "actuator stem retracts", additionally install the ready-made signal pressure pipe between the connection block and the actuator.

Actuator with 120 cm^2

With Type 3277-5 Actuator with 120 cm^2 the signal pressure is transmitted via the switchover plate to the diaphragm chamber.

For a rated travel of 7.5 mm, a brass throttle has to be pressed into the seal located in the signal pressure input on the actuator yoke. With 15 mm rated travel, this is only required when the supply air pressure is higher than 4 bar.

6. Remove the vent plug on the back of the positioner and close the side-located signal pressure output (38) with the plug from the accessory kit.

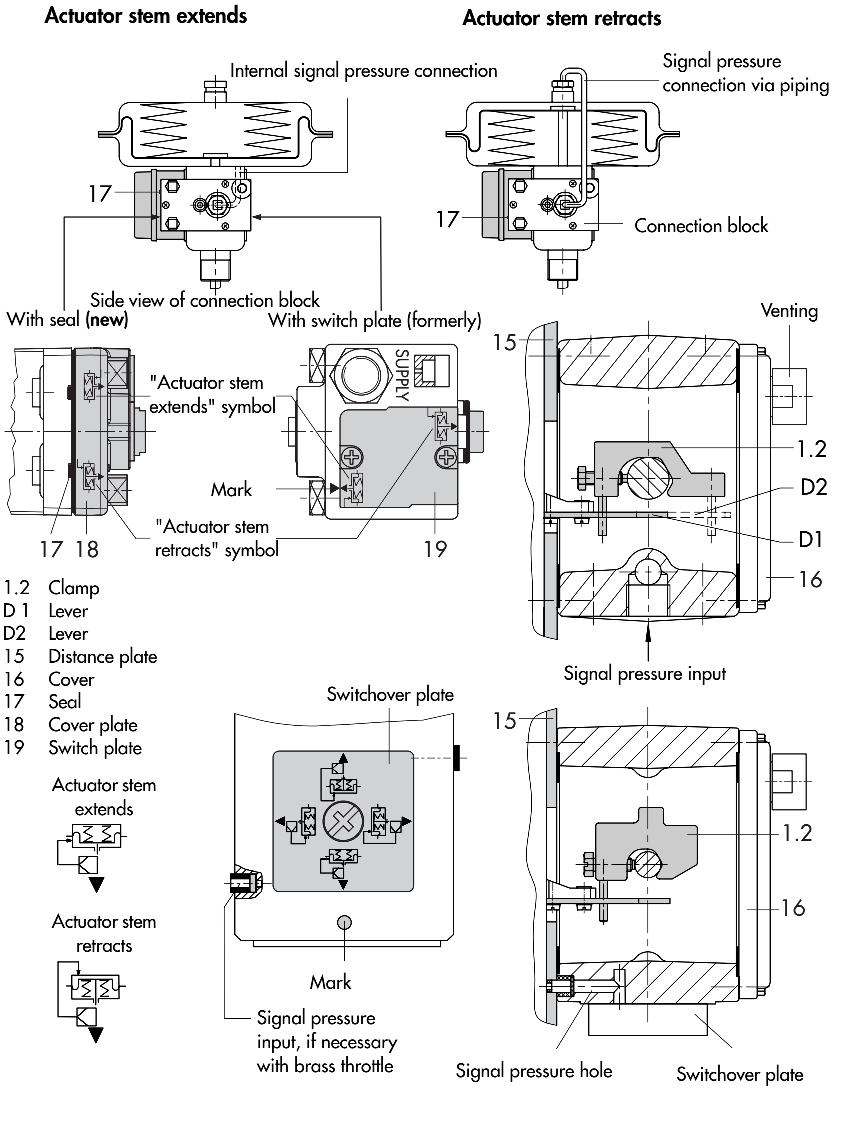


Fig. 3 · Attachment and signal pressure connection for Type 3277 (top) and Type 3277-5 with 120 cm² (below)

7. Mount the positioner so that the hole in the distance plate (15) matches the seal located in the hole of the actuator yoke.
8. Align the switchover plate with the corresponding symbol for left attachment according to the marking and screw tight onto the actuator yoke.

Important!
If, with the 120 cm² actuator in addition to the positioner, a solenoid valve or a similar device is attached to the actuator, do not remove the rear M3 screw. In this case, the signal pressure has to be fed from the signal pressure output to the actuator via the required connecting plate (see Table 2). The switchover plate is not used.

Note!
For quick-acting control valves (transit time < 0.6 s), it is necessary to replace the filter installed in the output pressure bore (Output 38) with a screw-in throttle (accessories specified in Table 3).

Filling the spring chamber with air

If the spring chamber of the Type 3277 Actuator must be filled with the air exhausted from the positioner, the spring chamber (version "Actuator stem extends") can be connected to the connection block by means of a tube (see Table 3). To proceed, remove the venting plug in the connection block.

In Type 3277-5 when "Actuator stem retracts" the exhausted air from the positioner is constantly applied to the spring chamber through an internal hole.

Table 1 Required lever with associated clamp and distance plate		Actuator size cm^2	Mounting kit Order no.
D1 with plug for output (38) Connecting thread	G 1/4 1/4 NPT	120	1400-6790 1400-6791
D1 (33 mm in length with clamp 17 mm in height)		240 and 350	1400-6370
D2 (44 mm in length with clamp 13 mm in height)		700	1400-6371

Table 2		Order no.
Switchover plate for actuator 120 cm^2	Actuator 3277-5xxxxxx. **00** (old)	1400-6819
Switchover plate **new**	Actuators with Index. **01** or higher (new)	1400-6822
Connecting plate for additional attachment e.g. of a solenoid valve	3277-5xxxxxxxx. **00** (old) G 1/8 1/8 NPT	1400-6820 1400-6821
Connecting plate **new**	Actuators with Index. **01** or higher (new)	1400-6823
NOTE: New switchover plates and connecting plates can only be used with the new actuators (Index ***01****). Old and new plates are not interchangeable.*		
Connection block required for actuator sizes 240, 350 and 700 cm^2 (including seals and fastening screw)	G 1/4	1400-8811
	1/4 NPT	1400-8812

Table 3	Actuator size cm^2	Material	Order no.
Required tubes incl. fittings for actuator: "actuator stem retracts" or for filling the top diaphragm chamber	240	Steel	1400-6444
	240	Stainless steel	1400-6445
	350	Steel	1400-6446
	350	Stainless steel	1400-6447
	700	Steel	1400-6448
	700	Stainless steel	1400-6449

Accessories		
Pressure gauge mounting kit for supply air and signal pressure	St.S/Brass: 1400-6957	St.S/St.S: 1400-6958
Signal pressure throttles (screw-in type and brass throttle)		1400-6964
Filter check valve, replaces venting plug and increases the degree of protection to IP 65 (one included with the delivered positioner)		1790-7408

2.2 Attachment according to IEC 60534-6

For the selection of the required mounting parts, refer to Tables 4 and 5 (page 21).

The positioner is attached according to NAMUR using an adapter housing as shown in Fig. 4. The valve travel is transmitted via the lever (18) and the shaft (25) to the bracket (28) of the adapter housing and then to the pin (27a) located at the positioner lever.
To attach the positioner, the mounting parts listed in Table 4 are required. Which lever is to be used depends on the rated valve travel.
Once the positioner is attached, however, the **arrow** on the black case cover has to point downwards **away** from the **diaphragm actuator**. (**Exception**: Control valves in which the plug closes the seat area when the actuator stem retracts. In this case, the arrow has to point **towards** the diaphragm actuator).

Note!
For quick-acting control valves (transit time < 0.6 s), it is necessary to replace the filter installed in the output pressure bore (Output 38) with a screw-in throttle (accessories specified in Table 4).

2.2.1 Mounting sequence

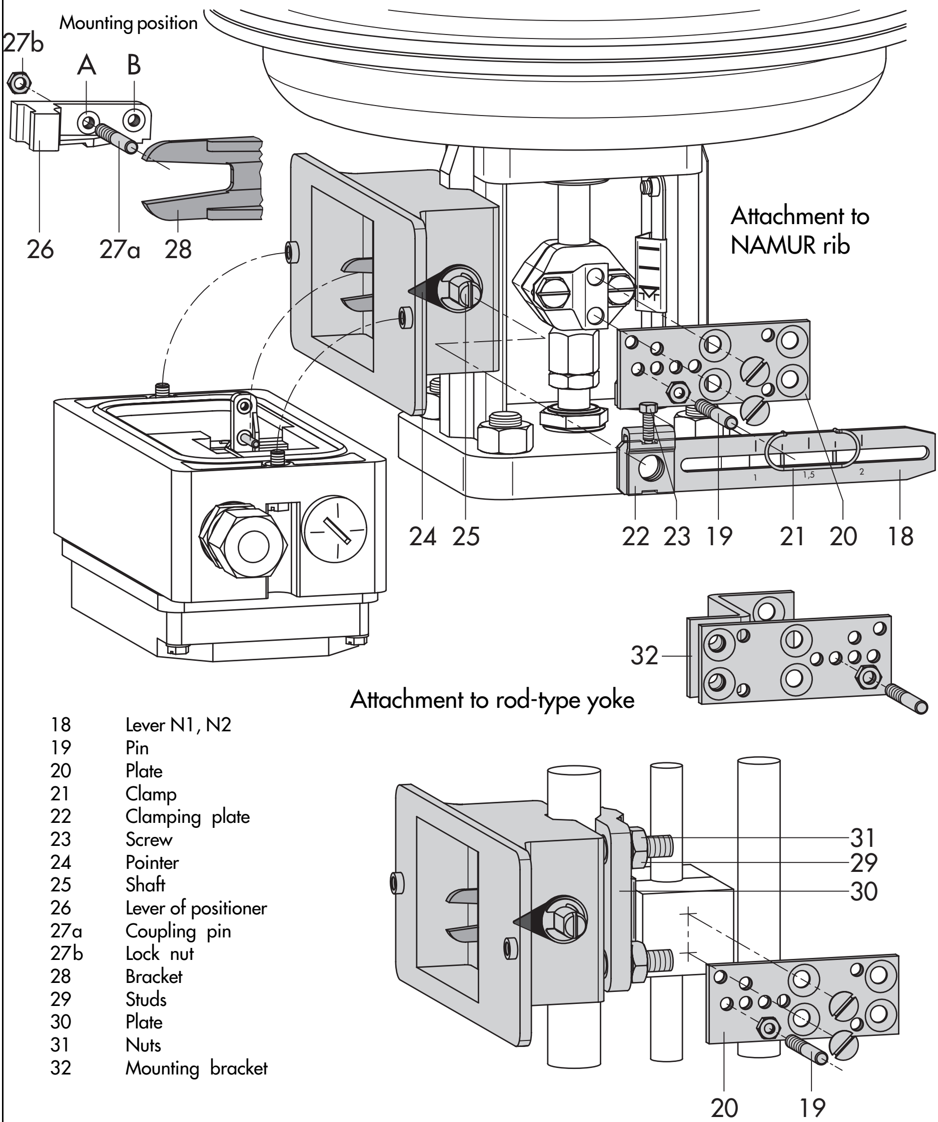
NOTE
Before you mount the parts, load the actuator with air pressure so that the valve is set to 50 % of its travel. This will ensure the exact alignment of the lever (18) and the bracket (28).

Control valve with cast yoke

1. Use countersunk screws to screw the plate (20) to the coupling which connects the plug and actuator stem. With 2100 and 2800 cm^2 actuators, use additional mounting bracket (32).
2. Remove rubber plug from the adapter housing and fasten the housing to the NAMUR rib, using the hexagon head screw.

Control valve with rod-type yoke

1. Screw plate (20) to the follower clamp of the plug stem.
2. Screw studs (29) into the adapter housing.
3. Place the housing with the plate (30) on either the right or left side of the valve rod and screw the housing tight by using nuts (31). While doing so, make sure that lever (18) to be mounted subsequently is horizontal (when the valve is at midtravel).
4. Screw the pin in a hole in the center row of holes in the plate (20) and lock it such that it will be located above the correct lever marking (1 to 2) for the assigned travel, see Table 5. Intermediate values must be calculated. Beforehand,



18	Lever N1, N2
19	Pin
20	Plate
21	Clamp
22	Clamping plate
23	Screw
24	Pointer
25	Shaft
26	Lever of positioner
27a	Coupling pin
27b	Lock nut
28	Bracket
29	Studs
30	Plate
31	Nuts
32	Mounting bracket

Fig. 4 · Attachment according to IEC 60534-6 (NAMUR) move the clamp (21) to surround the pin.

5. Measure the distance between the center of the shaft (25) and the center of the pin (19). You will be prompted for this value subsequently during the configuration of the positioner.

2.2.2 Presetting the valve travel

1. Adjust the shaft (25) in the adapter housing so that the black pointer (24) is aligned with the casted marking on the adapter housing.
2. Screw tight clamping plate (22) in this position, using a screw (23).
3. Screw in the pin (27) at the positioner lever (26) and secure it with a hex nut on the opposite side. Note the mounting position **A** or **B** respectively according to Table 5 and Fig. 5.
4. Put the positioner to the adapter housing such that the pin (27) will lie properly within the arms of the bracket (28).
   To do so, insert a 2.5 mm Allen key or a screwdriver from the front into the hole located below the oblong hole on the cover plate, and push the positioner lever in the required position.
5. Screw the positioner to the adapter housing.
6. Relieve the actuator from the signal pressure.

Table 4 Attachment acc. to IEC 60534-6	Control valve		Travel in mm	With lever	Order no.
NAMUR mounting kit Parts illustrated in Fig.4	Valve with cast yoke		7.5 to 60	N1 (125 mm)	1400-6787
			30 to 120	N2 (212 mm)	1400-6789
	Valve with rod-type yoke with rod diameter in mm	20 to 25		N1	1400-6436
		20 to 25		N2	1400-6437
		25 to 30		N1	1400-6438
		25 to 30		N2	1400-6439
		30 to 35		N1	1400-6440
		30 to 35		N2	1400-6441
Attachment to Fisher and Masoneilan linear actuators (one each of both mounting kits is needed per one actuator)					1400-6771 and 1400-6787
Accessories					Order no.
Pressure gauge mounting block				G 1/4 1/4 NPT	1400-7458 1400-7459
Pressure gauge set				St. st./Brass St. st./St. st.	1400-6957 1400-6958
Signal pressure throttles (screw-in type and brass throttle)					1400-6964
Filter check valve, replaces venting plug and increases the degree of protection to IP 65 (one included with the delivered positioner)					1790-7408

Table 5 Attachment according to IEC 60534-6										
Travel in mm *)	7.5	15	15	30	30	60	30	60	60	120
Pin on marking *)	1		1	2	1	2	1	2	1	2
Corresp. distance pin/lever fulcrum	42		42	84	42	84	84	168	84	168
With lever	N1 (125 mm in length)						N2 (212 mm in length)			
Transmission pin (27) on position	A		A		B		A		B	

*) Deviating travel values (intermediate values) must be calculated accordingly.

2.3 Attachment to rotary actuators

For the selection of the required mounting parts, refer to Table 6 (page 25).

The positioner can also be attached to rotary actuators in accordance with VDI/VDE 3845 by using the mounting parts and accessories listed in Table 6. In this arrangement, the actuator's rotary motion is converted via the cam disk on the actuator shaft and the feeler roll of the positioner lever to a linear motion required by the positioner's inductive displacement sensor system.

Each cam disk is suitable for two characteristics, i.e. for the ranges of angle of rotation from 0 to 90° (recommended for angles below 90°) and 0 to 120° (recommended for 90° and greater).

For double-acting, springless rotary actuators, it is necessary that a reversing amplifier be attached to the positioner on the side of the connection. (See section 2.3.4.)

If the positioner is attached to a SAMSON Type 3278 Rotary Actuator, the air exhausted from the positioner is admitted to the inside of the actuator and the chamber behind the diaphragm. No additional piping is required.
If the positioner is attached to actuators of other manufacturers (NAMUR) the air is applied to the chamber behind the diaphragm through a tube assembly and a tee, connected between actuator and intermediate piece.

Note!
For quick-acting control valves (transit time < 0.6 s), it is necessary to replace the filter installed in the output pressure bore (Output 38) with a screw-in throttle (accessories specified in Table 6).

2.3.1 Mounting the cam follower roll lever

1. Place lever with the attached roll (35) on the side of the transmission lever (37) and secure it with the enclosed screws (38) and washers.

2.3.2 Mounting the intermediate piece

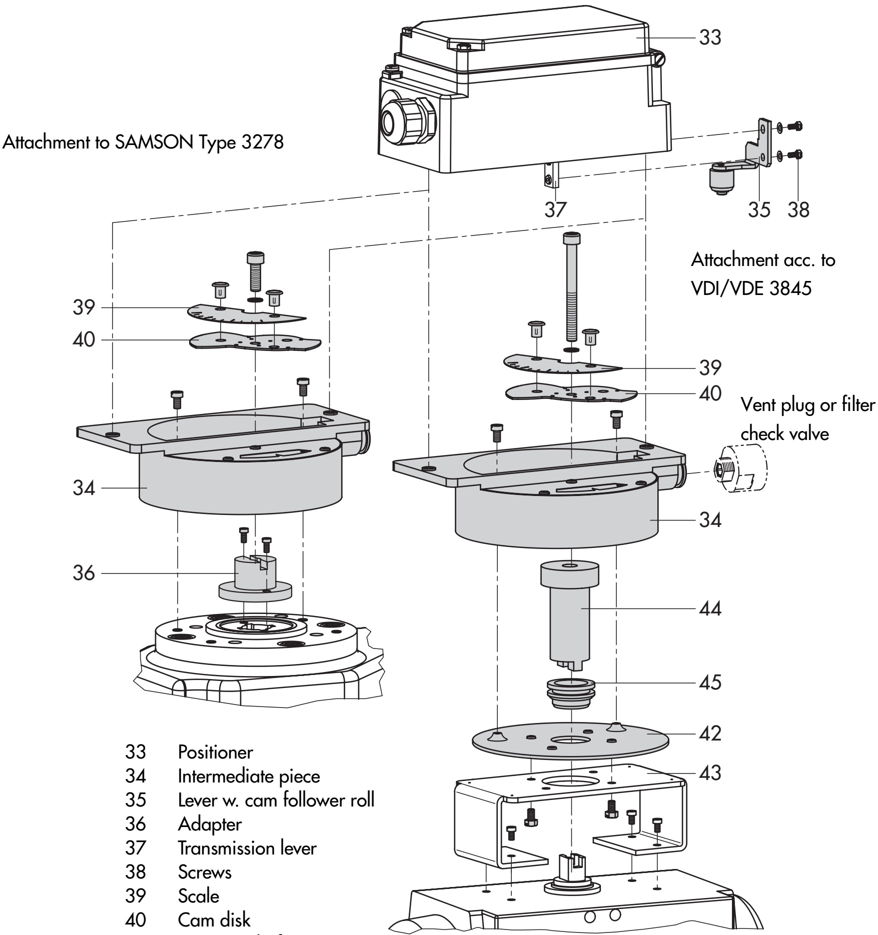
SAMSON Type 3278 Actuator:

1. Screw adapter (36) to the free end of the rotary actuator shaft with two screws.
2. Place the intermediate piece (34) on the actuator case and fasten with two screws. Align intermediate piece of the positioner so that the air connections of the positioner will face towards the diaphragm case side.

Actuators according to VDI/VDE 3845

1. Place the complete intermediate piece (34, 44, 45 and 42) onto the mounting bracket included in the delivery (fixing level 1 VDI/VDE 3845) and screw tight.
2. Align the cam disk (40) and scale (39) as described in section 2.3.3 and fasten tight.

With springless actuators, the reversing amplifier must be screwed to the side of the positioner case. See section 2.3.4 for more details.



33	Positioner
34	Intermediate piece
35	Lever w. cam follower roll
36	Adapter
37	Transmission lever
38	Screws
39	Scale
40	Cam disk
41	Actuator shaft
42	Plate
43	Bracket
44	Coupling
45	Seal

Fig. 5 · Attachment to rotary actuators

2.3.3 Aligning and mounting of the cam disk

In rotary actuators with spring-return mechanism, the built-in actuator springs determine the fail-safe position and the direction of rotation of the control valve (either counterclockwise or clockwise).
With double acting, springless rotary actuators, the direction of rotation depends on both the actuator and the valve model used.
Any adjustments are only permitted when the valve has been closed.
The direction of action of the positioner, i.e. whether the valve shall either open or close when the reference variable increases, has to be software-adjusted via the communication (increasing/increasing or increasing/decreasing direction of action).

1. Position the cam disk with the scale on the adapter (36) or the coupling (44) and fasten the screw loosely at first.

The cam disk carries two cam sections. The starting point of each section is marked by a small bore.

Note!
With the valve closed, the starting point (bore hole) of the respective characteristic is to be aligned so that the center of rotation of the cam disk, the 0° position on the scale, and the arrow mark on the disk are aligned.
The starting point when the valve is closed should not under any circumstances be below the 0° position!

With actuators with fail-safe position "Valve OPEN", the maximum signal pressure must be applied to the actuator before aligning the cam disk.
With springless actuators, the supply air must be connected.

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2. In aligning the cam disk, clip on the double-sided scaled disk in such a way that the valve on the scale will correspond to the direction of rotation of the control valve. Only then, secure the cam disk with the fastening screws.

Securing the aligned cam disk

If the cam disk should be additionally secured to prevent it from being turned, proceed as follows:

Choose one of the four bore holes located centrically around the center bore on the cam disk which is suitable to secure the cam disk.
Drill a hole in the adapter (36) or coupling (44) through the selected hole so that a 2 mm dowel pin can be inserted in this hole.

3. Attach the positioner to the intermediate piece (34) so that the lever (35) contacts the cam disk with its cam follower roll. To do so, insert a 2.5 mm hexagon socket key or a screw driver from the front into the bore hole which can be seen below an oblong hole on the cover plate and bring the positioner lever in the required position.
4. Screw the positioner onto the intermediate piece.

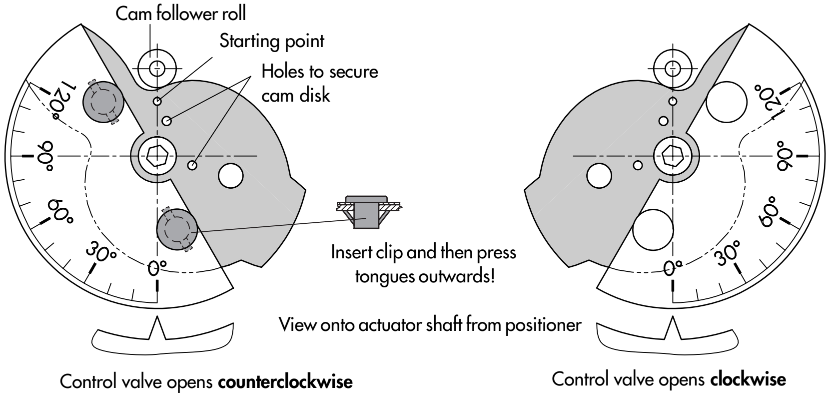


Fig. 6 · Aligning the cam disk

Table 6 Rotary actuators (Complete mounting parts, but without cam disks)						
SAMSON Type 3278 Actuator			Attachmt. acc. to VDI/VDE 3845	Attachment to Masoneilan actuator		
	Actuator 160 cm^2	Actuator 320 cm^2		Camflex I DN 25 ...100	Camflex I DN 125...250	Camflex II
	Order no.					
	1400-7103	1400-7104	1400-7105	1400-7118	1400-7119	1400-7120
Piping kit 8 x 1 stainl. steel						
G	1400-6670	1400-6672				
NPT	1400-6669	1400-6671				

Accessories	Order no.	
Reversing amplifier for double-acting, springless actuators	G: 1079-1118	NPT: 1079-1119
Cam disk (0050-0089) with accessories, angle of rotation 0 to 90° and 0 to 120°	1400-6959	
Cam disk (0050-0089) especially for VETEC, adjustable to 0 to 75° via software	1400-6960	
Cam disk (0050-0090) especially for Camflex, adjustable to 0 to 50° via software	1400-6961	
Pressure gauge mounting block	G 1/4: 1400-7458	1/4 NPT: 1400-7459
Pressure gauge set	St. st./Br.: 1400-6957	St. st./St. st.: 1400-6958
Signal pressure throttles (screw-in type and brass throttle)	1400-6964	
Filter check valve, replaces venting plug and increases the degree of protection to IP 65 (one included with the delivered positioner)	1790-7408	

2.3.4 Reversing amplifier for double-acting actuators

For the use with double-acting actuators, the positioner must be fitted with a reversing amplifier.
The reversing amplifier is listed as an accessory in the Table 6 on page 25.

The output signal pressure of the positioner is supplied at the output A_1 of the reversing amplifier. An opposing pressure, which equals the required supply pressure when added to the pressure at A_1, is applied at output A_2. The rule $A_1 + A_2 = Z$ applies.

Mounting

Note!
Prior to attaching the reversing amplifier, remove the sealing plug (1.5). The rubber seal (1.4) must remain installed.

1. Screw the special nuts (1.3) from the accessories of the reversing amplifier into the threaded connections of the positioner.
2. Insert the gasket (1.2) into the recess of the reversing amplifier and push both the hollowed special screws (1.1) into the connecting boreholes A1 and Z.
3. Place the reversing amplifier onto the positioner and screw tight using both the special screws (1.1).
4. Screw the enclosed filter (1.6) into the connecting boreholes A1 and Z using a screwdriver (8 mm wide).

Signal pressure connections

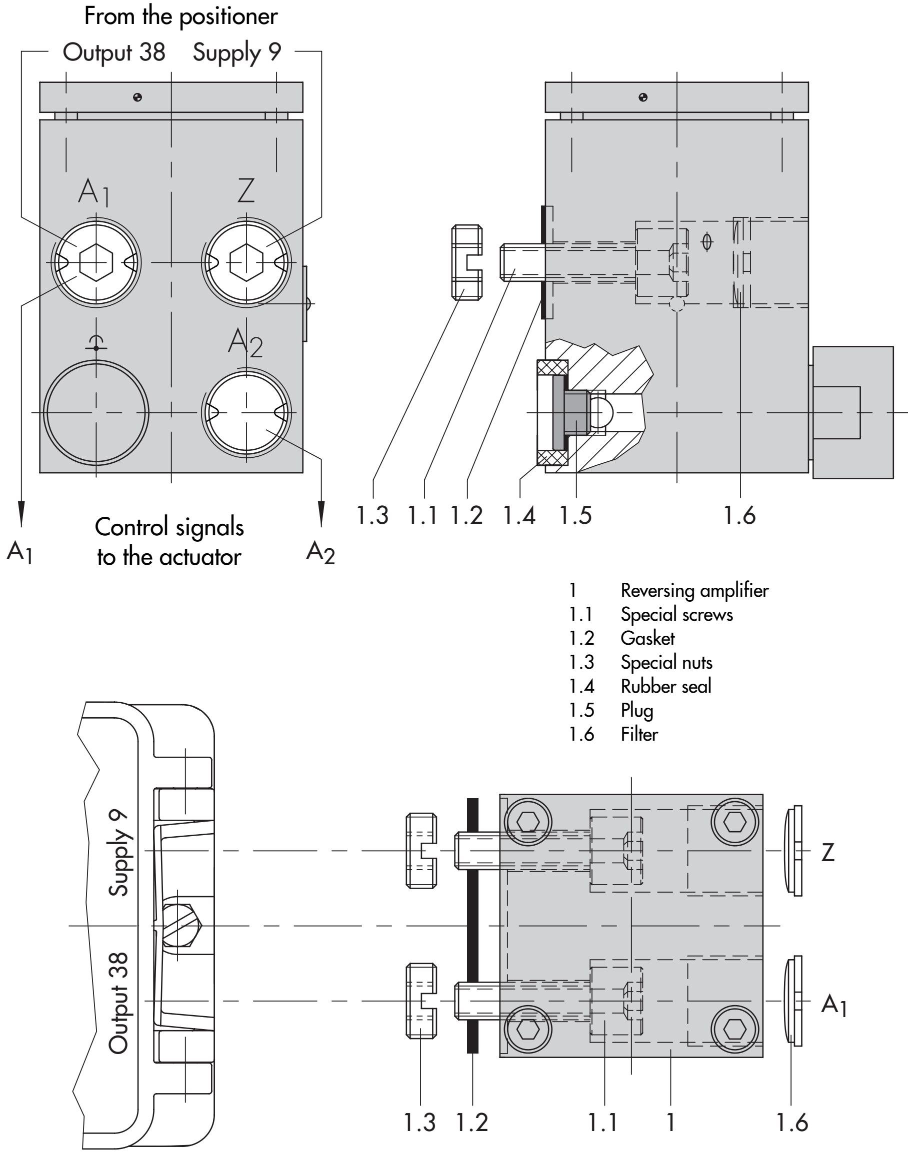
A_1 : Output A_1 leading to the signal pressure connection at the actuator which opens the valve when the pressure increases

A_2 : Output A_2 leading to the signal pressure connection at the actuator which closes the valve when the pressure increases

- Enter the actuator as "Double-acting without spring-return mechanism" in the user interface under Start-up → Actuator type.

2.4 Fail-safe action of the actuator

Note!
If the fail-safe action of the actuator is changed subsequently by modifying the actuator springs from "Actuator stem extends" to "Actuator stem retracts", the mechanical zero must be readjusted and the positioner must be re-initialized.



1 Reversing amplifier
1.1 Special screws
1.2 Gasket
1.3 Special nuts
1.4 Rubber seal
1.5 Plug
1.6 Filter

Fig. 7 · Mounting a reversing amplifier

3. Connections

3.1 Pneumatic connections

The air connections are either 1/4 NPT or G 1/4 tapped holes. The customary fittings for metal and copper tubes or plastic hoses can be used.

Note!
The supply air has to be dry and free from oil and dust. The maintenance instructions for upstream pressure reducing stations must be observed. Carefully blow through all air tubes and hoses before connecting them.

If the positioner is attached directly to the Type 3277 Actuator, the connection of the positioner's output pressure to the actuator is fixed. For Namur attachment, the signal pressure can be applied to either the upper or lower diaphragm chamber of the actuator, depending on the actuator's fail-safe position.

Exhaust air: The exhaust air connection of the positioner is located in the mounting kit. If the positioner is attached directly, a vent plug is located in the plastic cover of the actuator. For Namur attachment, it is in the adapter housing and for attachment to rotary actuators, it will either be located in the intermediate piece or in the reversing amplifier.

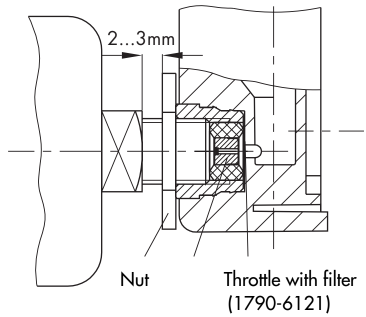


Fig. 8 · Attaching the pressure gauge

3.1.1 Pressure gauge

To monitor the positioner operation, we recommend connecting a pressure gauge for supply air and signal pressure. These parts are listed as accessories in Table 3, 4 or 6.

3.1.2 Supply air pressure

The required supply air pressure depends on the bench range and the actuator's fail-safe action. The bench range is registered on the nameplate either as spring range or signal pressure range.

Actuator stem extends:

required supply air pressure =
upper bench range value + 0.2 bar
at least 1.4 bar.

Actuator stem retracts:

for tight-closing valves, the signal pressure $p_{st\,max}$ is roughly estimated as follows:

$$pst_{max} = F + \frac{d^2 \cdot \pi \cdot \Delta p}{4 \cdot A} \text{ [bar]}$$

d = Seat diameter [cm]
Δp = Differential pressure $p_1 - p_2$ [bar]
A = Actuator area [cm^2]
F = Upper bench range value of the actuator [bar]

If there are no specifications, calculate as follows:

required supply air pressure =
upper bench range value + 1 bar

3.2 Electrical connections

As far as the electrical installation of the device is concerned, the relevant national regulations governing the installation of electrical equipment and the national accident prevention regulations of the country of destination must be adhered to.
In Germany, these are the VDE regulations and accident prevention regulations of the employer's liability insurance.
For installation in hazardous areas, the following standards apply: EN 60079-14: 1997; VDE 0165 Part 1/8.98 "Electrical apparatus for explosive gas areas" and EN 50281-1-2: VDE 0165 Part 2/11.99 "Electrical apparatus for use in the presence of combustible dust".
For intrinsically safe electrical apparatus that are certified according to the Directive 79/196/EEC, the data specified in the certificate of conformity apply for connection of intrinsically safe circuits.
For intrinsically safe electrical apparatus that are certified according to the Directive 94/9/EC, the data specified in the EC type examination certificate apply for connection of intrinsically safe circuits.
Note: *It is absolutely necessary to keep to the terminal plan specified in the certificate. Reversal of the electrical connections may cause the explosion protection to be ineffective!*

Note on the selection of cables and wires:
To run several intrinsically safe circuits in a multi-core cable, read paragraph 12 of EN 60039-14; VDE 0165/8.98.
For generally used insulating materials, for example polyethylene, the radial thickness of the conductor insulation has to be at least 0.2 mm. The diameter of a single wire in a flexible conductor shall not be smaller than 0.1 mm.
The conductor ends are to be protected against unlaying, e.g. by using wire end ferrules. If the positioner is connected via two separate cables, an additional cable gland can be mounted.
Wire entries left unused must be sealed with caps.

The wires for the reference variable are to be connected to the terminals 11 and 12 located in the case as shown in Fig. 9. Make sure to connect the appropriate poles. The voltage applied must not exceed 15 V.

***Caution!** If the poles are connected incorrectly, just 1.4 V is sufficient to reach the static destruction limit of 500 mA.*

The + and – socket contacts allow a communication to be connected locally.
In general, it is not necessary to connect the positioner to a bonding conductor (0). Should there be the need, however, this conductor can be connected either to the inside or outside of the case. For plants in hazardous areas, see paragraph 5.3.3 of VDE standard 0165.

Depending on the supplied version, the positioner is equipped with either inductive limit switches, software limit switches and/or forced venting function. All electric circuits are electrically isolated.

In versions with position transmitter, the built-in transmitter is operated in a two-wire circuit. With regard to the resistance of the supply lead, the voltage at the position transmitter terminals must not be lower than

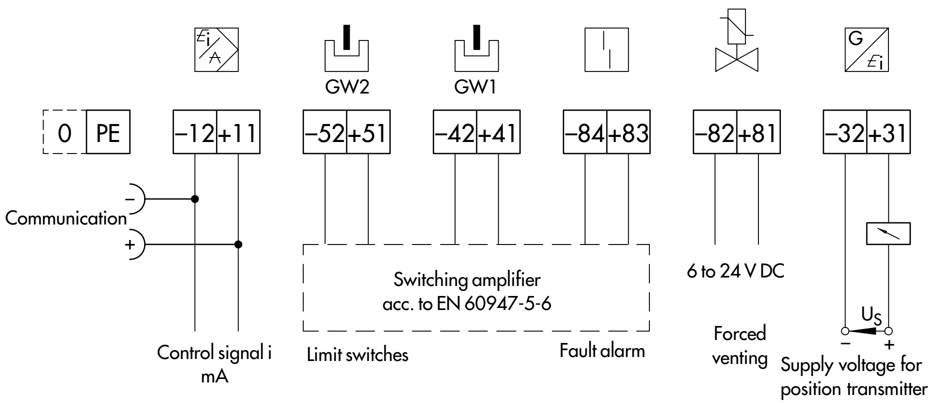


Fig. 9 · Electrical connections

12 V and not higher than 35 V DC.
Terminal assignment is shown in Fig. 9 and is indicated on the cover plate inside the case cover.

Accessories:
Model index 3780-x...x. 0**1**

Cable gland PG 13.5:

Black	Order no. 1400-6781
Blue	Order no. 1400-6782

Adapter PG 13.5 on 1/2" NPT:

Metallic	Order no. 1400-7109
Blue finish	Order no. 1400-7110

Model index 3780-x...x. 0**2** or higher

Cable gland M20 x 1.5:

Black plastic	Order no. 1400-6985
Blue plastic	Order no. 1400-6986

Adapter M20 x 1.5 on1/2" NPT:
Aluminum powder-coated
Order no. 0310-2149

3.2.1 Switching amplifiers

For operation of the limit switches and the fault alarm output, switching amplifiers complying to EN 60947-5-6 have to be connected in the output circuit.
If the positioner is to be installed in hazardous areas, the relevant regulations are to be observed.

3.2.2 Establishing communication

Communication between PC and positioner via FSK modem or communicator, if necessary, using an isolating amplifier is based on the HART protocol.

Viator FSK modem

RS-232 EEx ia	– Order no. 8812-0129
RS-232 not Ex	– Order no. 8812-0130
PC MCIA	– Order no. 8812-0131
USB not Ex	– Order no. 8812-0132

If the supply voltage of the controller or control station becomes too low because it has been reduced by the load in the circuit, an isolating amplifier is to be connected between controller and positioner (interfacing same as for positioner connected in hazardous areas, see Fig. 10).

If the positioner is used in hazardous areas, an explosion-protected isolating amplifier is to be used. Connection of an FSK bus always requires interfacing of isolating amplifiers.

By means of the HART protocol, all control room and field devices connected in the loop are accessible through their address via point-to-point or standard bus (multidrop).

Point-to-point:

The bus address/polling address must always be set to zero (0).

Standard bus (multidrop):

In the standard bus (multidrop) mode, the positioner follows the analog current signal (reference variable) as for point-to-point

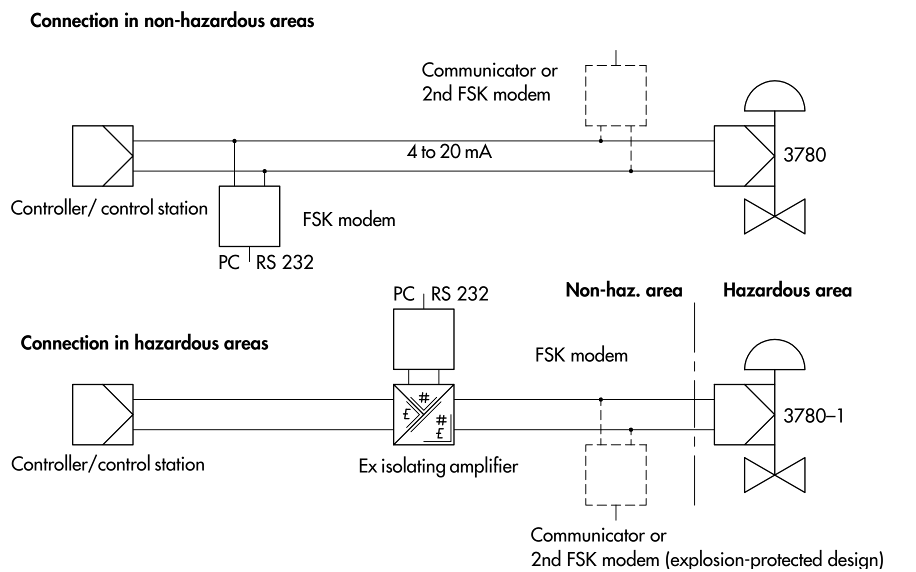


Fig. 10 · Connection with FSK modem

communication. This operating mode is, for example, suitable for split-range operation (series connection) of positioners. The bus address/polling address has to be within a range of 1 to 15.

Connect the FSK modem to the interface of the PC. If several interfaces are available, the selected interface may have to be configured over the user interface.

Note:

Communication faults may occur when the process controller/control station output is not HART compatible. For adaptation, the Z box, order no. 1170-2370, can be installed between output and communication interface. At the Z box a voltage of approx. 330 mV is released (≙16.5 Ω at 20 mA). Alternatively, a 250-Ω resistor can be connected in series and a 22-µF capacitor can be connected in parallel to the analog output. Note that in this case, the controller output load will increase.

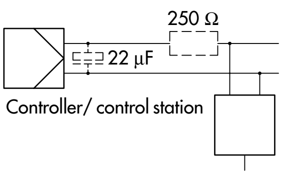


Fig. 11 · Adapting the output signal

4. Operation

> ⚠ ***Caution!***
> *Before taking the positioner into operation, carefully move the control valve to its end position by covering the hole (manual adjustment) on the cover plate (Fig. 12). Check whether the lever mechanism functions properly.*
> *If the wrong lever is used or the lever mechanism does not function properly, the valve will exceed the maximum permissible angle of rotation, which can destroy the positioner.*

4.1 Write protection

A sliding switch is located inside the hinged cover.

When it is activated (position 1), the positioner settings are write-protected so that they cannot be overwritten by the HART protocol. If you want to change the settings via communication, set the switch to 0 position.

4.2 Activate/deactivate forced venting function

Model index .0**3** or higher

1. Remove cover inside the positioner's lid by unscrewing the four screws.
2. Loosen the screw in the center of the board and swivel out the board.
3. Set switch to desired position
   1 ENABLED > Function activated
   2 DISABLED > Function deactivated.

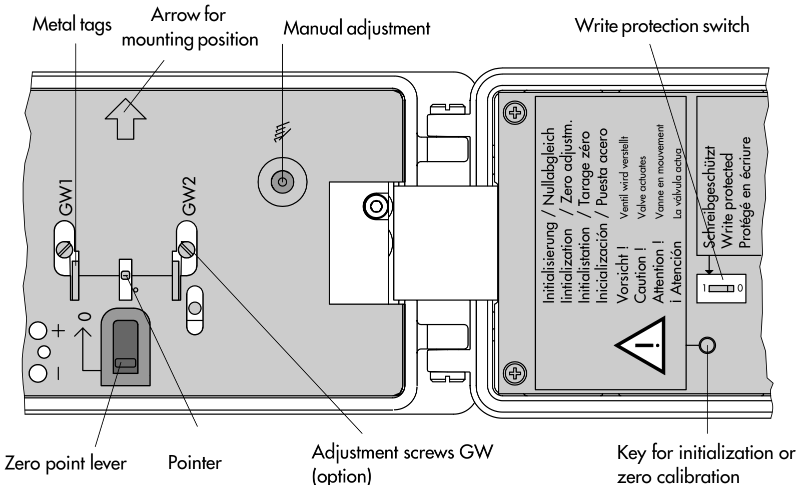


Fig. 12 · Inside view of cover plate

4.3 Default setting

All parameters are set to default values. See section 8 for a description of parameters.

Note!
Manual operation and activated final position functions can cause the actuator to be filled with the maximum supply pressure.
Should this lead to impermissible forces occurring, the supply pressure must be restricted by a reducing station.

4.3.1 Adjusting mechanical zero point

Note!
Zero must be adjusted with the valve completely closed (for three-way valves with the actuator stem extended).

- Firmly push the zero point lever, which is located in the cover plate of the positioner, once in the direction indicated by the arrow, as far as it will go. The yellow pointer will then be on the white marking line.

For control valves with the starting position OPEN, e.g. an actuator employing fail-safe action "actuator stem retracts", it is first necessary to supply the positioner with auxiliary air.
If the manual operation function is activated then, the signal pressure builds up and the valve moves to the closed position. Subsequently, the zero point lever can be operated.

4.3.2 Initialization

After the electric reference variable and the auxiliary supply pressure have been connected to the positioner, the initialization process can be started. In this process, the positioner adapts itself optimally to the mechanical conditions (friction) and signal pressure requirements of the control valve.

See list of parameters on page 48 for required changes of the proportional-action coefficient KP_Y1 and KP_Y2.

Caution!
The initialization process takes several minutes. During that time the valve leaves its position. Therefore, never initialize the positioner during a running process, but only during the start-up cycle when the shut-off valves in the plant are closed, or when the control valve with the positioner has been removed from the plant and is used on a test stand.

- Enter data on valve and actuator under "Start-up" in the operating software.
- Set "Type of initialization" to "Rated range", select "Maximum range" only for three-way valves.
- Start initialization.
- When the initialization process is completed, perform configuration suitable for the type of valve.

The following setting is recommended:

- **Fail-safe position "Actuator stem extends"** (FA):
  Direction of action: increasing/increasing (>>), the globe valve opens with increasing reference variable
  Final position at a reference variable less than 1% (tight closing),
  Final position at a reference variable larger than 125 % (function deactivated).
- **Fail-safe position "Actuator stem retracts"** (FE):
  Direction of action: increasing/decreasing (<>), the globe valve closes with increasing reference variable
  Final position at a reference variable less than –2.5% (function deactivated),
  Final position at a reference variable larger than 99 % (tight closing).
- Set delay time to 30 s at the minimum.
- Enter tag identification.
- If necessary, other configuration, e.g. special characteristics for rotary valves.

If there is **no communication** set up on the valve, initialization directly at the valve is also possible.

- Connect positioners that are not mounted on a valve to a power supply and initialize the positioner as described in section 4.3.2.
  If communication is not possible, the default setting must be used.
- Mount positioner and set the mechanical zero point as described in section 4.3.1.
- Start initialization by pressing the **Init/Zero** key on the positioner hinged cover using a suitable tool.

The initialization is completed when the positioner takes on the position predetermined by the reference variable.

Note!
*After the positioner has been initialized successfully for the first time, pressing the **Init/Zero** key subsequently only starts a zero calibration.*

A new initialization routine can only be started after this when communication is connected.

A completed initialization can be cancelled via the communication with the command "Reset to default values". After this, the Init/Zero key can be pressed to start a complete initialization.

Electric zero calibration

If, during the valve's operation, the mechanical zero has shifted, an electric zero calibration can be carried out. To do this, press the Init/Zero key located on the inside of the cover (Fig. 12).

Caution!
The control valve moves to its final position.

- Firmly press the zero lever, located on the cover plate of the positioner, in the direction indicated by the arrow as far as it will go once. The yellow pointer will then be aligned with the white line.
- Press the key again to start the electric calibration.

After the key is pressed twice, it is locked for approximately one minute!

The electric calibration has been completed when the positioner takes on the position predetermined by the reference variable.

4.4 Adjusting inductive limit switches

The positioner version with inductive limit switches has two adjustable tags that are mounted on the shaft of the positioner lever and operate the associated proximity switches.

For operation of the inductive limit switches, the corresponding switching amplifiers have to be connected to the output (see section 3.2.1). If the tag is in the inductive field of the switch, the switch assumes a high resistance. If the tag is out of the field, the switch assumes a low resistance.

Normally, the limit switches are adjusted such that they will provide a signal in both end positions of the valve. These switches, however, can also be adjusted to signalize intermediate valve positions.

The desired switching function, i.e. whether the output relay shall be picked up or released when the tag has entered the field, has to be selected, if necessary, at the switching amplifier.

Adjusting the switching point:
The limit switches are marked GW1 and GW2 on the inside of the case cover. Yellow tags and the associated adjustment screws (Fig. 12) are located below these markings.
Each switching position can optionally be signalized when the tag has entered the field, or when it has left the field.

- Move the valve to the switching position and adjust the tag of the required limit switch GW1 or GW2 by turning the related adjustment screw until the switching point is reached. This is indicated by the LED at the switching amplifier.

In so doing, one edge of the yellow tag will be in alignment with the white, horizontal line on the case cover. This indicates the side from which the tag enters the inductive field of the proximity switch.

To ensure safe switching under any ambient conditions, the switching point should be adjusted to a value of approx. 5% before the mechanical stop (OPEN - CLOSED).

5. Maintenance

The positioner is maintenance-free.
The pneumatic connection 9/Supply features a filter with 100 µm mesh size. If required, the filter can be unscrewed and cleaned.

The maintenance instructions for any upstream air pressure reducing stations for supply air must be observed.

6. Servicing explosion-protected versions

In the event that a positioner's part on which the explosion protection is based must be serviced, the positioner must not be put back into operation again until an expert has inspected the device according to explosion protection requirements, has issued a certificate stating this, or given the device a mark of conformity.

Inspection by an expert does not have to be carried out, if the manufacturer performs a routine check test on the device prior to taking it into operation again, and the success of the routine check test is documented by attaching a mark of conformity to the device.

Explosion-protected components may only be replaced by original checked components from the manufacturer.

7. Summary of parameters

The list of parameters describes - in alphabetical order - all parameters of the Type 3780 Positioner that can be transferred via HART communication and displayed or modified on a PC, a handheld communicator, or a similar device.

Device identification

- MSR no./bus identification
- Manufacturer
- Type number controller
- Product number controller
- Serial number controller
- Hardware version electronics/mechanics
- Firmware version communication/control
- HART universal revision, field device revision
- Number of required preambles
- Bus address/polling address
- Message/loop tag identification/numbers
- Description/plant identification
- Date
- Type of protection
- Identification of the options forced venting, contacts, position transmitter
- Ident. number actuator
- Ident. number valve
- Text field, not allocated

Start-up

- Actuator type
- Attachment
- Model
- Mounting position
- Rated travel/nominal angle
- Transmission code/length/pin position
- Initialization related to nominal range /maximum range
- Fail-safe position

- Minimum control pulses
- Minimum transit time on/off
- Initialization cycle

Device settings

Configuration

- Reference variable range
- Final position with reference variable below preset value
- Final position with reference variable above preset value
- Travel range/angle of rotation
- Limitation of travel range / angle of rotation
- Moving direction
- Selection of characteristic
- User-defined characteristic with 11 co-ordinates
- Required transit time on/off
- Limit values for software limit switches GW1/GW2
- GW1/GW2 on when the respective limit value is exceeded/not attained
- Operating direction position transmitter
- Write protection

Parameters

- Dead band Xtot
- Proportional-action coefficient KP_Y1/KP_Y2
- Derivative-action coefficient KD
- Tolerated overshoot

Operation

- Operating mode
- Reference variable w_analog
- Reference variable w_manual
- Reference variable w
- Controlled variable x
- Error e
- State fault message

- State software limit switches GW1/GW2
- Forced venting function

Diagnostics

- Device status (control loop monitoring, zero point monitoring, etc.)
- Total valve travel
- Limit value total valve travel
- Error monitoring tolerance band/lag time
- Fault message in case of communication fault
- Fault message with controller in special function
- Fault message if limit value for total valve travel is exceeded
- Test of fault indication output
- Test of position transmitter
- Test of software limit switches GW1/GW2
- Zero adjustment

8. List of parameters

Actuator id number Range:	Manufacturer's identification (id) number of the actuator and the positioner. 0 to 999 999
Actuator type States: Default (coldstart value):	---- Linear actuator/rotary actuator Linear actuator
Angle range End Range: Default (coldstart) value:	Upper limit of the effective working range (opening angle). For a non-linear characteristic, the characteristic is adapted to the reduced angle. If initialization is based on "maximum range", the angle range is always related to the entered nominal angle. The working range may not be selected 1/4 less than the nominal angle. Maximum value = nominal angle. 0.0 degrees to 120.0 degrees 90.0 degrees
Angle range Start Range: Default (coldstart) value:	Lower limit of the effective working range (opening angle). For a non-linear characteristic, the characteristic is adapted to the reduced angle. If initialization is based on "maximum range", the angle range is always related to the entered nominal angle. The working range may not be selected 1/4 less than the nominal angle. 0.0 degrees to 120.0 degrees 0.0 degrees
Attachment States: Default (coldstart) value:	Defines the positioner attachment to the control valve with a linear actuator. For a rotary-motion actuator, only attachment according to VDI / VDE 3845 (NAMUR) is possible. Integral - Type of attachment in combination with a SAMSON Type 3277 Linear Actuator. NAMUR - Type of attachment according to IEC 60534-6 (NAMUR). Integral
Bus address Range: Default (coldstart) value:	Address used by the control station to identify a field device. Changeable by the user: 0 for point-to-point, 1 to 15 for multidrop communication. 0 to 15 0 Non-IBIS devices → polling address
Bus identification	Text for instrument identification in connection with the field device installation. The text may be freely assigned. We recommend to clearly identify the field device. For field bus installation, a bus identification has to be assigned. Length: 8 characters Non-IBIS devices → MSR no.

Characteristic States: Default (coldstart) value:	Creation of assignments between the reference variable and valve travel/angle range. When the equal percentage characteristic is selected, this characteristic is copied in the user-defined characteristic, overwriting the previously entered user-defined characteristic. The control loop is interrupted (for approx. 3 seconds) while the characteristic is internally transmitted. User defined - characteristic in accordance with enterable coordinates x[n], y[n], preset to butterfly valve equal percentage Linear — linear characteristic Equal percent. — equal percentage characteristic Equal percent. reverse — equal percentage reverse characteristic Linear
Characteristic co-ordinates x [0] /y [0] to x [10] /y [10] Range: Default (coldstart) :	Characteristic co-ordinates for user-defined assignment between reference variable and travel/angle range. x[n] = reference size in % of the reference size range. y[n] = travel/angle in % of travel/angle range. The control loop is interrupted until the characteristic transmission is completed (max. 15 s). 0.0 % to 100 % For characteristic points: butterfly valve equal percentage.
Date	A date entered according to the European date format [DD.MM.YYYY] can be stored in the field device. The date can be entered as required.
Dead band Xtot Range: Default (coldstart) value:	Maximum tolerated deviation between set point value and actual value specified as a percentage of the travel range. A small dead band means a high degree of control accuracy. The smallest possible dead band is determined by the quality of the control valve; high friction and a small actuator volume can otherwise lead to unstable operation. 0.01 % to 0.00 % of the nominal travel/nominal angle 0.5 %
Description	Text stored in the field device. Length: 16 characters. For IBIS → plant identification
Direction of action States: Default (coldstart) value:	Determines the assignment of reference variable to the travel/angle of rotation. >>, Increasing reference variable opens the valve (for three-way valves: Actuator stem retracts) <>, Increasing reference variable closes the valve (for three-way valves: Actuator stem extends) >>
End position when w: above limit value Range: Default (coldstart) value:	If the reference value exceeds the entered limit, the valve moves in the pre-determined end position, corresponding to 100 % of the reference variable. Hysteresis 1 %. When the value is 125 %, the function is deactivated. 0 % to 125.0 % 99 %

	Caution: Since the actuator will automatically be filled (loaded with air) or vented (exhausted) when this function is executed, the control valve moves to its absolute end position. Constraints specified in the function "travel range" or "travel limit" are inapplicable here. This function must be deactivated if unacceptably high positioning forces might result from the complete filling/venting action.
End position when w: below limit value Range: Default (coldstart) value:	If the reference variable falls below the entered limit, the valve moves in the pre-determined end position, corresponding to 0 % of the reference variable. Hysteresis 1 %. When the value is –2.5 %, the function is deactivated. –2.5 % to 100.0 % 1 % **Caution:** Since the actuator will automatically be filled (loaded with air) or vented (exhausted) when this function is executed, the control valve moves in its absolute end position. Constraints specified in the function "travel range" or "travel limit" are inapplicable here. This function must be deactivated if unacceptably high positioning forces might result from the complete filling/venting action.
Error e	Control system deviation in %
Error monitoring of delay time Range: Default (coldstart) value:	Reset criterion for active control loop monitoring. A control loop fault is reported when an entered delay time is exceeded and the deviation (error) does not lie within the entered tolerance band. The delay time is determined from the minimum transit time during the initialization process when the detected value exceeds the preset value. 0 s to 240 s 10 s
Error monitoring of tolerance band Range: Default (coldstart) value:	Reset criterion for active control loop monitoring. Entry of the specified maximum permissible control system deviation (error). See also delay time. 0.1 % to10.0 % of nominal travel/nominal angle 5 %
Error variable x	Error variable in % related to travel/angle range.
Ex-proof type States:	 Not installed/Installed
Fail-safe action States: Default (coldstart) value:	Fail-safe action of the actuator in the event of air/power failure. This is determined automatically during the initialization process. Unknown .... if not yet initialized Actuator stem retracts .... linear actuator Actuator stem extends .... linear actuator Opening .... rotary actuator Closing .... rotary actuator None .... double acting Unknown
Fault alarm: Communication failure	Fault of the positioner communication hardware

States: Default (coldstart) value:	No/Yes Yes
Fault alarm: Special function States: Default (coldstart) value:	Fault message for controller in special function (zero calibration, initialization, test functions). No/Yes Yes
Fault alarm: Total valve travel exceeded States: Default (coldstart) value:	Fault alarm whenever the limit value for the total valve travel is exceeded. No/Yes Yes
Field device revision	Revision status of the field device-specific description that the field device conforms to.
Firmware version Communication/Control	Revision status of the communication and control software implemented in the field device.
Forced venting States:	Indicates whether the optional forced venting function has been installed. Not installed/Installed
Hardware version electronics/ mechanics	Revision number of the electronics/mechanics implemented in the field device.
Inductive limit switches States: Default (coldstart) value:	For devices without software limit switches you can enter whether inductive contacts were installed (no automatic identification). Not installed/Installed Not installed
Initialization (special function)	Automatic start-up. Prerequisite: Mechanical zero point adjustment must have been carried out once. Valid initialization data must have been entered.
Initialization alarm States:	Message concerning initialization. Unknown Ok Air leakage of pneumatic system Wrong selection of rated travel or transmission
KD derivative-action coefficient Range: Default (coldstart) value:	Derivative-action coeff. of the differential element. When optimizing the value, increments of 0.02 are recommended. Higher increments cause an increased "deceleration" before reaching the reference variable. 0.0 to 1.00 0.12
Limit switches States:	Indicates which type of limit switch is installed. Not installed Inductive — inductive limit switches attached to the internal travel pick-up. Software — Derived by software from the signal of the displacement pick-up.
Limit switch Software GW1	Limit value alarm referring to travel/angle range, determined by the software from the signal of the travel (displacement) pick-up. (Switching hysteresis 1%).

Range: Default (coldstart) value:	0.0 % to 120 % 2.0 %
Limit switch Software GW2 Range: Default (coldstart) value:	Limit value alarm referring to travel/angle range, determined by the software from the signal of the travel (displacement) pick-up. (Switching hysteresis 1%). 0.0 % to 120 % 98 %
Limit switch Software GW1 set when States: Default (coldstart) value:	Defines the contact circuit state as ≤1 or ≥3 mA ≥3 mA values under range for travel/angle, values over range for travel/angle values under range
Limit switch Software GW2 set when States: Default (coldstart) value:	Defines the contact circuit state as ≤1 or ≥ 3 mA ≥3 mA values under range for travel/angle, values over range for travel/angle values over range
Limit value for total valve travel Range: Default (coldstart) value:	An alarm message is issued as soon as the limit for the total valve travel is exceeded. 0 to 16 500 000 1 000 000
Loop/tag number	Loop/tag number - text that is associated with the field device installation. This text can be used by the user in any way. Each field device is recommended to be assigned a unique loop/tag number. Length: 32 characters For non-IBIS devices →message
Manufacturer	Manufacturer's id code - Clearly identifies the manufacturer of the field device.
Message	Unassigned text stored in the field device. Length: 32 characters. For IBIS devices → loop/tag number.
Minimum control pulses States:	Shortest pulse supplied to the supply air or exhaust air valve. The pulses for the travel ranges 0 to 20 %, 20 to 80 % and 80 to 100 % are determined separately! None ....no pulses determined yet Exhaust air ....pulse for exhaust air determined Supply air ....pulse for supply air determined Valid..................................pulse for exhaust and supply air determined
Minimum transit time (filling/venting)	The minimum transit time, in seconds, for filling or venting air from the actuator during initialization is measured separately for supply and vented air. The transit time is defined as the time required by the system comprising positioner, actuator, and valve to pass through the rated travel /nominal angle.

Mounting position (linear actuator) States: Default (coldstart) value:	An arrow is located on the cover plate of the positioner, which is used for alignment on the actuator. This arrow must either point toward the actuator (direct attachment) or away from the actuator (NAMUR attachment). Exception: Control valves for which the seat is solely closed by a retracting actuator stem. In this case, the arrow must point either away from the actuator (direct attachment) or toward the actuator (NAMUR attachment). For rotary-type (part-turn) actuators, this parameter is omitted. Arrow pointing toward the actuator / Arrow pointing away from the actuator. Integral attachment: Arrow pointing toward the actuator. NAMUR attachment: Arrow pointing away from the actuator.
MSR no.	Text for instrument identification in connection with the installation of the field device. This text can be used by the user in any way. Each field device is recommended to be assigned a unique MSR no. Length: 8 characters. For IBIS devices → bus identification.
Nominal angle Range: Default (coldstart) value:	Nominal working range of the valve. 0.0 degrees to 360.0 degrees 60.0 degrees
Nominal travel Range: Default (coldstart) value:	Nominal working range of the valve. 0.0 mm to 255.9 mm 15.0 mm
Number of (request) preambles	Number of preambles required from the control station requested by the field device.
Operating direction of position transmitter States: Default (coldstart) value:	Determines the operating direction of the optional position transmitter. >>, Increasing controlled variable causes increasing output signal. <>, Increasing controlled variable causes decreasing output signal . >>
Operating mode States: Default (coldstart) value: Default (warmstart) value:	Determines whether the reference variable is specified via the analog current signal (automatic) or via the digital communication (manual). The manual/automatic transfer is smooth. Automatic - The reference variable is specified via the analog current signal. Manual - The reference variable is specified via the digital communication by entering w_manual. Fail-safe - The valve moves in the fail-safe position. Fail-safe position Automatic
Plant identification	Text stored in the field device. Length: 16 characters For non-IBIS devices → description
Polling address	Address used by the control station to identify a field device. Changeable by the user: 0 for point-to-point, 1 to 15 for multidrop communication.

Range: Default (coldstart) value:	0 to 15 0 For IBIS devices → bus address
Positioner type number	Type number of the positioner
Position transmitter States:	Indicates whether the option position transmitter is installed. Not installed/Installed
Product number	Manufacturer's product number of the positioner. Length: 16 characters.
Proportional-action coefficient KP_Y1/ KP_Y2 Range: Default (coldstart) value:	Proportional-action coefficient KP_Y1 for supply air, KP_Y2 for exhaust air. We recommend to adjust the value in increments of 0.1. If the value is increased, the set point will be attained faster. 0.01 to 10.0 1.2 **Note:** Proportional-action coefficients KP_Y1 / KP_Y2 are determined when the positioner is initialized for the first time. The initialization values listed in the table below may possibly have to be adapted to the changed operating conditions, in order to attain the best control response.

Type of actuator	Nom. travel/angle	Transit time				KD	KP_Y1 Filling	KP_Y2 Venting
		Min.	Effect of spring	Open	Close			
Rotary actuator		–	–	> 0.7 s	> 0.7 s	0.12	0.5	0.5
			Closes	> 0.7 s	< 0.7 s	0.12	0.5	0.1
			Closes	< 0.7 s	> 0.7 s	0.12	0.1	0.5
			–	< 0.7 s	< 0.7 s	0.12	0.1	0.1
			Opens	> 0.7 s	< 0.7 s	0.12	0.1	0.5
			Opens	< 0.7 s	> 0.7 s	0.12	0.5	0.1
Linear actuator	≥ 60 mm	< 10 s	–			0.12	0.5	0.5
		≥ 10 s	–			0.12	3.0	4.0
	< 60 mm	< 10 s	–	> 0.7 s	> 0.7 s	0.12	0.5	1.2
			Extends	> 0.7 s	< 0.7 s	0.12	0.5	0.8
			Extends	< 0.7 s	> 0.7 s	0.12	0.3	1.2
			–	< 0.7 s	< 0.7 s	0.12	0.3	0.8
			Retracts	> 0.7 s	< 0.7 s	0.12	0.3	1.2
			Retracts	< 0.7 s	> 0.7 s	0.12	0.5	0.8
		≥ 10 s	–			0.12	3.0	4.0

Pulse adaptation States: Default (coldstart) value:	Adaptation of the minimum pulses in order to optimize the control algorithm for the system comprising positioner, actuator and valve. In normal control mode the parameter should be set to "Automatic". Disable this parameter when tuning the control parameters. For R 1.20 and upwards, the pulse adaptation is internally set to "Automatic". Disabled Automatic Automatic
Reference variable end Range: Default (coldstart) value:	End of the valid input range (corresponding to 100 % w). The minimum span is 4.0 mA. 4.00 mA to 20.00 mA 20.00 mA
Reference variable start Range: Default (coldstart) value:	Start of the valid input variable (corresponding to 0 % w). The minimum span is 4.0 mA. 4.00 mA to 20.00 mA 4.00 mA
Reference variable w	Reference variable in % with consideration of reference variable start and reference variable end.
Reference variable w_analog	Current input signal in mA, used as reference variable in "Automatic" mode.
Reference variable w_manual Range:	Reference variable in mA, adjustable in "Manual" mode via communication. 3.8 mA to 22 mA
Required transit time (filling/venting) Range: Default (coldstart) value:	The transit time is defined as the time required by the system comprising positioner, actuator and valve to pass through the complete rated travel/nominal range. The actual transit time is extended to the entered value. If the required transit time is less than the minimum transit time determined during initialization, the minimum transit time shall apply. Separately adjustable for filling and venting. 0 s to 75 s 0 s
Scanning rate Range:	Time between the start of two requests to the positioner (only for IBIS). 1 to 3600 s
Serial no.	Uniquely identifies the field device combined with the manufacturer name and the device type number.
State of fault alarm States:	Switching state of fault alarm output. Off, ≥3 mA On, ≤1 mA
State of forced venting States:	If installed, the absence of the input signal forces the control valve to move in the appropriate fail-safe position. Forced venting off with control signal >3 V Forced venting on (i.e. actuator vented) with control signal <3 V

State of software limit switch GW1 / GW2 States:	State of the software limit switch GW1 or GW2. Off, ≤1 mA On, ≥3 mA
Test of fault alarm (special function)	Functional test of the fault alarm output by activating it three times.
Test of position transmitter (special function)	Test of the optional position transmitter by specifying values in % (only when the software limit switch option is installed).
Test of software limit switch GW1 (special function)	Test of software limit switch GW1 by activating it three times (only when this option is installed).
Test of software limit switch GW2 (special function)	Test of software limit switch GW2 by activating it three times (only when this option is installed).
Text field	Unassigned information text to be stored in the field device 4 lines with 32 characters each
Tolerated overshoot Range: Default (coldstart) value:	If the error signal e exceeds the overshoot, the pulse adaptation reduces the minimum pulses in the moving direction that has caused the overshoot. If the error signal e exceeds the dead band xtot, but remains within the overshoot range, the pulse adaptation only reduces the minimum pulses in both moving directions after two complete oscillations within the overshoot range. 0.01 % to 10.00 % of the nominal travel/nominal angle 0.5 %
Total valve travel	Sum of nominal duty cycles. Maximum value: 16 500 000. The value is indicated in double in up-and-down travels, i.e. corresponds to the travel rate determined during initialization multiplied by 2.
Transmission code (for linear actuator with integral positioner attachment) States: Default (coldstart) value:	Determination of the geometrical code for the travel pick-up when the positioner is integrally attached. D1 for actuators 120, 240 and 350 cm2 / D2 for actuator 700 cm2 D1
Transmission code for rotary actuator States:	Maximum opening (rotational) angle of the selected cam segment. S90, 90 degree segment / S120, 120 degree segment
Transmission code (length) for linear actuator acc. to NAMUR Range: Default (coldstart) value:	Lever length, distance between the travel pick-up and pivot of the pick-up lever. 0.0 mm to 1023.0 mm 42.0 mm

Transmission pin position States: Default (coldstart) value:	Pin position of the positioner lever. See marking on the positioner lever. Only for attachment to linear actuator acc. to NAMUR. A/B A
Travel/angle limit lower Range: Default (coldstart) value:	Lower limitation of valve travel/angle to the entered value. The characteristic is not adapted. –20.0 % to 99.9 % of the travel/angle range 0.0 %
Travel/angle limit upper Range: Default (coldstart) value:	Upper limitation of valve travel/angle to the entered value. The characteristic is not adapted. 0.0 % to 120.0 % of the travel/angle range 100.0 %
Travel range end Range: Default (coldstart) value:	Upper limitation of the effective working range (travel). For a non-linear characteristic, the characteristic is adapted to the reduced valve travel. Maximum value = rated travel. If the "maximum range" has been initialized, the travel range is always related to the entered nominal travel. The working range may not be selected 1/4 less than the nominal angle. 0.0 mm to 255.9 mm 15.0 mm
Travel range start Range: Default (coldstart) value:	Lower limitation of the effective working range (travel). For a non-linear characteristic, the characteristic is adapted to the reduced travel. If the "maximum range" has been initialized, the travel range is always related to the entered nominal travel. The working range may not be selected 1/4 less than the nominal angle. 0.0 mm to 255.9 mm 0.0 mm
Type of initialization States: Default (coldstart) value:	Type of initialization related to the nominal or maximum range. For initialization in the nominal range, only the range of the manipulated variable is considered (e.g. globe valve with mechanical stop at one side). When the maximum range is initialized, the maximum range is passed (e.g. three-way valve with mechanical stop at both sides). Nominal range / maximum range Maximum range
Type of characteristic	Unassigned text describing the user-defined characteristic Length: 32 characters
Universal revision	Revision number of the universal device description that the field device conforms to.
Valve id number	Manufacturer identification of the valve delivered with the positioner.
Version States: Default (coldstart) value:	Actuator with/without spring return. Single acting with spring return / double acting without spring return. Single acting.

Write protection States:	When this option is activated, the device data can only be read, but they cannot be overwritten. The only way to activate the write protection is using the switch installed on the device. Activated/deactivated
Zero calibration (special function)	Zero correction with valid mechanical zero point.

9. Error messages and diagnostics

During the initialization cycle, the Type 3780 HART Positioner offers the best possibilities for diagnosis. In the automatic mode, detailed tests are carried out in order to check the attachment situation and the positioner's reaction while taking the preset or entered data into account. When routine tests are carried out or in case of unclear error messages during operation the system should be initialized so that the positioner system can be optimally assessed. The IBIS user software differentiates between information/alerts which are displayed on the screen in yellow, and errors which are displayed in red.

9.1 Information/alerts

9.1.1 Device setup modified

Is always set if the device data were modified, thus checking (unintentional/unauthorized) modifications of the originally preset values.
The error message is reset via `[Device data → Specialist → Device data → Reset "Device setup modified"]`.

9.1.2 Insufficient power supply

The parameter is set when the power supply exceeds ≤3.6 mA.
It is automatically reset when the current exceeds 3.6 mA again.

9.1.3 Warmstart completed

This message is displayed when the power supply was ≤3.2 mA informing about a possible power supply failure. The device is automatically reset after the message has been acknowledged.

9.1.4 Coldstart completed

This message is displayed if the device was reset via `[Device data → Specialist → Device → Reset]` and restarted with the standard control values.
The device must be re-initialized. Information, such as loop/tag number, bus identification or plant identification remain intact.
The device is automatically reset after acknowledgement.

9.1.5 Choose mode "Manual"

This message is issued when the "Manual" reference variable is modified, but the device is not set for "Manual" operating mode.
This error can not occur under IBIS.
The device is automatically reset after correction.

9.1.6 Parameter not supported

After downloading to the positioner, the positioner intelligence replies that this parameter is unknown. This message can occur with older firmware versions.
The device is automatically reset after acknowledgement.

9.1.7 Limit value of total valve travel exceeded

The current value which is stored after 1024 double strokes and protected against power failure lies above the limit value entered or preset via **`[Device data → Specialist → Extension → Configuration]`**.
When this limit value is preset slightly below the value determined for a broken-down reference valve, the positioner automatically signals that the valve needs to be maintained so that possible failure is prevented.

Reset via **`[Diagnostics → Device status]`**.

9.1.8 Zero adjustment aborted

Zero adjustment was aborted by the user.
Automatic reset after acknowledgement.
The previous zero point is maintained if zero adjustment has already been carried out successfully.

Initialization status

9.1.9 Initialization aborted

Initialization was aborted by the user.
If the device has been successfully initialized and no coldstart was triggered, the control operation is restarted.

9.1.10 Not initialized

The device has not been initialized, or a coldstart was carried out.

The device is automatically reset after initialization has been successfully completed.

9.2 Error messages

9.2.1 Communication fault

This message is displayed when the HART communication is interrupted.

Possible sources of error:

- Auxiliary power too low or power failure
- FSK modem not properly connected
- Communication (for example COM1) configured incorrectly **`[Options → Configure communication]`**
- Attempt to set up communication via menu item **`[Set up communication → Single unit]`** while the system is in bus mode

The device is reset after the error has been eliminated.

9.2.2 Control loop error

This message is displayed when the positioner fails to control the adjusted range of tolerance for error messages within the preset delay time. The criteria are adjusted via **`[Device data → Specialist → Extension → Configuration]`**.

Possible sources of error:

- Oscillation caused by actuator being operated too fast (small travel volume).
  Remedy: Reduce the supply air pressure as described in section 3.1.2 and install a signal pressure throttle (see chap. 2)
- Supply air failure/supply air insufficient
- Filter clogged
- Solenoid valves oiled-up
- Actuator diaphragm torn
- Actuator springs broken
- Considerable increase of friction at the control valve
- Control valve blocked

Reset via **`[Diagnostics → Device status]`**.

9.2.3 Zero point erroneous

The zero point monitoring signals any changes exceeding the value determined during the initialization or zero adjustment by ±5 % .

Possible sources of error:

- Worn-out valve plug/seat

- Impurities between valve plug/seat

The device is reset after the zero adjustment has been carried out effectively.

9.2.4 Zero calibration erroneous, mechanical readjustment necessary

The value determined during electric zero calibration exceeds the permissible tolerance of ±5 % by the internal absolute value for the detection of measured values.
The device is reset after electric zero calibration has been successfully completed and after mechanical zero point adjustment.

9.2.5 Measuring mode erroneous

The internal A/D converter does not function properly within its specified time frame, or the measured values are not within the physical measuring range limits. In case reset is not successful after a warmstart, repair work is required.

9.2.6 Reference var. w out of range

The internal A/D conversion results in values which are not within the permissible measuring range.
Possible sources of error:

- Reference variable exceeded (power supply) >22.5 mA

This message is automatically reset when the power supply decreases below 22.5 mA.

9.2.7 Controlled var. x out of range

The internal A/D conversion results in values which are not within the permissible measuring range.
Possible sources of error:

- Improper mechanical attachment
- Incorrect transmission value entered
- For attachment according to NAMUR: incorrect pin position entered
- Overtravel larger than rated travel

This message is automatically reset after the error has been eliminated.

9.2.8 Parameter out of range

Message indicating that incorrect values have been entered.
After downloading data to the positioner, it responds with the message that the downloaded value is not within the permissible range. The previous value is retained.
Acknowledge this message to reset.

Characteristic fault

In case a characteristic fault (sections 9.2.9 to 9.2.11) occurs, the characteristic is automatically switched from user-defined to linear after downloading data to the positioner.

9.2.9 Erroneous characteristic

This message is generated when errors are recognized during transmission of the characteristic.
It is automatically reset after a correct characteristic has been transmitted.

9.2.10 Erroneous characteristic monotony

This message is generated when you did not enter the input values in ascending order for a user-defined characteristic.
It is automatically reset after a correct characteristic has been transmitted.

9.2.11 Erroneous characteristic inclination

This message is generated when you enter too high an inclination value (>16).
It is automatically reset after a correct characteristic has been transmitted.

9.2.12 Timeout

This message is generated when a specified time frame is exceeded during certain tests.
Acknowledge this message to reset.

9.2.13 Application data invalid

This message is generated in case an internal communication fault or a HART communication fault occurs.
It is reset after the error has been eliminated.

9.2.14 Control data memory erroneous

A memory block in the EEPROM area cannot be written.
Repair required.

9.2.15 Checksum error control data memory

This message is generated when the cyclic check determines that a memory block in the control parameter section has been modified without verification.
The user can reset this message by rewriting one memory block minimum after checking all values.

9.2.16 Communication data memory erroneous

A memory block in the RAM/EEPROM area cannot be written.
Repair required.

9.2.17 Checksum error communication data memory

This message is generated when, during cyclic check, a memory block in the communication parameter area has been modified without verification.
It is automatically reset when the communication parameters are reset to the default values.

9.2.18 Checksum error device information

This message is generated when, during the cyclic check, a memory block in the device information area has been modified without verification.
The user can reset this message by rewriting one memory block minimum after checking all values.

9.3 Error messages during initialization without abortion

Error message without abortion of the initialization procedure.
Error message with abortion of the initialization procedure.
After the error has been eliminated, initialization must be restarted.

9.3.1 Wrong selection of rated travel or transmission

The maximum determined travel which is read out as %-value of the rated travel/angle is smaller than the selected rated travel/angle. This message is only generated in initialization mode "related to nominal range".

Possible sources of error:

- Incorrect mechanical attachment
- Incorrect transmission entered
- For NAMUR attachment: wrong pin position entered
- Valve is blocked

Supply pressure too low. The supply pressure must be higher than the spring range and stable. It should be minimum 0.4 bar above the upper spring range value (refer also to section 3.1.2)

9.3.2 Air leakage of pneumatic system

The actuator stalls for a few seconds when the duty cycle is being determined. This time is used by initialization to check the pneumatic system for leaks. If the control valve moves more than 9.3 % from this resting position within 7 seconds, initialization is aborted with this error message.

Possible sources of error:

- Actuator not tight
- Signal pressure connection not tight
-

9.4 Error messages during initialization with abortion

9.4.1 Forced venting check:

Initialization cannot be started if the implemented option forced venting is activated

If the implemented option forced venting is activated, the initialization procedure is aborted. For implemented option forced venting it is required that between 6 and 24 V DC be applied to terminal +81 and –82.

9.4.2 Determining the mechanical end stops

The initialization routine recognizes the spring action and zero during determination of the mechanical end stops by completely venting and exhausting the actuator. In addition, the routine checks whether the positioner can pass 100 % rated travel/angle.

9.4.2.1 Defective mechanics/pneumatic section when determining the mechanical end stops

The initialization routine recognizes a constant change or no change of the value measured for travel/angle.

Possible sources of error:

- Supply pressure too low/not stable
- Air capacity too low
- Improper mechanical attachment
- Lever not properly hung
- For NAMUR attachment: lever not correctly secured to the shaft of the adapter housing
- Connecting cable between logic and displacement sensor board disengaged

9.4.2.2 Zero calibration error

The determined zero point does not lie within the acceptable tolerance limit of max. ±5 % by the internal absolute value for the detection of measured values.
To eliminate this error, mechanical zero must be adjusted. The yellow pointer of the displacement sensor must then be approximately in alignment with the marking on the cover plate.

9.4.3 Messages during determination of transit time

Transit time determination measures the time required by the valve to pass through the rated travel/angle from 0 % to100 %.

9.4.3.1 Control loop error

If the system cannot travel through the entire rated travel/angle, the supply air pressure is usually too low.

9.4.4 Messages during determination of minimum pulses

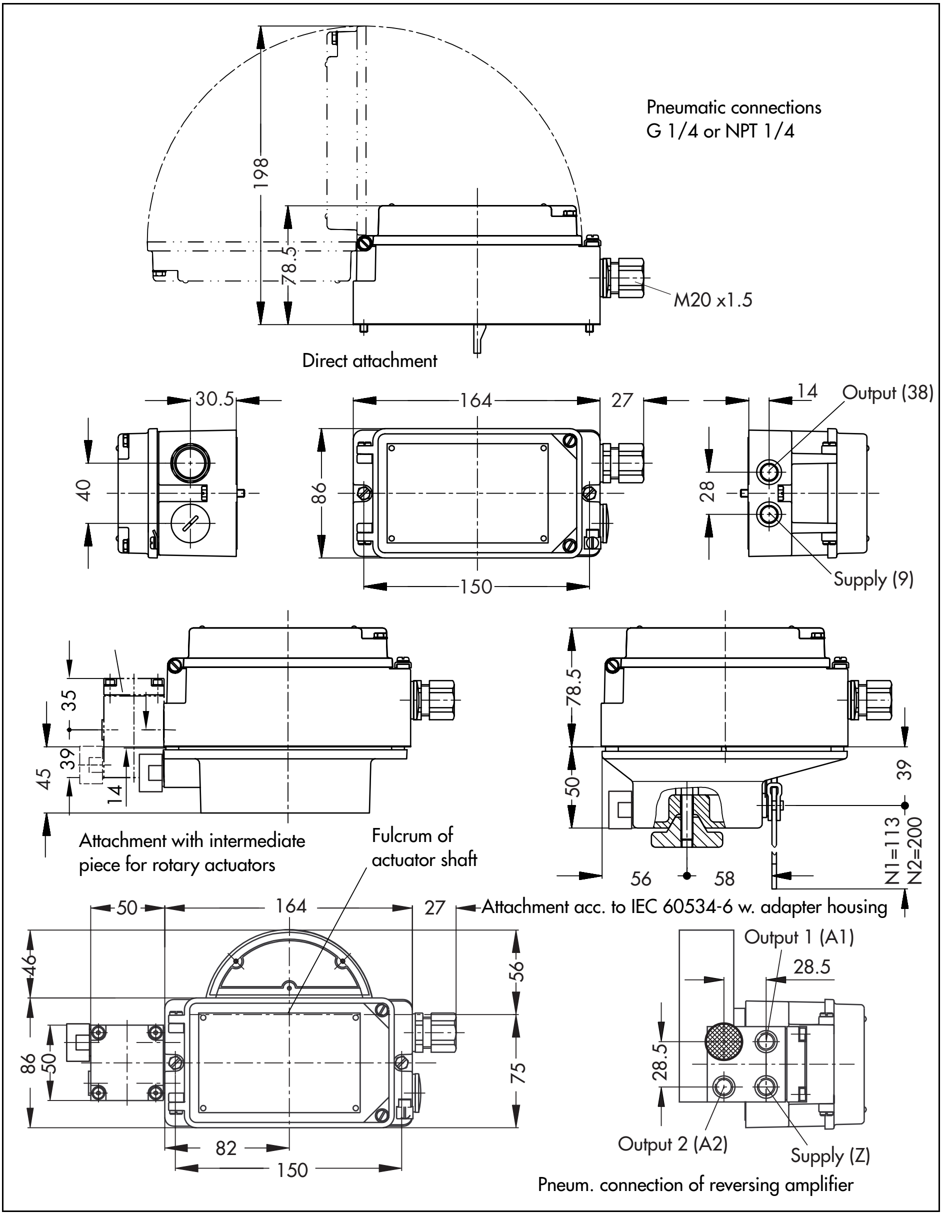
9.4.4.1 Proportional band restricted too much

Even the smallest permissible pulses still cause too large changes in travel. Initialization is aborted.

Possible sources of error:

– Supply pressure too high
– Missing signal pressure throttle for actuators with small volumes
– Fault in the mechanics, particularly with attachment according to IEC 60534-6 (NAMUR)
– In case a booster valve has been mounted with large volume actuators, the bypass should be opened further.

Dimensional diagram



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Braunschweig und Berlin

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T R A N S L A T I O N

(1) **EC TYPE EXAMINATION CERTIFICATION**

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres – **Directive 94/9/EC**

(3) EC Type Examination Certificate Number

PTB 00 ATEX 2038

(4) Equipment: Model 3780-1... Positioner

(5) Manufacturer: SAMSON AG

(6) Address: Weismüllerstr. 3, D-60314 Frankfurt, Germany

(7) This equipment and any acceptable variations thereof are specified in the schedule to this certificate and the documents referred to therein.

(8) The Physikalisch-Technische Bundesanstalt, certified body number 0102 in according to Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirement relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres specified in Annex II to the Directive.

The examination and test results are recorded in confidential report

PTB Ex 00-20009.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with

EN 50014: 1997 **EN 50020: 1994**

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

PTB

Test Report: **PTB Ex 00-20009**

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) According to the Directive 94/9/EC, this EC TYPE EXAMINATION CERTFICATE relates only to the design and construction of the specified equipment. If applicable, further requirements of this Directive apply to the manufacture and supply of the equipment.

(12) The marking of the equipment shall include the following:

II 2 G EEx ia IIC T6

Zertifizierungsstelle Explosionsschutz
By order

Braunschweig, ...

(Signature) (Seal)

Dr. Ing. U. Johannsmeyer
Regierungsdirketor

(13) **S c h e d u l e**

(14) **EC TYPE EXAMINATION CERTIFICATE No. PTB 00 ATEX 2038**

(15) **Description of Equipment**

The Model 3780-1... Positioner serves for converting a load-independent current into a pneumatic control signal. Pneumatic power is supplied by noncumbustible media.

The Model 3780-... Positoner is a passive two-pole network which may be connected to any certified intrinsically safe circuit, provided the permissible maximum values of U_i, I_i and P_i are not exceeded.

The Positioner is permitted to be installed inside and outside hazardous areas.

The correlation between temperature classification and permissible ambient temperature ranges is shown in the table below:

Temperature class	Permissible ambient temperature range
T6	-40 °C ... 60 °C
T5	-40 °C ... 70 °C
T4	-40 °C ... 80 °C

For the Model **3780-12...** Positioners the correlation between temperature classification, permissible ambient temperature ranges and maximum short-circuit current is shown in the table below

Temperature class	Permissible ambient temperature range	Maximum short-circuit current
T6	-40 °C ... 45 °C	52mA
T5	-40 °C ... 60 °C	
T4	-40 °C ... 75 °C	
T6	-40 °C ... 60 °C	25mA
T5	-40 °C ... 80 °C	
T4	-40 °C ... 80 °C	

Electrical data

Signal circuit (terminals 11/12)

Type of protection. Intrinsic safety EEx ia IIC only for connection to a certified intrinsically safe circuit

Maximum values:

U_i = 28 V
I = 115 mA
P_i = 1 W

C_i = 5.3 nF, L_i = negligible

Position indicator (terminals 31/32)

Type of protection: Intrinsic safety EEx ia IIC only for connection to a certified intrinsically safe circuit

Maximum values:

U_i = 28 V
I = 115 mA
P_i = 1 W

C_i = 5.3 nF, L_i = negligible

Version **3780-12...** Llimit switches (terminals 41/42and 51/52)

Type of protection: Intrinsic safety EEx ia IIC only for connection to a certified intrinsically safe circuit

Maximum values:

U_i = 16 V
I_i = 52 mA
P_i = 169 mW

C_i = 60 nF, L_i = 200 μH, or

U_i = 16 V
I_i = 25 mA
P_i = 64 mW

C_i = 60 nF, L_i = 200 μH

Type of protection: Intrinsic safety EEx ia IIC only for connection to a certified intrinsically safe circuit

Limit switches, software (terminals 41/42 and 51/52)	**Maximum values:** U = 20 V I = 60 mA P = 250 mW C =5.3 nF, L = negligible
Forced venting function (terminals 81/82)	Type of protection: Intrinsic safety EEx ia IIC only for connection to a certified intrinsically safe circuit **Maximum values:** U = 28 V I_i = 115 mA P = 500 mW C = 5.3 nF, L = negligible
Fault alarm output (terminals 83/84)	Type of protection: Intrinsic safety EEx ia IIC only for connection to a certified intrinsically safe circuit Maximum values: U_i = 20 V I = 60 mA P = 250 mW C = 5.3 nF, L = negligible

(16) <u>Test Report PTB Ex 00-20009</u>

(17) <u>Special conditions for safe use</u>

Not applicable

(18) <u>Special Health and Safety Requirements</u>

In compliance with the standards specified above

Zertifizierungsstelle Explosionsschutz Braunschweig, 03 May 2000
By order
(Signature) (seal)

Dr. Ing. U. Johannsmeyer
Regierungsdirektor

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

PTB

T R A N S L A T I O N

A D D E N D U M N o.: 1

in compliance with Directive 94/9/EC Annex III Clause 6
to the EC Type Examination Certificate PTB 98 ATEX 2038

Equipment:	Model 3780-1... Positioner
Marking:	Ex **II 2 G EEx ia IIC T6**
Manufacturer:	SAMSON AG
Address:	Weismüllerstr. 3, D-60314 Frankfurt, Germany

Description of the additions and modifications

In future the Model 3780-1... Positioner may be manufactured in compliance with the certification documents identified in the associated test report.

The coupling circuit, the wiring of the logic board and the wiring of the displacement transducer were modified because of changed EMC limit values.

The modifications relate to the design and construction.

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

PTB

The electrical data are changed as follows:

Electrical data:

Signal circuit (terminals 11/12)

Type of protection. Intrinsic safety EEx ia IIC only for connection to a certified intrinsically safe circuit

Maximum values:

U_i = 28 V
I_i = 115 mA
P_i = 1 W

C_i = 5.3 nF, L_i = 45 µH

All the other data apply without change also to this Addendum No. 1

Test report: **PTB Ex 00-20260**

Zertifizierungsstelle Explosionsschutz
By order

Braunschweig, 10. October 2000

(Signature) (Seal)

Dr. Ing. U. Johannsmeyer
Regierungsdirektor

EC Type Examination Certificates without signature and seal are invalid.
This EC Type Examination Certificate may only be reproduced in its entirety and without any changes, schedule included.
Extracts or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.

Physikalisch-Technische Bundesanstalt., Bundesallee 100, D-38116 Braunschweig

19Add-1.doc

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TRANSLATION

ADDENDUM No.: 2

in compliance with Directive 94/9/EC Annex III Clause 6
to the EC Type Examination Certificate PTB 00 ATEX 2038

Equipment: Model 3780-1...I/P Positioner

Marking: **II 2G EEx ia IIC T6**

Manufacturer: SAMSON AG Mess- und Regeltechnik

Address: Weismüllerstr. 3, D-60314 Frankfurt, Germany

<u>Description of the additions and modifications</u>

The Model 3780-1...I/P Positioner satisfy the requirements of EN 50281-1-1: 1998 relating to electrical apparatus with protection provided by the enclosure.

The positioners are attached to pneumatic control valves or butterfly valves either directly across actuators of the 3277 Series or to conventional actuators via NAMUR adapter plates.

The Model 3780-1.. I/P Positioners shall be provided in addition with the following marking:

II 2D IP 65 T80 °C

all the other data apply without change also to this Addendum No. 2.

Test report: **PTB Ex 03-23395**

Zertifizierungsstelle Explosionsschutz Braunschweig, 14 January 2004
By order

(Signature) (Seal)

Dr. Ing. U. Johannsmeyer
Regierungsdirektor

Physikalisch-Technische Bundesanstalt., Bundesallee 100, D-38116 Braunschweig

19Add-2.doc

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

PTB

T R A N S L A T I O N

(1) **Statement of Conformity**

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres – **Directive 94/9/EC**

(3) Test Certificate Number

PTB 02. ATEX 2033 X

(4) Equipment: Model 3780-8.. Positioner

(5) Manufacturer: SAMSON AG Mess- und Regeltechnik

(6) Address: Weismüllerstr. 3, 60314 Frankfurt am Main, Germany

(7) The equipment and any acceptable variation thereof are specified in the schedule to this certificate and the documents referred to therein.

(8) The Physikalisch-Technische Bundesanstalt, notified body number 0102 according to Article 9 of the Council Directive 94/9/ of 23 March 1994, certifies that this equipment has been found to comply with the essential health and safety requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres specified in Annex II to the Directive.

The examination and test results are recorded in confidential report

PTB Ex 01-21298.

(9) The essential health and safety requirements are satisfied by compliance with

EN 50021: 1999

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use as specified in the schedule to this certificate.

(11) In compliance with the Directive 94/9/EC this Statement of Conformity relates only to the design and construction of the equipment specified. Further requirements of this Directive apply to manufacture and marketing of the equipment.

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(12) The marking of the equipment shall include the following:

II 3 G EEx nA II T6

Zertifizierungsstelle Explosionsschutz
By order

Braunschweig, 05 April 2002

(Signature) (Seal)

Dr. Ing. U. Klausmeyer
Regierungsdirketor

Statements of Conformity without signature and seal are invalid.
This Statement of Conformity may be reproduced only in its entirety without any changes.
Extracts or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.

(13) **S c h e d u l e**

(14) **Statement of Conformity PTB 02 ATEX 2033 X**

(15) **Description of Equipment**

The Model 3780-8 Positioner serves for converting a load-independent current into a pneumatic control signal. Pneumatic power is supplied by non-combustible media.

The Positioner is intended for use inside and outside of hazardous locations.

The correlation between temperature classification and permissible ambient temperature ranges is shown in the table below:

Temperature classification	Permissible ambient temperature range
T6	... 60 °C
T5	-40 °C ... 70 °C
T4	...80 °C

The same permissible ambient temperature ranges apply to the version with metallic cable entry.

Electrical data

Signal circuit (terminals 11/12)	Type of protection EEx nA II
Position indicator (terminals 31/32)	Type of protection EEx nA II
Limit switches (terminals 41/42 and 51/52)	Type of protection EEx nA II
Forced ventilation (terminals 81/82)	Type of protection EEx nA II
Fault alarm output (terminals 83/84)	Type of protection EEx nA II

(16) Test report **PTB Ex 01-21298**

(17) **Special conditions for safe use**

The signal circuit (terminals 11/12) shall be provided with a series connected fuse complying with IEC 60127-2/II, 250 V F or IEC 60127-2/VI, 250 V T with a maximum current rating $I_N \leq 63$ mA, to be installed outside of the hazardous location.

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The position indicator circuit (terminals 31/32) shall be provided with a series-connected fuse complying with IEC 60127-2/II, 250 V F or IEC 60127-2/VI, 250 V T with a maximum current rating of $I_N \leq 40$ mA, to be installed outside of the harzardous location.

The Model 3780-8.. Positioner shall be installe din an enclosure providing at lest Degree of Protection IP 54 in compliance with IEC Publication 60529:1989.

The wiring shall be connected in such a manner that the connection facility is not subject to pull and twisting.

(18) **Basis health and safety requirements**

Are satisfied by compliance with the standards specification.

Zertifizierungsstelle Explosionsschutz Braunschweig, 05. April 2002
By order

(Signature) (seal)

Dr. Ing. U. Klausmeyer
Regierungsdirektor

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Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

PTB

T R A N S L A T I O N

A D D E N D U M N o.: 1

in compliance with Directive 94/9/EC Annex III Clause 6
to the Statement of Conformity PTB 02 ATEX 2033 X

Equipment:	Model 3780-8.. Positioner
Marking:	**II 3G EEx nA II T6**
Manufacturer:	SAMSON AG, Mess- und Regeltechnik
Address:	Weismüllerstr. 3, D-60314 Frankfurt, Germany

Description of the additions and modifications

The Model 3780-8.. Positioners satisfy the requirements of EN 50281-1-1:1998 relating to electrical apparatus with protection provided by the enclosure.

The positioners are attached to pneumatic control valves and butterfly valves either directly across actuators of the 3277 Series or to conventional actuators via NAMUR adapter plates.

The Model 3780-8.. Positioners shall be provided in addition with the following marking:

II 3D IP 65 T 80 °C or **II 3D IP 54 T 80 °C**

All the other data apply also to this Addendum No. 1 without any change.

Test report: **PTB Ex 03-23398**

Zertifizierungsstelle Explosionsschutz Braunschweig, 14 January 2004
By order

(Signature) (Seal)

Dr. Ing. U. Johannsmeyer
Regierungsdirketor

Installation Manual for apparatus certified by CSA for use in hazardous loctions.

Electrical rating of intrinsically safe apparatus and apparatus for installation in hazardous locations.

Table 1: Maximum values

	Control-signal	Postion-indicator	Forced venting-function	Limit switches inductiv	Limit switches software	Fault-signal
Circuit No.	1	2	5	3 and 4	3 and 4	6
Terminal No.	11 / 12	31 / 32	81 / 82	41 / 42 and 51 / 52	41 / 42 and 51 / 52	83 / 84
U_i or V_{max}	28V	28V	28V	16V	20V	20V
I_i or I_{max}	115mA	115mA	115mA	25/52 mA	60mA	60mA
P_i or P_{max}	1W	1W	500mW	64/169 mW	250mW	250mW
C_i	5.3nF	5.3nF	#	60nF	5.3nF	5.3nF
L_i	45µH	#	#	200µH	#	#

Notes: Entity parameters must meet the following requirements:

U_0 or V_{0C} or $V_t \le U_i$ or V_{max}
I_0 or I_{0C} or $I_t \le I_i$ or I_{max}
P_0 or $P_{max} \le P_i$ or P_{max}
$C_a \ge C_i + C_{cable}$ and $L_a \ge L_i + L_{cable}$

Table 2: CSA – certified barrier parameters of circuit 2 and 5

Barrier	Supply barrier				Evaluation barrier		
	V_{0C}	R_{min}	I_{0C}	P_{max}	V_{0C}	R_{min}	I_{0C}
circuit 2	≤28V	≥300Ω	≤115mA	≤1W	≤28V	#	0mA
circuit 5	≤28V	≥392Ω	≤115mA	≤500mW	≤28V	#	0mA

Table 3: The correlation between temperature classification and permissible ambient temperature ranges is shown in the table below:

Temperatur class	Permissble ambient temperature range
T6	- 40°C ... 60°C
T5	- 40°C ... 70°C
T4	- 40°C ... 80°C

Table 4: For the Model 3780 – 32 . . . . Positioner the correlation between temperatur classification, permissible ambient temperature ranges and maximum short- circuit current is shown in the table below:

Temperture class	Permissible ambient temperature range	Maximum short-circuit current
T6	- 40°C ... 45°C	52mA
T5	- 40°C ... 60°C	
T4	- 40°C ... 75°C	
T6	- 40°C ... 60°C	25mA
T5	- 40°C ... 80°C	
T4	- 40°C ... 80°C	

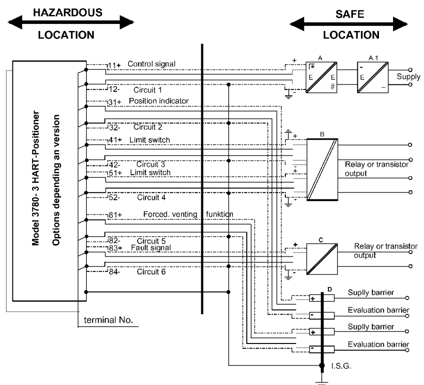
Intrinsically safe if installed as specified in manufacturer's installation manual.

CSA- certified for hazardous locations

Class I, Division 1, Groups A, B, C, D./ T6 **(Type 4 Enclosure)**
Class I, Zone 0 Ex ia IIC T6

1.) **Notes:** Max. two cable enties per positioner
2.) Each pair of wire must be provided with a grounded shield. The shield must extend as close to the terminal as possible. Each shield must be grounded as the I.S. barrier ground.
3.) Install in accordance with the Canadian Electrical Code, Part I.
4.) Max. two cable enties per positioner
5.) Each pair of wire must be provided with a grounded shield. The shield must extend as close to the terminal as possible. Each shield must be grounded as the I.S. barrier ground.
6.) Install in accordance with the Canadian Electrical Code, Part I.

A = HART- isolating stage CSA- certified. A1 = Power supply

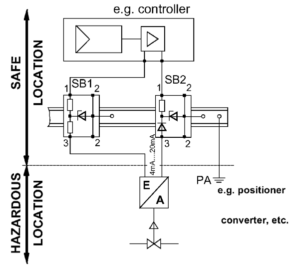


B and C = Isolating amplifer 1 or 2 channel(s) resp. CSA- certified
D = CSA- certified I.S. barrier(s)

For the permissible maximum values for the intrinsically safe circuits 1 and 5 see Table 1
For the permissible barrier parameters for the circuits 1 and 5 see Table 2
Cable entry M 20 x 1.5 or metal conduit according to drawing No. 1050 – 0539 T or 1050 – 0540 T

On interconnection to form ground- free signal circuits, only evaluation barriers must be installed in the return line. Correct polarity must be ensured.

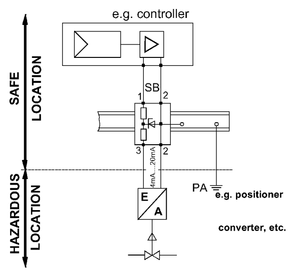
Circuit diagram of a ground- free signal circuit.
(position indicator and forced venting function)



Ground-free control signal circuit with two barriers

In grounded signal circuits with only one barrier, the return line must be grounded or included in the potential equalization network of the system.

Circuit diagram of a grounded signal circuit
(position indicator and forced venting function

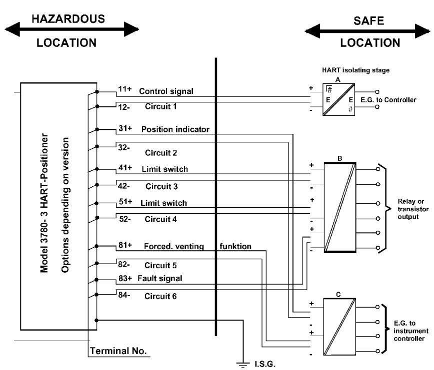


Ground signal circuit with one barriers

CSA- certified for hazardous locations

Class I, Division 2, Groups A, B, C, D./ T6 **(Type 4 Enclosure)**
Class I, Zone 2

HART- positioner with position indicator, forced venting function, fault signal and limit switches.



Notes:
1.) Install in accordance with the Canadian Electrical Code, Part I.
2.) A, B and C of any manufacturer, for the maximum values for the individual circuits see Table 1.
3.) The cables shall be protected by conduits.
4.) Cable entry only rigid metal conduit according to drawing No. 1050-0539 T and 1050-0540 T

Installation Manual for apparatus approved by FM for use in hazardous loctions.

Electrical rating of intrinsically safe apparatus and apparatus for installation in hazardous locations.

Table 1: Maximum values

	Control-signal	Postion-indicator	Forced venting-function	Limit switches inductiv	Limit switches software	Fault-signal
Circuit No.	1	2	5	3 and 4	3 and 4	6
Terminal No.	11 / 12	31 / 32	81 / 82	41 / 42 and 51 / 52	41 / 42 and 51 / 52	83 / 84
U_i or V	28V	28V	28V	16V	20V	20V
I_i or I_{max}	115mA	115mA	115mA	25/52 mA	60mA	60mA
P or P	1W	1W	500mW	64/169 mW	250mW	250mW
C_i	5.3nF	5.3nF	#	60nF	5.3nF	5.3nF
L_i	45µH	#	#	200µH	#	#

Notes: Entity parameters must meet the following requirements:

U_0 or V_{0C} or $V_t \leq U_i$ or V_{max}
I_0 or I_{0C} or $I_t \leq I_i$ or I_{max}
P_0 or $P_{max} \leq P_i$ or P_{max}
$C_a \geq C_i + C_{cable}$ and $L_a \geq L_i + L_{cable}$

Table 2: FM – approved barrier parameters of circuit 2 and 5

Barrier	Supply barrier				Evaluation barrier		
	V_{0C}	R_i	I_{0C}	P	V_{0C}	R_i	I_{0C}
circuit 2	≤28V	≥300Ω	≤115mA	≤1W	≤28V	#	0mA
circuit 5	≤28V	≥392	≤115mA	≤500mW	≤28V	#	0mA

Table 3: The correlation between temperature classification and permissible ambient temperature ranges is shown in the table below:

Temperatur class	Permissble ambient temperature range
T6	- 40°C ... 60°C
T5	- 40°C ... 70°C
T4	- 40°C ... 80°C

Table 4: For the Model 3780 – 32 . . . . Positioner the correlation between temperatur classification, permissible ambient temperature ranges and maximum short- circuit current is shown in the table below:

Temperture class	Permissible ambient temperature range	Maximum short-circuit current
T6	- 40°C ... 45°C	52mA
T5	- 40°C ... 60°C	
T4	- 40°C ... 75°C	
T6	- 40°C ... 60°C	25mA
T5	- 40°C ... 80°C	
T4	- 40°C ... 80°C	

Intrinsically safe if installed as specified in manufacturer's installation manual.

FM - approved for hazardous locations

Class I, II, III, Division 1, Groups A, B, C, D, E, Fand G
Class I, Zone 0 A Ex ia IIC T6

(NEMA Type 4X)

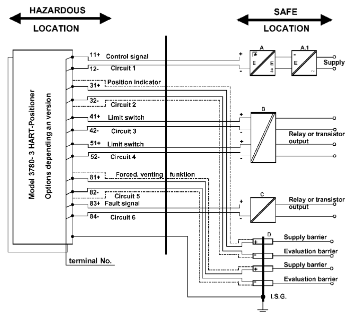
Notes:

1.) The apparatus may be installed in intrinsically safe circuits only when used in conjunction with the FM approved apparatus. For maximum values of U_i or V_{max} ; I_i or I_{max}; P_i or P_{max} ; C_i and L_i of the varrious apparatus see Table 1 on page 6.

2.) The apparatus may be installed in intrinsically safe circuits only when used in conjunction with the FM approved intrinsically safe barrier.
For barrier selection see Table 2 on page 6.

3.) Installation must be in accordance with the National Electrical Code ANSI/NFPA 70 and ANSI/ISA RP 12.6.

4.) Use only supply wires suitable for 5°C above surrounding temperature.



A = HART- isolating stage FM- approved. A1 = Power supply
B and C = Isolating amplifer 1 or 2 channel(s) resp. FM- approved
D = FM- approved I.S. barrier(s)

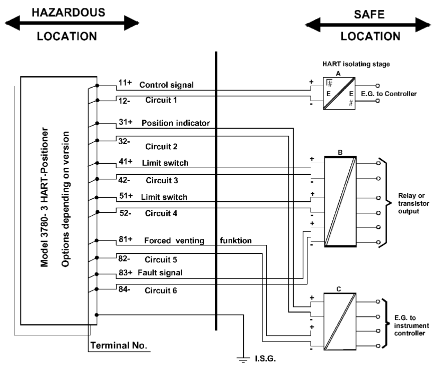
For the permissible maximum values for the intrinsically safe circuits 1 and 5 see Table 1
For the permissible barrier parameters for the circuits 1 and 5 see Table 2
Cable entry M 20 x 1.5 or metalconduit according to drawing No. 1050 – 0539 T or 1050 – 0540 T

FM- approved for hazardous locations

Class I, II, III, Division 2, Groups A, B, C, D, F and G
Class I, Zone 2 A Ex nA IIC T6

(NEMA Type 4X)

HART- positioner with position indicator, forced venting function, fault signal and limit switches.

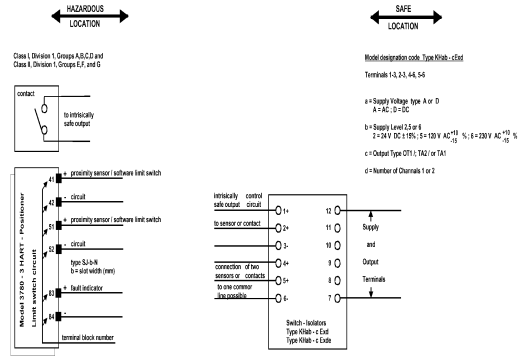


Notes:

A, B and C of any manufacturer, for the maximum values for the individual circuits see Table 1.

Cable entry only rigid metal conduit

Installation drawing Control Relay K Hab - cEx de with proximity sensors typ SJ-b-N



maximum capacitance of each induct. sensor 60 nF

maximum capacitance of each induct. sensor 100 µH

The total series Inductance and shunt capacitance of thefield wiring must be restricted to the following maximum values

Control Relay Terminals	Groups	inductance (millihenries)	capacitance (microfarads)	Voc (V)	Isc (mA)
1-3, 2-3, 4-6, 5-6	A + B	84,8	1,27	12,9	19,8
	C + E	299	3,82		
	D,F,G	744	10,2		

Model designation code Type KHab - cExde

a = Supply Voltagetype A or D
A = AC ; D = DC

b = Supply Level 2,5 or 6
2 = 24 V DC ± 15% ; 5 = 120 V AC $^{+10}_{-15}$ % ; 6 = 230 V AC $^{+10}_{-15}$ %

c = Output Type RTA / ; RW1 / ; SS1 / ; SS2 / ; RS1 / ; SR / ; SRT / ; ST- or SOT-

d = Number of Channals 1 or 2

e = Power Rail Designation .P, .2S.P or .GS.P
(includes Model KHD2 - EB - PB Power Feed Modul) or Blank

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Internet: http://www.samson.de

S/Z 2004-07

FOUNDATION™ FIELDBUS Positioner
Type 3787

Fig. 1 · Type 3787

FOUNDATION

Mounting and Operating Instructions

EB 8383-1 EN

Firmware R 1.42/K 1.40

Edition January 2004

Contents Page

- *The device may only be assembled, started up, and operated by experienced personnel familiar with this product.*
  In these mounting and operating instructions, the term "experienced personnel" refers to individuals who are able to evaluate the responsibilities assigned to them as well as recognize potential hazards due to their specialized training, knowledge, and experience as well as their special knowledge of the relevant standards.
- *Explosion-protected versions of this device may only be operated by personnel who have undergone special training or instructions, or who are authorized to work on explosion-protected devices in hazardous areas.*
- *Any hazards which could be caused by the process medium, the operating pressure, the signal pressure and moving parts of the control valve, must be prevented by means of appropriate measures.*
- *Should inadmissible motions or forces be produced in the pneumatic actuator as a result of the level associated with the supply air pressure, these must be restricted by means of a suitable pressure reducing station.*
- *Proper shipping and appropriate storage of the device are assumed.*

Note: *Devices with the CE mark meet the requirements specified in the Directive 94/9/EC and the Directive 89/336/EEC.*
The Declaration of Conformity can be viewed and downloaded from the SAMSON website at www.samson.de.

Modifications of positioner firmware in comparison to previous versions	
Previous	New
Positioner R 1.41	**R 1.42**
	Correction in the zero calibration activated over software communication

Communication K1.00	K1.20
	Version compatible with user interface software version number: Fisher-Rosemount DeltaV in version 5.1 or higher National Instruments Fieldbus Configurator in version 2.3 or higher. All host systems certified by the Fieldbus Foundation Alteration to default values of the following parameters: AO Function Block CHANNEL, PID Function Block GAIN, PID Function Block RESET, PID Function Block BYPASS Resource Block parameter extended: BLOCK_ERROR, page 40 Transducer Block parameters changed/extended: BLOCK_ERR, page 46.
Communication K 1.00	**K1.31**
	The output parameters of the function blocks can be interconnected within a device and with blocks in other devices at the same time. In the previous version, it was only possible to either interconnect function blocks within a device or with blocks in other devices. An Output Failure in BLOCK_ERR of the AO Function Block generates a Block Alarm. The automatic resetting control loop monitor (previously not automatic resetting) is evaluated for the control loop error indication via LED or the message "Calibration Error". This means this alarm or message is automatically reset as soon as the control loop monitor cannot find an error anymore.
Communication K 1.31	**K1.40**
	The default value for RESET in the PID Block has been changed from 0 to 3402823466 x 10^{38} (maximum possible value). The integral-action component of the PID is ineffective at this value as well as at 0. On switching over the operating mode from MAN to AUTO, a smooth switchover is achieved.

Positioner	
Travel Direct attachment to Type 3277 Attachment acc. to IEC 60534-6	Adjustable 7.5 to 30 mm 7.5 to 120 mm or 30 to 120° for rotary actuators
Bus connection	Fieldbus interface as per EN 61158-2, bus-powered Physical Layer Class: 113 (not explosion-protected version) and 111 (Ex-version) Field device according to FM 3610 entity and FISCO.
Permissible operating voltage	9 to 32 V DC[1)], power supply over bus
Max. operating current	13 mA
Additional current in case of fault	0 mA
Supply air	Supply air from 1.4 to 6 bar (20 to 90 psi) Air quality as per ISO 8573-1: Max. particle size and density: Class 2, Oil contents: Class 3, the pressure dew point must be 10 °C lower than the lowest expected ambient temperature.
Signal pressure (output)	0 bar up to the pressure of the supply air
Characteristic, adjustable Deviation	Globe valve: linear, equal percentage, reverse equal percentage, SAMSON butterfly valve: linear, equal percentage VETEC plug rotary valve: linear, equal percentage ≤1 %
Dead band (based on rated travel/angle	Adjustable from 0.1 to 10.0 % , default 0.5 %
Resolution (internal measurement)	< 0.05 %
Transit time	For valve transit time up to 240 s, set point ramp for venting and supply air separately adjustable
Operating direction	Reversible, setting by software
Air consumption	Independent of supply air <90l_n/h
Air supply	Actuator filled: when Δp = 6 bar 9.3 m_n^3/h, when Δp = 1.4 bar 3.5 m_n^3/h Actuator vented: when Δp = 6 bar 15.5 m_n^3/h, when Δp = 1.4 bar 5.8 m_n^3/h
Permissible ambient temperature	–40 to 80 °C The specifications in the EC type examination certificate additionally apply for explosion-protected devices
Effects	Temperature: ≤0.15 %/10 K, supply air: none, Vibrations: none up to 250 Hz and 4 g
Degree of protection	IP 65 using filter check valve included
Electromagnetic compatibility	Requirements acc. to EN 50081/50082 are met
Binary input	Internal power supply 5 V DC, R_i = 100 kΩ for alarm function
Forced venting (activated over an internal switch)	Input 6 to 24 V DC, R_i approx. 6 kΩ at 24 V DC (depending on voltage) Switching point for "1" signal ≥ 3 V, switching point for "0" signal only at 0 V, K_V value 0.17

Accessories	
Inductive limit switches	Two Type SJ 2 SN Proximity Switches for connection to a switching amplifier acc. to EN 60947-5-6
Communication	
Data transmission	In accordance with FOUNDATION™ Fieldbus specification Communication Profile Class: 31 PS, 32: Interoperability Test System (I TS) Revision 4.0
Materials	
Case	Die-cast aluminum, chromized and plastic-coated
External parts	Stainless steel WN 1.4571 and WN 1.4301
Weight	Approx 1.3 kg

Versions of the positioner

Model			**3787 -**	X	X	X	**0**	X	3	X
Explosion protection	Without			**0**						
	II 2 G EEx ia IIC T6 acc. to ATEX			**1**						
	Ex ia FM/CSA			**3**						
	II 3 G EEx ia IIC T6 acc. to ATEX			**8**						
Accessories	Limit switches	Without			**0**					
		2 inductive			**2**					**2**
Forced venting	Without (deactivated)					**0**				
	With (activated)					**1**				**2**
Pneumatic connections	NPT 1/4- 18							**1**		
	ISO 228/1-G 1/4							**2**		
Electric connections	Cable gland M20 x 1.5 Nickel-plated brass									
		Quantity: 1								**1**
		2								**2**

1 Design and principle of operation

The digital positioner compares the reference variable, which is cyclically transmitted over the FOUNDATION™ Fieldbus, with the travel or opening angle of the control valve. It then delivers a corresponding signal pressure. It is suitable for attachment to linear and rotary actuators.

The Type 3787 Positioner communicates as per FOUNDATION™ Fieldbus specification with field devices, programmable logic controllers and process management systems. An integrated PID Function Block allows the control of required process variables directly in the field.

The travel of the control valve is picked up by the inductive displacement sensor (1) and supplied to the microcontroller (2) via a converter.
The microcontroller compares the travel with the reference variable and controls the two pneumatic 2/2-way on-off valves (3, 4) when a system deviation occurs. The on-off valves fill (3) or vent (4) the pneumatic actuator via corresponding amplifiers corresponding to the system deviation.
Two LEDs on the inside of the cover indicate the operating status of the positioner.
The positioner is equipped with a standard binary input over which any process information can be signaled via the FOUNDATION™ Fieldbus.
The write protection switch (6) located on the inside of the cover prevents stored configuration data from being overwritten.

Forced venting:
The positioner is controlled over a 6 to 24 V signal which causes the corresponding signal pressure to be applied to the actuator. If the voltage signal drops, the signal pressure is shut off and the actuator is vented. The control valve moves to its fail-safe position regardless of the output variable issued by the microcontroller.

1.1 Optional limit switches

Limit switches can be retrofitted to the standard positioner.

Two proximity switches can be used for fail-safe circuits to indicate the valve's end positions.

1.2 Communication

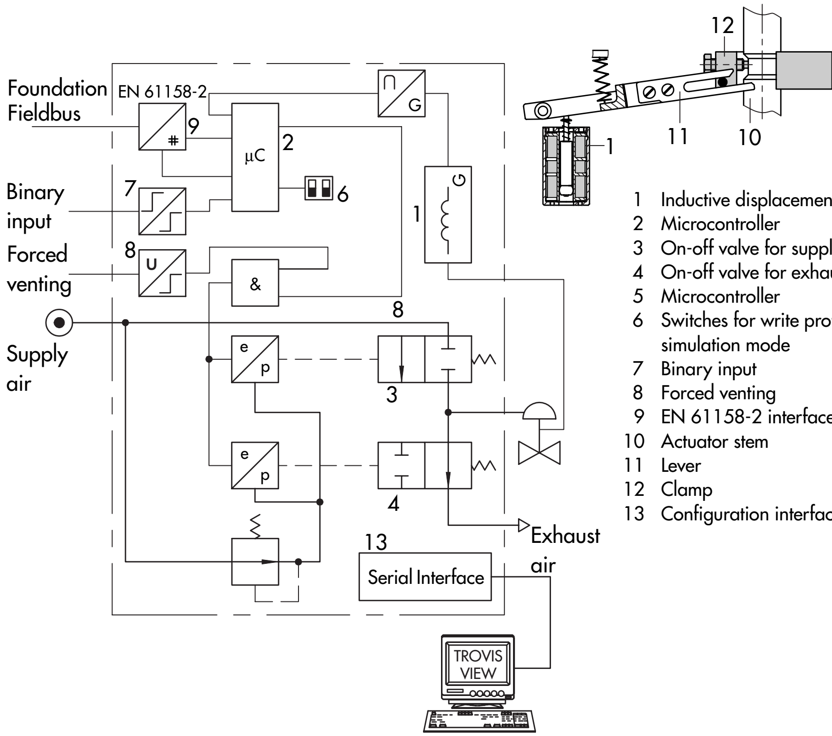
The positioner is completely controlled via digital signal transmission according to the FOUNDATION™ Fieldbus specification based on the E EN 50170/A1 draft. Data is transmitted as bit synchronous current modulation at a transmission rate of 31.25 kbit/s over twisted pairs according to EN 61158-2.

Configuration with TROVIS-VIEW
The positioner can be configured using the SAMSON Configuration and Operator Interface, TROVIS-VIEW.
To configure the positioner, connect its additional **SERIAL INTERFACE** to the RS-232 interface of a PC using an adapter cable.
After adapting the positioner to the process requirements, TROVIS-VIEW enables the process to be controlled online.

Configuration with NI-FBUS™ Configurator

The positioner can also be configured using the NI-FBUS™ Configurator from National Instruments.
An interface card installed in a PC is required to connect it to FOUNDATION™ Fieldbus.

The NI-FBUS™ Configurator can be used to configure the whole FOUNDATION™ Fieldbus network.



1 Inductive displacement sensor
2 Microcontroller
3 On-off valve for supply air
4 On-off valve for exhaust air
5 Microcontroller
6 Switches for write protection and simulation mode
7 Binary input
8 Forced venting
9 EN 61158-2 interface module
10 Actuator stem
11 Lever
12 Clamp
13 Configuration interface

Fig. 2 · Functional diagram

2 Attachment to the control valve

The positioner can be attached either directly to a SAMSON Type 3277 Actuator or to control valves with cast yokes or rod-type yokes according to IEC 60534-6 (NAMUR).
In connection with an intermediate piece, the positioner can also be attached to rotary actuators.

Since the standard positioner is delivered without accessories, please refer to the tables for required mounting parts and their order numbers.

Note!
For fast control valves with small travel volumes (transit time < 0.6 sec.), replace the filter in the signal pressure output with a screw-in throttle, if necessary, to improve the control properties. See also sections 2.1, 2.2 and 2.3.

Important!
The positioner does not have its own venting plug, instead vented air has to escape through venting plugs located on the mounting parts (see Figs. 3, 5 and 7).
A filter check valve for the vented air is included in every positioner delivery (under the transparent protective cap on the back of the positioner). Replace the standard venting plug included in the accessories with this filter check valve. This is the only way to achieve the degree of protection IP 65 by preventing dirt and moisture from entering the device.

2.1 Direct attachment to Type 3277 Actuator

The necessary accessories are listed in the Tables 1, 2 and 3 on page 13*.*

When looking at the signal pressure connection or the switchover plate (actuator 120 cm^2), the positioner must be attached to the left side of the actuator.
The **arrow** on the black cover of the case (Fig. 11) should point **towards the diaphragm chamber**.
Exception: Control valves in which the plug closes the seat area when the actuator stem retracts. In this case, the positioner has to be attached to the right side of the actuator and the arrow points away from the diaphragm chamber.

1. Screw the clamp (1.2) to the actuator stem, ensuring that the fastening screw is located in the groove of the actuator stem.
2. Screw the assigned pick-up lever D1 or D2 to the transmission lever of the positioner.
3. Fasten the distance plate (15) with seal pointing towards the actuator yoke.
4. Place the positioner on the plate so that the lever D1 or D2 slides centrally over the pin of the clamp (1.2). Then screw tight to the distance plate (15).
5. Mount cover (16).

Actuators with 240, 350 and 700 cm^2

6. Check whether the tongue of the seal (17) is properly aligned at the side of the connection block (Fig. 3, center)

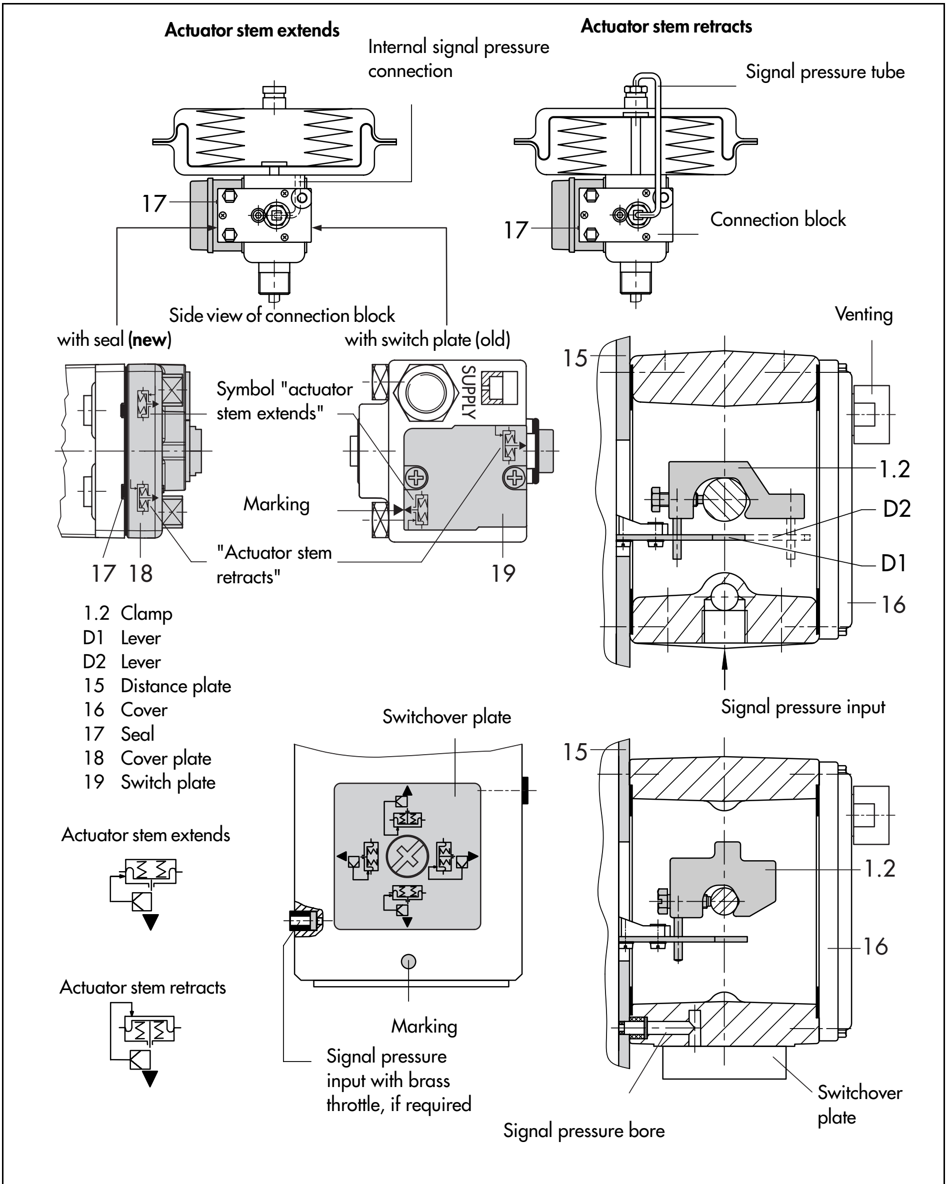


Fig. 3 · Attachment and signal pressure connection for Type 3277 Actuators (top) and 3277-5 with 120 cm² (bottom)

with the actuator symbol "actuator stem extends" or "actuator stem retracts" to match the actuator version used.
If not, remove the three fastening screws and the cover plate (18), turn the seal (17) by 180° and reinsert it. When the **old** connection block is used, turn the switch plate (19) to align the actuator symbol with the arrow.

7. Place the connection block with its seal rings on the positioner and actuator yoke and screw it tight using the fastening screw.

   For actuators with "actuator stem retracts", additionally attach the ready-made signal pressure line.

Actuator with 120 cm^2

For the Type 3277-5 Actuator with 120 cm^2 effective diaphragm area, the signal pressure is transmitted to the diaphragm chamber via the switchover plate (Fig. 3 bottom).

For a rated travel of 7.5 mm, a brass throttle (see Accessories table on page 13) must be pressed into the seal located in the signal pressure input on the actuator yoke. For a rated travel of 15 mm, this is only required when the supply pressure exceeds 4 bar.

6. Remove the screw plug on the rear of the positioner case and seal the signal pressure output (Output 38) with the plug from the accessories.
7. Mount the positioner so that the bore in the distance plate (15) is aligned with the seal located in the bore of the actuator yoke.
8. Align the switchover plate with the corresponding symbol for left attachment and screw the plate to the actuator yoke.

Important!
If, in addition to the positioner, a solenoid valve or a similar device is attached to the 120 cm^2 actuator, the rear M3 screw must not be removed. In this case, the signal pressure has to be fed from the signal pressure output to the actuator via the required connecting plate (see Table 2). The switchover plate is no longer required.

Note!
For faster control valves with a transit time less than 0.6 seconds, replace the filter in the signal pressure output (output 38) with a screw-in throttle (see Accessories table), if necessary.

Filling the diaphragm chamber with air

If the Type 3277 Actuator's diaphragm chamber must be filled with air exhausted from the positioner, the diaphragm chamber (for version with "actuator stem extends") can be connected to the connection block using a tube (see Table 3). To do this, first remove the screw plug from the connection block.

For the Type 3277-5 Actuator with "actuator stem retracts", the air exhausted from the positioner is constantly supplied to the diaphragm chamber through an internal bore.

Table 1 Required lever with associated clamp and distance plate		Actuator size cm^2	Mounting kit Order no.
D1 (33 mm in length with clamp 17 mm in height)		120 (G 1/4) 120 (1/4 NPT)	1400-6790 1400-6791
D1 (33 mm in length with clamp 17 mm in height)		240 and 350	1400-6370
D2 (44 mm in length with clamp 13 mm in height)		700	1400-6371
Table 2			Order no.
Switchover plate for 120 cm^2 actuators	Actuator 3277-5xxxxxx.**00** (old)		1400-6819
Switchover plate **new**	Actuator with index .**01** or higher (new)		1400-6822
Connecting plate for mounting an additional device, e.g. a solenoid valve	3277-5xxxxxxxx.**00** (old)	G 1/8 1/8 NPT	1400-6820 1400-6821
Connecting plate **new**	Actuator with index .**01** or higher (new)		1400-6823
Note: *For new actuators (index **01**) new switchover and connecting plates can only be used. Old and new plates are not interchangeable.*			
Connection block required for 240, 350 and 700 cm^2 actuators (including seals and fastening screw)		G 1/4	1400-8811
		1/4 NPT	1400-8812
Table 3	Actuator size cm^2	Material	Order no.
Required tubes including fittings	240	Steel	1400-6444
	240	Stainless steel	1400-6445
For actuator:	350	Steel	1400-6446
actuator stem retracts or	350	Stainless steel	1400-6447
for filling top diaphragm chamber	700	Steel	1400-6448
	700	Stainless steel	1400-6449
Accessories	Press. gauge mounting kit for supply air and signal pressure	St. steel/brass: 1400-6957	St. steel/St. steel: 1400-6958
	Signal pressure throttles (screw-in type and brass throttle)		1400-6964
	Filter check valve, replaces vent plug and increases the degree of protecton to IP 65 (one included with the delivered positioner)		1790-7408

2.2 Attachment acc. to IEC 60534-6

The positioner is attached according to NAMUR as shown in Fig. 4 using an adapter housing. The valve travel is transmitted via the lever (18) and the shaft (25) to the bracket (28) in the adapter housing and then to the coupling pin (27) located on the lever of the positioner.
To attach the positioner, you will require the mounting parts listed in Table 4. Which lever should be used depends on the rated valve travel.
The positioner must be attached to the adapter housing with the **arrow** on the black case cover pointing **away from the diaphragm actuator** towards the valve.
Exception: Control valves in which the plug closes the seat area when the actuator stem retracts. In this case, the arrow must point towards the diaphragm actuator.

If the adapter housing cannot be mounted **between** the actuator and valve (e.g. because the actuator is from another manufacturer), the **arrow** on the case cover must point towards the valve!

Note!
For faster control valves with a transit time less than 0.6 seconds, replace the filter in the signal pressure output (output 38) with a screw-in throttle (see Accessories table).

2.2.1 Mounting sequence

Refer to Tables 4 and 5 on page 16 for required mounting parts.

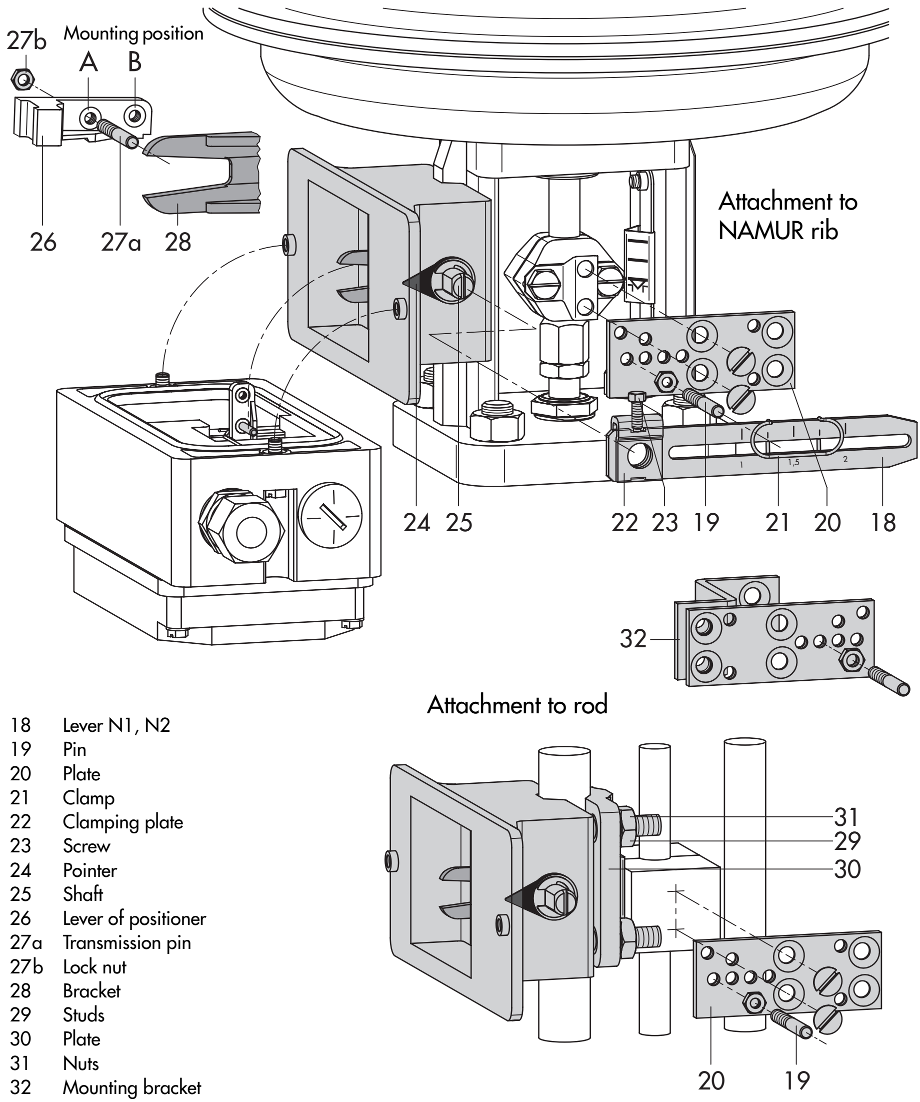
Note!
Prior to mounting the parts, apply signal pressure to the actuator so that the valve is set to 50 % of its travel. This is the only way to make sure that the lever (18) and bracket (28) are exactly aligned.

Control valve with cast yoke

1. Use countersunk screws to fix the plate (20) to the coupling which connects the plug stem and actuator stem. With actuators 2100 and 2800 cm^2, use additional mounting bracket (32).
2. Remove rubber plug from the adapter housing and fasten the housing to the NAMUR rib with hexagon head screw.

Control valve with rod-type yoke

1. Screw plate (20) to the follower clamp of the plug stem.
2. Screw the studs (29) into the adapter housing.
3. Place the housing with the plate (30) on either the right or left side of the valve stem and fasten tight using the nuts (31). On doing so, make sure the housing is aligned at a height which will still allow the lever (18) to be attached horizontally.
4. Screw the pin (19) into the center row of holes in the plate (20) and lock into place so that it is located approximately above the correct lever marking (1 to 2)



18 Lever N1, N2
19 Pin
20 Plate
21 Clamp
22 Clamping plate
23 Screw
24 Pointer
25 Shaft
26 Lever of positioner
27a Transmission pin
27b Lock nut
28 Bracket
29 Studs
30 Plate
31 Nuts
32 Mounting bracket

Fig. 4 · Attachment according to IEC 60534-6 (NAMUR) for the assigned travel, see Table 5. Intermediate values must be calculated. Move the clamp (21) beforehand to clasp the pin.

5. Measure the distance from the middle of the shaft (25) to the middle of the pin (19). This value must be entered later when the positioner is being configured.

2.2.2 Presetting the valve travel

1. Adjust the shaft (25) in the adapter housing so that the black pointer (24) is aligned with the casted marking on the adapter housing.
2. Screw the clamping plate (22) tight in this position using the screw (23).
3. Screw the coupling pin (27) into the positioner lever (26) on the side with the

Table 4 Attach. acc. to IEC 60534-6	Control valve		Travel in mm	With lever	Order no.
NAMUR mounting kit See Fig. 4 for parts	Valve with cast yoke		7.5 to 60	N1 (125 mm)	1400-6787
			30 to 120	N2 (212 mm)	1400-6789
	Valve with rod-type yoke with rod diameter in mm	20 to 25		N1	1400-6436
		20 to 25		N2	1400-6437
		25 to 30		N1	1400-6438
		25 to 30		N2	1400-6439
		30 to 35		N1	1400-6440
		30 to 35		N2	1400-6441
Attachment to Fisher and Masoneilan linear actuators (one each of both mounting kits is needed per one actuator)					1400-6771 and 1400-6787
Accessories	Press. gauge mounting block	G 1/4:	1400-7458	1/4 NPT:	1400-7459
	Pressure gauge set	St. st./brass:	1400-6957	St. st./St. st.:	1400-6958
	Signal pressure throttles (screw-in type and brass throttle)				1400-6964
	Filter check valve, replaces vent plug and increases the degree of protection to IP 65 (one included with the delivered positioner)				1790-7408

Table 5 Attachment according to IEC 60534-6										
Travel mm *)	7.5	15	15	30	30	60	30	60	60	120
Pin on mark *)	1		1	2	1	2	1	2	1	2
Corresp. distance: pin/lever pivot	42		42	84	42	84	84	168	84	168
With lever	N1 (125 mm in length)						N2 (212 mm in length)			
Transmission pin (27) at position	A		A		B		A		B	

*) Deviating travels (intermediate values) must be calculated accordingly

insert nuts and secure the pin on the other side with a hex nut. Observe the mounting position **A** or **B** explained in Table 5 and Fig. 4.

4. Place the positioner onto the adapter housing, making sure the coupling pin (27) is positioned within the arms of the bracket (28).
   To do so, insert a 2.5 mm Allen key or a screwdriver from the front into the bore located below the oblong hole on the cover plate, and push the positioner lever into the required position.
5. Screw positioner to the adapter housing.
6. Relieve signal pressure from the actuator.

2.3 Attachment to rotary actuators

The positioner can also be attached to rotary actuators in accordance with VDI/VDE 3845 by using the mounting parts and accessories listed in Table 6. In this arrangement, the actuator's rotary motion is converted via the cam disk of the actuator stem and the feeler roll of the positioner lever into a linear motion which is required for the inductive displacement sensor.
Each cam disk has two curves for the ranges of rotational angle from 0 to 90° and 0 to 120°.

For double-acting, springless rotary actuators, a reversing amplifier must be attached

Table 6 Rotary actuators (Complete mounting parts, but without cam disks)						
SAMSON Type 3278 Actuator			Attachmt. acc. to VDI/VDE 3845	Attachment to Masoneilan actuator		
	Actuator 160 cm^2	Actuator 320 cm2		Camflex I DN 25 ...100	Camflex I DN 125...250	Camflex II
	Order no.					
	1400-7103	1400-7104	1400-7105	1400-7118	1400-7119	1400-7120
Piping kit 8 x 1 stainl. steel						
G	1400-6670	1400-6672				
NPT	1400-6669	1400-6671				

Accessories	Order no.	
Reversing amplifier for double-acting actuators without springs	G: 1079-1118	NPT: 1079-1119
Cam disk (0050-0089) with accessories, angle of rotation 0 to 90° and 0 to 120°	1400-6959	
Cam disk (0050-0089) specially for VETEC, adjustable per software from 0 to 75°	1400-6960	
Cam disk (0050-0090) specially for Camflex, adjustable per software from 0 to 50°	1400-6961	
Pressure gauge mounting block	G 1/4: 1400-7458; 1/4 NPT: 1400-7459	
Pressure gauge set	St. steel/Brass: 1400-6957	St. steel/St. steel: 1400-6958
Signal pressure throttles (screw-in type and brass throttle)	1400-6964	
Filter check valve, replaces vent plug and increases the degree of protection to IP 65 (one included with the delivered positioner)	1790-7408	

to the positioner housing on the side where it is connected to the actuator (see section 2.3.4).

If the positioner is attached to a SAMSON Type 3278 Rotary Actuator, the air exhausted from the positioner is admitted to the inside of the actuator without any additional tubing.
If the positioner is attached to actuators from other manufacturers (NAMUR), the air is applied to the diaphragm chamber through a tube with a tee connecting the actuator and the exhaust connection of the intermediate piece.

Note!
For faster control valves with a transit time less than 0.6 seconds, replace the filter in the signal pressure output (output 38) with a screw-in throttle (see Accessories Table 6).

2.3.1 Mounting the lever with feeler roll

1. Place lever with attached feeler roll (35) on the transmission lever (37) and secure it with the supplied screws (38) and washers.

2.3.2 Mounting the intermediate piece

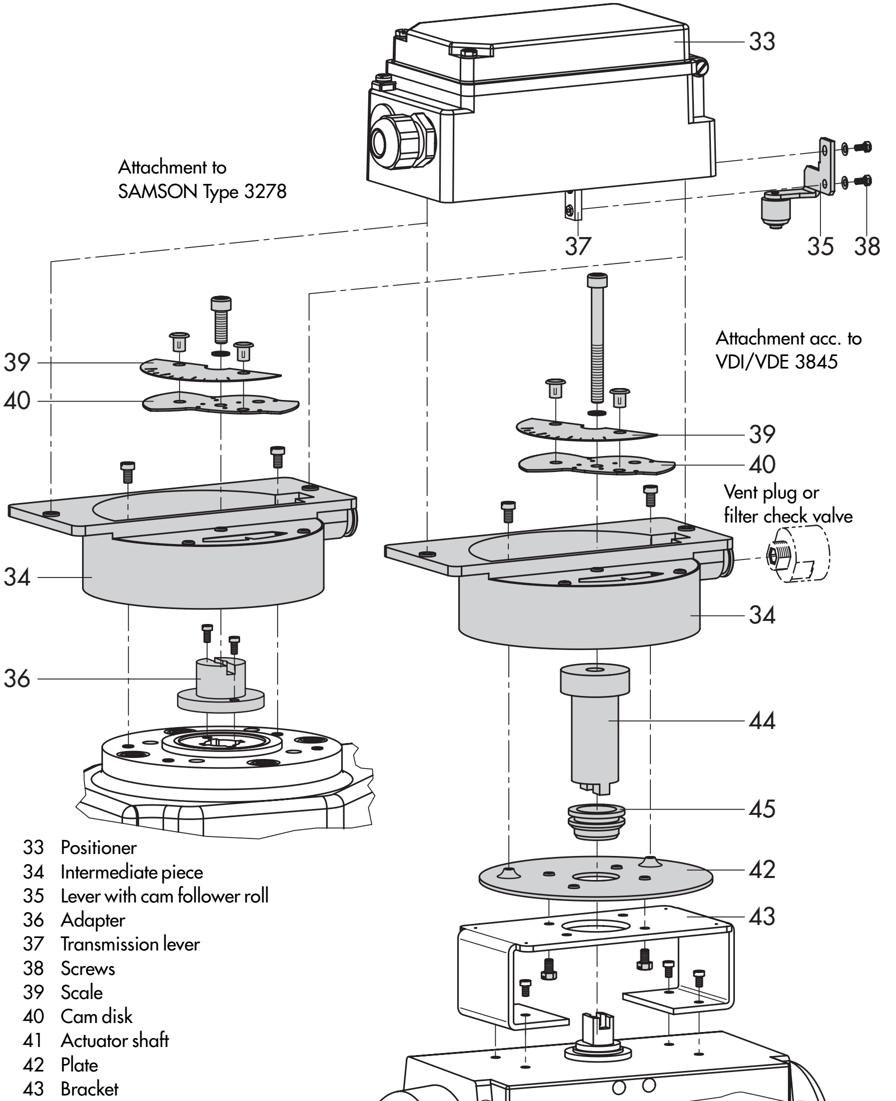
SAMSON Type 3278 Actuator:

1. Screw adapter (36) to the free end of the rotary actuator shaft, using two screws.
2. Position intermediate piece (34) on the actuator housing and secure it with two screws. Align the intermediate piece so that the air connections of the positioner face the side of the diaphragm case.

Actuators according to VDI/VDE 3845

1. Place the whole intermediate piece (34, 42, 44 and 45) onto the bracket included in the delivery scope of the actuator (fixing level 1 VDI/VDE 3845) and secure with screws.
2. Align the cam disk (40) and scale (39) as described in section 2.3.3 and screw tight.

With springless actuators, the reversing amplifier must be screwed to the side of the positioner case. See section 2.3.4.



33 Positioner
34 Intermediate piece
35 Lever with cam follower roll
36 Adapter
37 Transmission lever
38 Screws
39 Scale
40 Cam disk
41 Actuator shaft
42 Plate
43 Bracket
44 Coupling
45 Seal

Fig. 5 · Attachment to rotary actuators

2.3.3 Aligning and mounting the cam disk

In rotary actuators with spring-return mechanism, the actuator springs determine the fail-safe position and the direction of rotation of the control valve.
With double-acting, springless rotary actuators, the direction of rotation depends on both the actuator and valve version used. The initial position is always based on a closed valve!

Whether the control valve should open or close when the reference variable increases must be set in the software (direction of action increasing/increasing or increasing/decreasing).

1. Place the cam disk with scale on the adapter (36) or coupling (34), and fasten the screws loosely at first.

The cam disk has two cam sections. The starting point of each section is marked by a small hole.

Note!
When the valve is closed, the starting point (hole) of the disk must be aligned so that the pivot of the cam disk, the 0° position of the scale and the arrow mark on the viewing window are in one line.
The starting point for the closed valve position should never be below the 0° position!

In actuators with fail-safe position "valve OPEN", the maximum signal pressure must be applied to the actuator prior to aligning the cam disk.
In springless actuators, the supply air must be connected.

---

2. On aligning the cam disk, clip on the double-sided scale disk so that the scale matches the direction of rotation of the control valve. Only then secure the cam disk with the fastening screws.

Securing the aligned cam disk

If you want to additionally secure the cam disk to prevent it from being turned, proceed as follows:

There are four holes arranged around the center hole on the cam disk. Select a suitable hole from the four holes to secure the cam disk.
Drill a hole in the adapter (36) or coupling (44) through the hole chosen and insert a 2 mm dowel pin.

3. Attach the positioner to the intermediate piece (34) so that the lever (35) touches the cam disk with its feeler roll.
   To do so, insert a 2.5 mm Allen key or screwdriver from the front into the bore hole located below an oblong hole in the cover plate and bring the positioner lever in the required position.
4. Screw positioner to the intermediate piece.

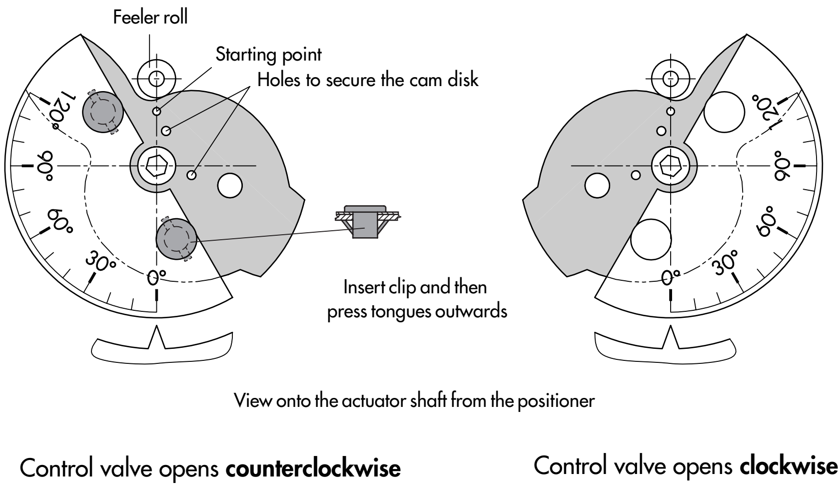


Fig. 6 · Aligning the cam disk

2.3.4 Reversing amplifier for double-acting actuators

For the use with double-acting actuators, the positioner must be fitted with a reversing amplifier.
The reversing amplifier is listed as an accessory in the Table 6 on page 17.

The output signal pressure of the positioner is supplied at the output A_1 of the reversing amplifier. An opposing pressure, which equals the required supply pressure when added to the pressure at A_1, is applied at output A_2. The rule $A_1 + A_2 = Z$ applies.

Mounting

Note!
Prior to mounting the reversing amplifier, remove the sealing plug (1.5). The rubber seal (1.4) must be remain attached.

1. Thread the special nuts (1.3) from the accessories of the reversing amplifier into the threaded ports of the positioner.
2. Insert the gasket (1.2) into the recess of the reversing amplifier and push both the hollowed special screws (1.1) into the connecting ports A1 and Z.
3. Place the reversing amplifier onto the positioner and screw tight using both the special screws (1.1).

Signal pressure connections

A_1 : Output A_1 leading to the signal pressure connection at the actuator which opens the valve when the pressure increases

A_2 : Output A_2 leading to the signal pressure connection at the actuator which closes the valve when the pressure increases

- Enter the actuator as "Double-acting without spring-return mechanism" in the user interface software under Start-up → Type of actuator.

2.4 Fail-safe action of the actuator

Note!
If the fail-safe action of the actuator is changed subsequently by converting the actuator springs from "actuator stem extends" to "actuator stem retracts", the mechanical zero must be recalibrated and the positioner reinitialized.

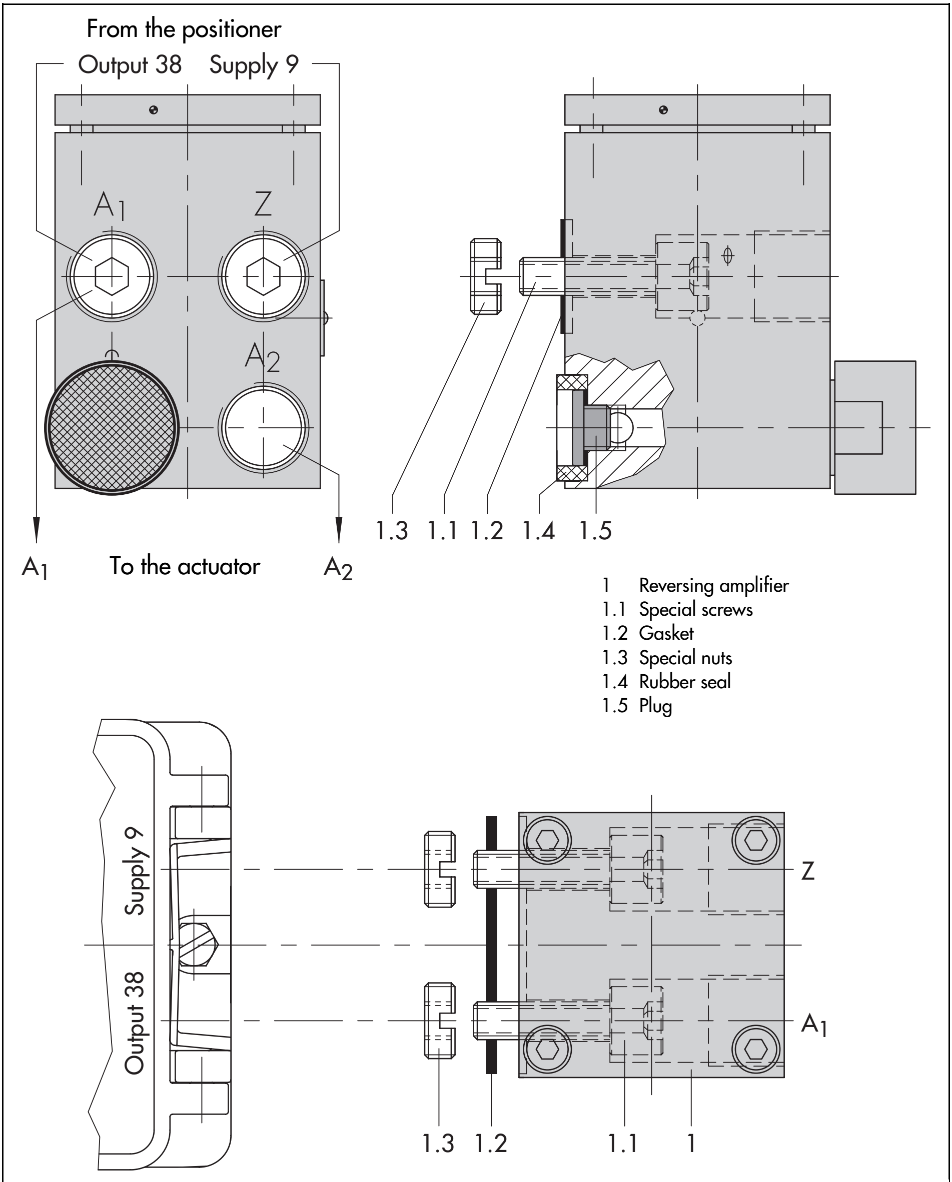


Fig. 7 · Mounting a reversing amplifier

3 Connections

3.1 Pneumatic connections

The air connections are either 1/4 NPT or G 1/4 tapped holes. Customary fittings for metal and copper pipes or plastic tubes can be used.

Note!
The supply air must be dry and free from oil and dust. Observe the maintenance instructions for upstream pressure reducing stations. Carefully purge all tubes before connecting them.

If the positoner is attached directly to Type 3277 Actuator, the connection for the signal pressure is fixed. For NAMUR attachment, the signal pressure can be applied to either the top or bottom diaphragm chamber depending on the fail-safe position "actuator stem extends or retracts".

Exhaust air: The exhaust air connection of the positioner is included in the mounting parts. For direct attachment of the positioner, there is a vent plug on the plastic cover of the actuator. For NAMUR attachment, this plug is on the adapter housing and for attachment to rotary valves, it is on the intermediate piece or reversing amplifier.

3.1.1 Pressure gauge

We recommend mounting pressure gauges for supply air and signal pressure to monitor the positioner. The parts are listed as accessories in Tables 3, 4 and 6.

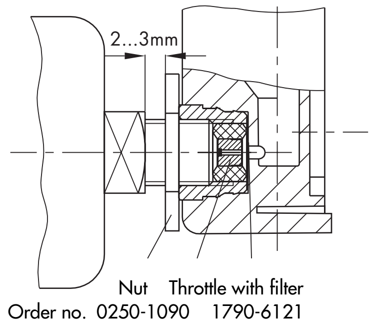


Fig. 8 · Mounting the pressure gauge

3.1.2 Supply air pressure

The required supply air pressure depends on the bench range and the operating direction (fail-safe position) of the actuator.
The bench range is mentioned on the nameplate as spring range or signal pressure range.

Actuator stem extends:
Required supply air pressure =
Upper bench range value + 0.2 bar,
min. 1.4 bar.

Actuator stem retracts:
The required supply air pressure for tight-closing valves is calculated from the maximum signal pressure pst_{max}

$$pst_{max} = F + \frac{d^2 \cdot \pi \cdot \Delta p}{4 \cdot A} \quad [bar]$$

d = Seat diameter [cm]
Δp = Differential pressure across the valve [bar]
A = Actuator area [cm^2]
F = Upper bench range value of the actuator [bar]

If there are no specifications, calculate as follows:
Required supply air pressure = Upper bench range value + 1 bar

3.2 Electrical connections

As far as the electrical installation of the device is concerned, the relevant national regulations governing the installation of electrical equipment and the national accident prevention regulations of the country of destination must be adhered to.
In Germany, these are the VDE regulations and accident prevention regulations of the employer's liability insurance.
For installation in hazardous areas, the following standards apply: EN 60079-14: 1997; VDE 0165 Part 1/8.98 "Electrical apparatus for explosive gas areas" and EN 50281-1-2: VDE 0165 Part 2/11.99 "Electrical apparatus for use in the presence of combustible dust".
For intrinsically safe electrical apparatus that are certified according to the Directive 79/196/EEC, the data specified in the certificate of conformity apply for connection of intrinsically safe circuits.
For intrinsically safe electrical apparatus that are certified according to the Directive 94/9/EC, the data specified in the EC type examination certificate apply for connection of intrinsically safe circuits.
***Note:** It is absolutely necessary to keep to the terminal plan specified in the certificate. Reversal of the electrical connections may cause the explosion protection to be ineffective!*
Do not tamper with any painted screws inside or on the case.

Note on the selection of cables and wires:
To run several intrinsically safe circuits in a multicore cable, note section 12 of EN 60079-14; VDE 0165/8.98.
In particular, the radial thickness of commonly used materials, e.g. polyethylene, for the conductor insulation must be at least 0.2 mm.
The diameter of a single wire in a flexible conductor should not be smaller than 0.1 mm.
The conductor ends must be protected against unlaying, e.g. by using wire end ferrules. If the positioner is connected via 2 separate cables, an additional cable gland can be mounted. Any unused cable entries should be sealed with caps.
Positioners used down to temperatures of –40 °C must have metal cable glands.

The terminal assignment can be found in Fig. 9 as well as on the labels on the cover plate of the positioner case.

Bus line

The shielded fieldbus connecting cable must be routed over the EMI-proof brass cable gland (standard) of the positioner to the terminals. The shield which is placed over the clamping insert is connected over a large area to the gland and housing.

- To connect the bus line, loosen the coupling nut and the clamping insert from the positioner and remove the dust cap.
- Slide the coupling nut and clamping insert over the connecting cable.
- Insulate the end of the bus line to the required connecting length and cut the wire shield off up to a length of approx. 13 mm. If necessary, cut off any cable core filling as well.
- Disentangle the braided shield and pull it over the clamping insert.
- Press the clamping insert into the connecting screw gland and screw tight the coupling nut until the connecting cable is clamped tight.
- Route the two-wire bus line to the screw terminals marked "EN 61158-2", whereby no polarity has to be observed.

In exceptional cases, when the plant may not allow such a connection, feed the cable shield through the cable gland and connect it to be capacitive over the terminal "S". However, make sure that a conducting connection cannot occur from the shield to the cable gland or housing.

Note!
The connection of limit switches, binary input and forced venting function requires an additional cable gland that must replace the cap fitted on the housing.
Accessories: *Cable gland M20 x 1.5, nickel-plated brass, order no. 8808-0143*

Limit switches

For operation of the limit switches, switching amplifiers have to be connected in the output circuit. Their function is to control the limit values of the control circuit according to NAMUR, thus ensuring operational reliability of the positioner.
If the positioner is installed in hazardous areas, the relevant regulations must be observed.

Binary input

A passive floating contact can be used at the binary input. The positioner signals the status over the bus protocol.

Forced venting

For the positioners with forced venting function, a voltage between 6 and 24 V DC must be connected to the terminals 81 and 82.

Note!
If there is no voltage connected or the voltage drops, the positioner vents the actuator and does not respond to the reference variable.

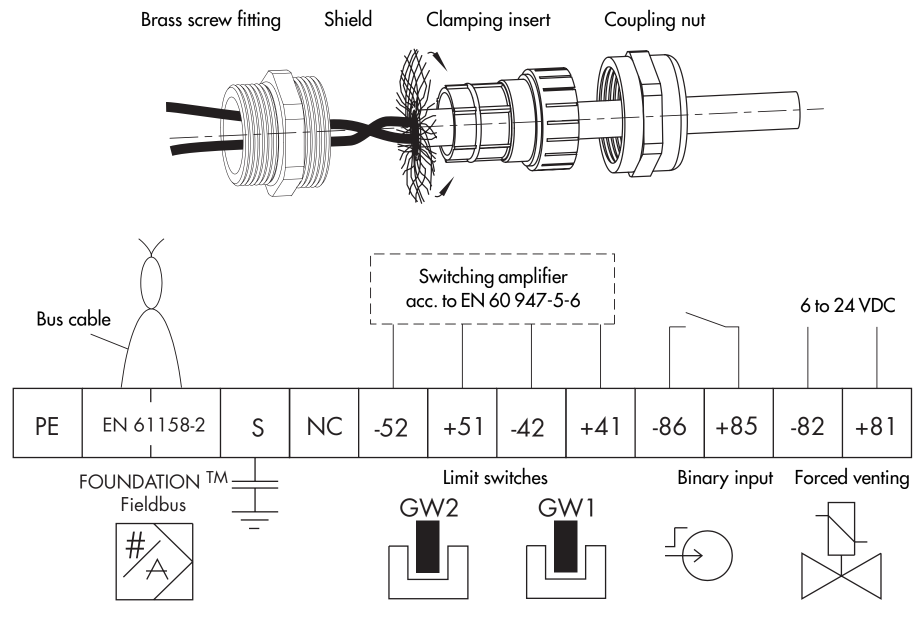


Fig. 9 · Bus line connection and terminal assignment (terminal markings according to DIN 45140)

3.2.1 Establishing communication

Communication between positioner, programmable logic controller or automation system or between PC and workstation and positioner(s) is established in accordance with EN 61158-2.

If positioners are used in hazardous areas, ex-barriers must be used.

A maximum of 32 control valves can be operated in one segment. The number of positioners that can be connected is reduced when they are used in hazardous areas.

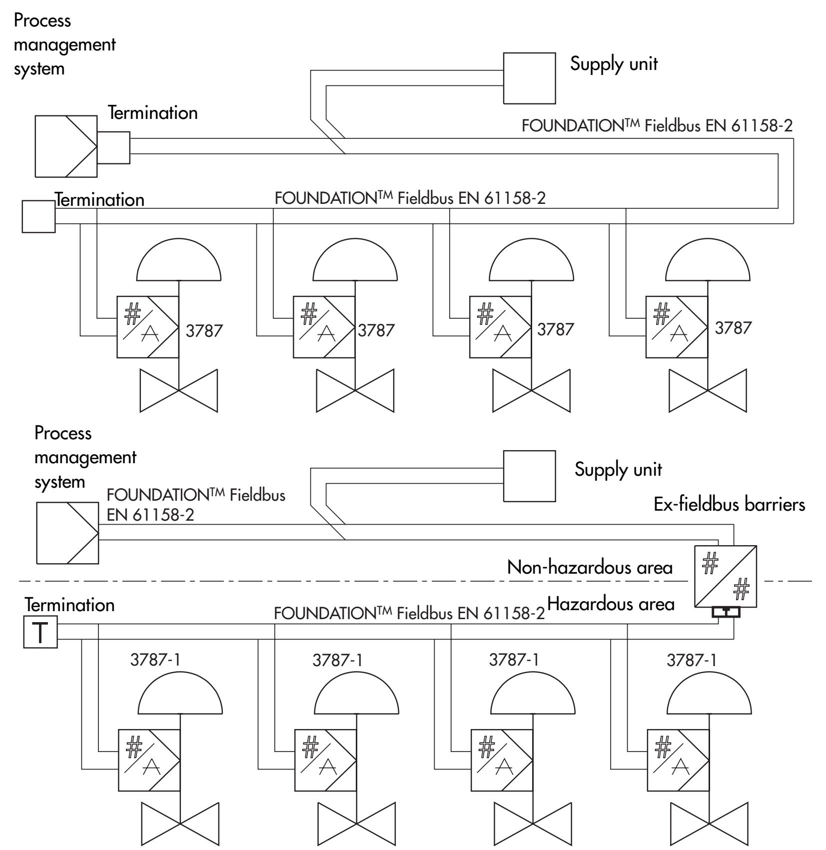


Fig. 10 · FOUNDATIONTM Fieldbus connection, for non-hazardous areas (top) and for hazardous areas (bottom)

4 Operation

Warning!
Before you take the control valve into operation, carefully move the control valve to its end position by covering the hole (manual operation) on the cover plate (Fig. 11). On doing so, check whether the lever mechanism works properly. If the maximum angle of rotation is exceeded because the wrong lever mechanism has been selected or incorrectly sized, the positioner may be ruined.

4.1 LEDs

There are two LEDs located inside the cover used to monitor the positioner during start-up, operation and to indicate possible faults.

General meaning of LEDs:

Red Device start-up or error, no control operation possible

Green No error detected, control operation or fail-safe position (e.g. if not initialized)

Red and green Error detected, control operation possible

See table below for detailed description.

Description	LED
Device start-up:	Red on
No error detected: Device connected to bus, cold start completed, initialization required Initialization or zero calibration running Device is initialized, no valid set point Device is initialized, valid set point, control operation	Green, generally Green blinks slowly Green blinks quickly Green blinks 3x quickly + long interval Green on
Error in the control loop: Zero point error Control loop fault	Red and green Red and green blink slowly Red and green blink quickly
Error leading to first initialization being cancelled (Device does not go to standard operation) Zero point error Mechanics/pneumatics failure Control loop fault	Red, generally Red blinks slowly Red on Red blinks quickly
Device errors causing the control operation to be left Device has detected an internal fault	 Red blinks 3x quickly + long interval

4.2 Write protection and simulation switches

There are two microswitches inside the hinged cover to activate the write protection and enable simulation.

When the write protection switch is ON, the configuration data of the positioner are write-protected and cannot be overwritten. The switch must be set to OFF before any configuration data can be changed over the communications.

The simulation switch enables the simulation of the position value for Analog Output Function Block using the Simulate parameter.

4.3 Activate/deactivate forced venting function

For models with index .0**3** or higher:

1. Remove cover plate on the inside of the positioner lid by unscrewing the four screws.
2. Unscrew the central screw on the board and push the board to one side.
3. Set switch to desired position:
   1 ENABLED > Function activated
   2 DISABLED > Function deactivated.

4.4 Default setting

All parameters are set to default values. See chapter 7 on description of parameters.

Note!
Manual operation and activated final position functions can cause the actuator to filled with the maximum supply pressure. Should this lead to impermissible forces occurring, the supply pressure must be restricted by a reducing station.

4.4.1 Adjusting mechanical zero

Note!
Zero must be calibrated when the valve is closed (with actuator stem extended in three-way valves).

- Firmly push the zero switch, located on the cover plate inside the positioner, in the direction indicated by the arrow as far as it will go once. The yellow pointer will then be aligned with the white line.

For control valves which are open in their initial position, e.g. when the actuator’s fail-safe position is "actuator stem retracts", the positioner must be first supplied with air. The manual operation function must then be activated so that the supply pressure builds up and moves the valve to the closed position. Then press the zero switch.

4.4.2 Initialization

After connecting the supply air and electrical connections to the bus cable, initialization must be started. During initialization, the positioner adapts itself optimally to the friction conditions and signal pressure requirements of the control valve.

Caution!
Initialization takes several minutes to complete. During this time, the control valve moves. Therefore, never initialize while a process is running, but only during the start-up phase when the shut-off valves in the plant section are closed. Alternatively, remove the control valve with positioner from the plant and initialize on a test bench.

- Enter data on valve and actuator under "Start-up" in the operating software.
- Set "Type of initialization" to "Rated range", select "Maximum range" only for three-way valves.
- Start initialization.

A successful initialization is indicated in the operating software and over the LEDs (see chapter 4.1).

- Carry out the configuration suitable for the valve type.

The following setting is recommended:

- **Fail-safe position "Actuator stem extends":**
  Direction of action: increasing/increasing (>>), the globe valve opens with increasing reference variable
  Final position at a reference variable less than 1% (tight closing),

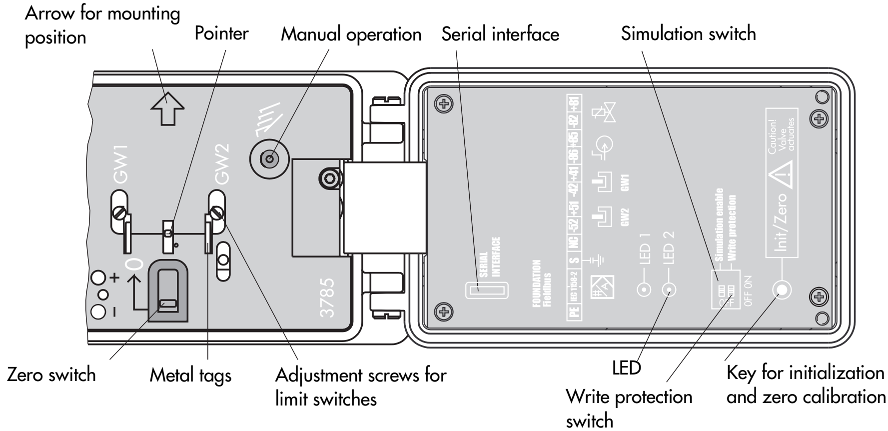


Fig. 11 · View of the positioner cover open

Final position at a reference variable larger than 125 % (function deactivated).

- **Fail-safe position "Actuator stem retracts":**
  Direction of action: increasing/decreasing (<>), the globe valve closes with increasing reference variable
  Final position at a reference variable less than –2.5% (function deactivated),
  Final position at a reference variable larger than 99 % (tight closing).
- Set delay time to 30 s at the minimum.
- Enter tag reference.
- If necessary, other configuration, e.g. special characteristics for rotary valves.

If there is **no communication** set up on the valve, initialization directly at the valve is also possible.

- Connect positioners that are not mounted on a valve to a power supply and initialize the positioner as described in chapter 4.4.2.
  If communication is not possible, the default setting must be used.
- Mount positioner and set the mechanical zero as described in chapter 4.4.1.

Start initialization by pressing the **Init/Zero** key on the positioner case cover using a suitable tool.

The initialization is completed when the positioner takes on the position predetermined by the reference variable.

Note!
After the positioner has been initialized successfully for the first time, pressing the ***Init/Zero*** *key subsequently only starts a zero calibration.*

A new initialization routine can only be started after this when the communication is connected.

A completed initialization can be cancelled via the communication with the command "Reset to default values". After this, the Init/Zero key can be pressed to start a complete initialization.

Electric zero calibration

If, during the valve's operation, the mechanical zero has shifted, an electric zero calibration can be carried out. To do this, press the Init/Zero key located on the inside of the cover (Fig. 11).

Caution!
The control valve moves to its final position.

- Firmly press the zero switch, located on the cover plate of the positioner, in the direction indicated by the arrow as far as it will go once. The yellow pointer will then be aligned with the white line.
- Press the key again to start the electric calibration.

After the key is pressed twice, it is locked for approximately one minute!
The electric calibration has been completed when the positioner takes on the position predetermined by the reference variable.

4.5 Operation via TROVIS-VIEW

In addition to using the fieldbus configuration or operating system via fieldbus communication, the positioner can also be operated with SAMSON's TROVIS-VIEW user interface via the serial port integrated in the device.

You can configure all the parameters using the device module intended for the TROVIS-VIEW software.

For connection of the positioner to the serial port of the PC, you will need an adapter (order no. 1400-7700).

You can either connect the power supply to the device using a fieldbus segment, or by connecting a voltage source (9 to 32 V) to the bus terminals on the device.

When the device is connected to a Foundation Fieldbus bus segment, you can simultaneously operate TROVIS-VIEW and the fieldbus system without any restrictions.

4.5.1 Initialization

When you initialize the device via the fieldbus system or TROVIS-VIEW, the initialization routine is started over the parameter SELF_CALIB_CMD.

You can select an initialization routine based on either the nominal range or maximum range by setting the parameter INIT_METHOD accordingly.

During initialization based on nominal range, the following parameters must be set:

- VALVE_TYPE
  Option: Rotary or linear actuator
- MOUNTING_POSITION
  Positioner alignment to actuator (for linear actuator).
- ATTACHMENT
  Defines the attachment of the positioner (Select: Namur/integrated).
- RATED_TRAVEL
  Rated travel or nominal angle of the valve
- ACTUATOR_VERSION
  Determines whether the actuator is single acting or double acting.

Options for linear actuator with NAMUR attachment:

- TRANSM_LENGTH
  Specifies the length of the lever
- TRANSM_PIN_POS
  Specifies the position of the pin on the lever.

Options for linear actuator with integrated attachment:

- TRANSM_CODE
  Determines the size of the travel pick-off for integrated attachment.

Options for rotary actuator:

- TRANSM_CODE
  Determines the cam disk used.

During initialization, the following parameters are determined:

- ACT_FAIL_ACTION
  Fail-safe action of the actuator when the supply air fails.
- ACT_STROKE_TIME_DEC
  Minimum transit time to CLOSED position
- ACT_STROKE_TIME_INC
  Minimum transit time to OPEN position

- MAX_HUB
  Maximum travel/angle of rotation in percent of the rated travel/nominal angle.

The integrated LEDs and the parameters

- SELF_CALIB_STATUS
- SELF_CALIB_WARNUNG

indicate if the initialization has been successfully completed or whether errors have occurred.

4.5.2 Testing the control valve

Upon successful initialization, you can easily test the control valve using TROVIS-VIEW software. This function allows you to run the valve for test purposes without the use of a complex fieldbus system and without requiring knowledge about the function blocks and their configuration.

Proceed as follows:

1. **Set the Transducer Block to "Local override" mode:**
   In the menu "Positioner-> Operating mode TRD" under "Required operating mode" select "Local override (LO)".
   Deactivate the option "Fail safe position (O/S)".
2. **Defining a positioning value:**
   In the menu "Positioner-> Process data", you can select a positioning value for the valve over "Positioning value TRD" (FINAL_VALUE).
   Note that the status of the positioning value must be set to "Good".
   The position feedback can be retrieved via "Current valve position" (FINAL_POSITION_VALUE).
3. **Set the Transducer Block to the "Auto" mode.**
   In the menu "Positioner-> Operating mode TRD" under "Required operating mode" select "Automatic (AUTO)".
   Deactivate the option "Local override (LO)".

4.6 Setting the inductive limit switches

The positioner version with inductive limit switches has two adjustable tags that are mounted on the shaft of the positioner lever and operate the associated proximity switches.
For operation of the inductive limit switches, the corresponding switching amplifiers have to be connected to the output. If the tag is in the inductive field of the switch, the switch assumes a high resistance. If the tag is out of the field, the switch assumes a low resistance.
Normally, the limit switches are adjusted such that they will provide a signal in both end positions of the valve. These switches, however, can also be adjusted to indicate intermediate valve positions.
The desired switching function, i.e. whether the output relay shall be picked up or released when the tag has entered the field, has to be selected, if necessary, at the switching amplifier.

Adjusting the switching point:
The limit switches are marked GW1 and GW2 on the inside of the case cover. Yellow tags and the associated adjustment screws (Fig. 11) are located below these markings.
Each switching position can optionally be indicated when the tag has entered the field, or when it has left the field.

- Move the valve to the switching position and adjust the tag of the required limit switch GW1 or GW2 by turning the related adjustment screw until the switching point is reached. This is indicated by the LED at the switching amplifier.

In so doing, one edge of the yellow tag will be in alignment with the white, horizontal line on the case cover. This indicates the side from which the tag enters the inductive field of the proximity switch.

To ensure safe switching under any ambient conditions, the switching point should be adjusted to a value of approx. 5% before the mechanical stop (OPEN - CLOSED).

5 Maintenance

The positioner is maintenance-free.
Pneumatic connection 9/Supply contains a sieve with a mesh size of 100 µm. If required, the sieve can be unscrewed and cleaned.

Please also observe the maintenance instructions for upstream pressure reducing stations for supply air, if applicable.

6 Servicing explosion-protected versions

In the event that a positioner's part on which the explosion protection is based must be serviced, the positioner must not be taken into operation again, unless an expert has inspected the device according to the explosion protection requirements, has issued a certificate stating this, or equipped the device with his mark of conformity.

Inspection by an expert does not have to be carried out, if the manufacturer performs a routine check test on the device prior to taking it into operation again, and the success of the routine check test is documented by attaching a mark of conformity to the device.

7 Parameter description

7.1 General

The section is based on:

Fieldbus Foundation Specification "Function Block Application Process Part 1 to 3" Revision 1.4.

Fieldbus Foundation Specification "Transducer Block Application Process Part 1 to 2" Revision PS 3.0.

7.2 Device Description (DD)

The following Device Description files are required for integrating the device described into host systems:

Device Description: < 0201.ffo >, < 0201.sym >

Capabilities File: < 020101.cff >

You can order these Device Description files on disk (3 1/2") from SAMSON under the product number 1400-7705 or you can download them from the Internet at *www.samson.de* or *www.fieldbus.org*.

Note: *The file < Positioner 3787_Rev2.fhx > is required for integration into the System DeltaV from Fisher-Rosemount, instead of the capabilities file from Fieldbus Foundation.*
This file can be provided by SAMSON.

7.3 Notes on the parameters

All times specified in the Resource Block are in 1/32 ms units in accordance with the Fieldbus specification Version 1.4.
In the Device Description Library supplied by the Fieldbus Foundation on which the Device Description of the Type 3787 is based, these parameters are incorrectly shown with the ms unit. The numerical values supplied by the device should, however, always be interpreted as units of 1/32 ms.
Due to the same reason, the IO_OPTS parameter in the AO Block displays "Fault state to value" as "Fault state type".
Several parameters can only be altered in certain modes (see "Access" in Parameter description).
Therefore, it is important that the Target Mode is set and not the Actual Mode.

7.3.1 Legends assigned to the parameters

r	= Read
w	= Write
Index	= Relative index of the parameter in each block
O/S	= Out of Service
MAN	= Manual
AUTO	= Automatic
CAS	= Cascade
RCAS	= Remote Cascade
ROUT	= Remote Output
S	= Static parameter
N	= Non-volatile parameter
D	= Dynamic parameter

7.3.2 Notes on parameter storage classes S, N and D

*Static and non-volatile parameters are stored in the positioner's EEPROM.
If such parameters are changed over acyclic FOUNDATION Fieldbus communication, the changes are saved in the EEPROM.
The number of write accesses granted to the EEPROM is limited due to technical restrictions.
Writing of transducer block parameters is limited to 10,000 accesses. For all other blocks, the limit is 1 million.*

*These access limits must be observed. If they are exceeded, integrity of the stored data and thus the function of the positioner can no longer be guaranteed due to data being overwritten.
Make sure these parameters are not constantly overwritten by acyclic FOUNDATION Fieldbus transfers.*

When transferring data to the positioner using cyclic, scheduled FOUNDATION Fieldbus publishing (Publisher/Subscriber), these data are not saved in the EEPROM.

7.4 Block structure

FOUNDATION Fieldbus assigns all functions and data of a device to three different block types. Each block type has a different area of application.

A FOUNDATION Fieldbus device has the following block types:

- One Resource Block
  The Resource Block contains all the hardware specific characteristics.
- One or more Transducer Blocks
  The Transducer Block contains all the data and device-specific parameters to link the device to the process data (sensor or actuator).
- One or more Function Blocks
  Function Blocks provide generally useable automation functions.
  There are various different types of Function Block, e.g. Analog Input Function Block, Analog Output Function Block, PID Function Block and other input, output and processing blocks.
  Each of these Function Blocks can be used for processing various application functions in the entire automation system.

Various tasks can be solved depending on how individual blocks are arranged and connected.

The SAMSON Type 3787 Foundation Fieldbus Positioner contains the following blocks:

- One Resource Block.
- One Standard Advanced Positioner Valve Transducer Block.
- Two Function Blocks:
  one Analog Output Function Block,
  one PID Function Block.

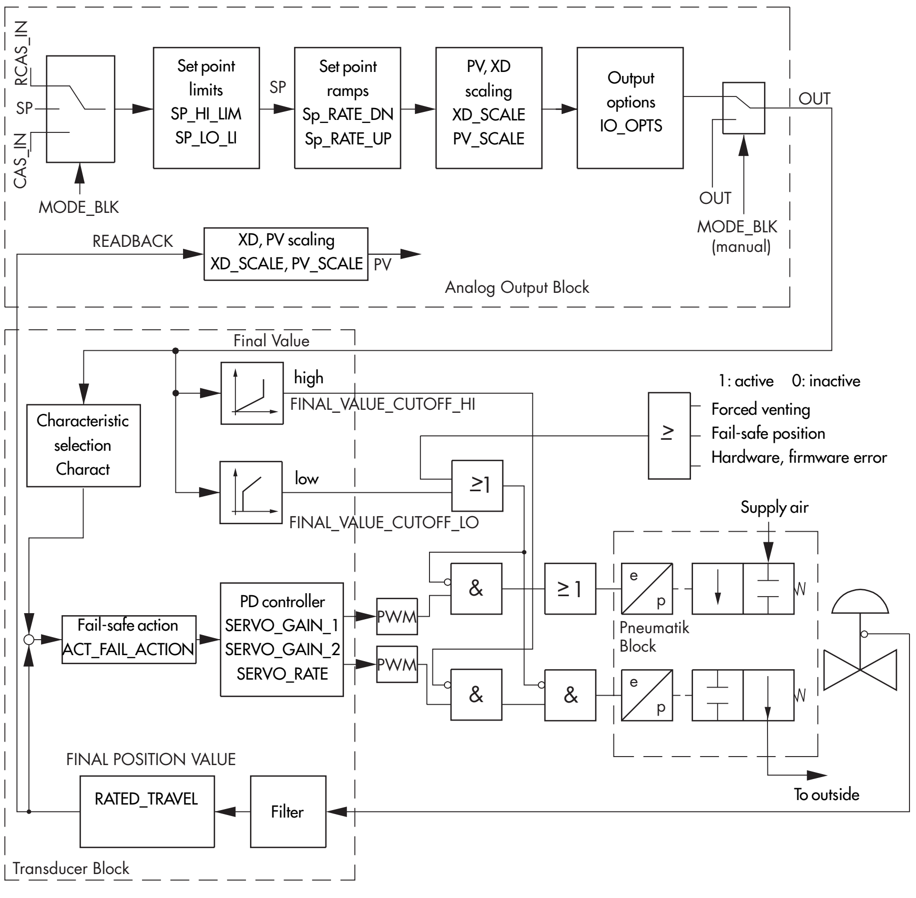


Fig. 12 · Block structure

7.4.1 Resource Block

The Resource Block contains all the data that clearly identifies the device. It is, so to speak, the electronic nameplate of the device.
The Resource Block's parameters include, for example, device type, device name, manufacturer ID, serial number as well as parameters which affect the behavior of all other Blocks in the device.

Parameters of the Resource Block

Storage class:		
ACK_OPTION S Index: 38 Access: r, w Options: Default:	This parameter allows you to choose whether an alarm associated with this block should be automatically acknowledged, i.e. without any influence from fieldbus host system. Undefined DISC ALM BLOCK ALM Undefined Note: The alarm is sent to the fieldbus host system, but it is not acknowledged by it.	 No option Write protection has been changed Block alarm
ALARM_SUM S Index: 37 Access: r, w Display:	Shows current status of process alarms in the Resource Block. DISC ALM BLOCK ALM Note: Additionally, the process alarms can be cleared in this parameter group.	 Write protection has been changed Block alarm
ALERT_KEY S Index: 4 Access: r; w Input: Default:	The identification number of the plant unit. This information may be used in the fieldbus host system for sorting alarms and events. 1...255 0 Note: The value 0 (default) is not a tolerated value and is therefore rejected with an error message when writing to the device.	
BLOCK_ALARM D Index: 36 Access: r; w	Shows the current block status with information about existing configuration, hardware or system errors. Note: Additionally, the active block alarm can be manually acknowledged in this parameter group.	
BLOCK_ERR D Index: 6 Access: r Display:	Shows the active block error. SIMULATE ACTIVE OUT OF SERVICE LOST STATIC DATA DEVICE NEEDS MAINTENANCE SOON	 Simulation possible, Simulation Enable set. The block model is O/S . Data loss in EEPROM (Zero error, control loop disturbed or total valve travel. exceeded). This alert triggers a block alarm (BLOCK_ALM) of the ResourceBlock.

CLR_FSTATE Index: 30 Access: r, w	D	Writing a Clear to this parameter will clear the fault state of the Analog Output Function Block.
CONFIRM_TIME Index: 33 Access: r, w Default:	S	Default of confirmation time for event report. If the device does not receive any confirmation within this time, the event report is sent again. 640000 1/32 ms
CYCLE_TIME Index: 20 Access: r, w Options: Default:	S	Block execution methods predetermined by fieldbus host system. SCHEDULED COMPLETION OF BLOCK EXECUTION SCHEDULED Note: The execution method is selected directly in the fieldbus host system.
CYCLE_TYPE Index: 19 Access: r Display:	S	Shows the block execution methods supported by the device. SCHEDULED COMPLETION OF BLOCK EXECUTION
DD_RESOURCE Index: 9 Access: r	S	Shows the string for the Device Description in the device. Note: If there is not Device Description in the device, "null" appears in the display.
DD_REV Index: 13 Access: r	S	Shows revision number of Device Description.
DESCRIPTOR Index: 46 Access: r, w	S	Description, freely available space for entering text to describe the application, stored in the field device.
DEV_REV Index: 12 Access: r	S	Shows the revision number of the device.
DEV_TYPE Index: 11 Access: r Display:	S	Shows the device type in decimal number format. 1 for Type 3787
DEVICE_ CERTIFICATION Index: 45 Access: r	N	Type of protection, indicates whether Ex approvals for this field device are available.
DEVICE_MESSAGE Index: 47 Access: r, w	N	Message, freely available space for entering text stored in the field device.
DEVICE_ PRODUCT_NUM Index: 48 Access: r	N	Product number of the positioner.

DEVICE_ SER_NUM Index: 44 Access: r	N	Serial number of the device, allows together with MANUFAC_ID and DEV_TYPE the clear identification of the field device.
FAULT_STATE Index: 28 Access: r	N	Shows current status of the fault state of the Analog Output Function Block.
FEATURES Index: 17 Access: r	S	Shows additional functions supported by the device, see FEATURES_SEL.
FEATURES_SEL Index: 18 Access: r, w Options:	S	Used to select the additional functions supported by the device. REPORTS — The fieldbus host system must acknowledge receipt of the event report. HARD W LOCK — Hardware write protection switch is interpreted. FAULTSTATE — Fault state can be initiated (see SET_FSTATE / CLR_FSTATE) OUT READBACK — Current valve position is issued in PV of the Analog Output Function Block (otherwise SP).
FREE_TIME Index: 25 Access: r	D	Shows the free system time (in percent) which is available to process additional function blocks. Note: This parameter is not supported as the function blocks of the Type 3787 are configured invariably.
FREE_SPACE Index: 24 Access: r, w	D	Shows the free memory (in percent) which is available to process additional function blocks. Note: This parameter is not supported as the function blocks of the Type 3787 are configured invariably.
GRANT_DENY Index: 14 Access: r	D	Grant or deny access of host computer to the field device. Note: This parameter is not interpreted by the Type 3787.
HARD_TYPES Index: 15 Access: r, w Display:	S	Shows the types of output signal for the Analog Output Function Block. SCALAR OUTPUT — scalable analog output variable
HW_REVISION Index: 43 Access: r	S	Hardware edition of electronics / mechanics.
ITK_VER Index: 41	S	Version number of the interoperability test system used to certify this device.
LIM_NOTIFY Index: 32 Access: r, w Option: Default:	S	Maximum number of unacknowledged event reports allowed. 0 to 8 8

MANUFAC_ID S Index: 10 Access: r Display:	Shows the manufacturer identification number. 0 x 00E099 = SAMSON AG
MAX_NOTIFY S **Index: 31** **Access:** r Display	Shows the maximum number of unacknowledged event reports possible. 8
MEMORY_SIZE S Index: 22 Access: r	Shows available configuration memory in kilobyte. Note: This parameter is not supported as the function blocks of the Type 3787 are configured as permanent.
MIN_CYCLE_T S **Index: 21** **Access:** r Display:	Shows time duration of the shortest cycle interval of which the device is capable (execution time of the AO Function Block 50 ms). 1600 1/32 ms
MODE_BLK N **Index: 5** **Access:** r, w Display:	Shows the actual, target, permitted and normal modes of the Resource Block. AUTO O/S The Resource Block supports the following modes: AUTO In this mode, the execution of the function blocks is (AO and PID Function Blocks) granted. O/S In this operating mode, the execution of the function blocks is (AO and PID Function Blocks) is stopped. These blocks then go into O/S mode.
NV_CYCLE_T S **Index: 23** **Access:** r	Shows the minimum time interval for copying device data to non-volatile memory. Note: Non-volatile data are saved directly after being transferred in the Type 3787.
RESTART D **Index: 16** **Access:** r, w Option:	Allows a manual restart to be initiated. Several degrees of restart are possible. RUN Standard operation RESOURCE (is not supported) DEFAULTS Device data and connection of the function blocks are reset to the values determined in the specification. PROCESSOR Reset of the device, reboost of the processor.

RS_STATE D **Index: 7** **Access:** r Display:	Shows the actual operating state of the Resource Block. ONLINE Standard operation, the block is in the operating mode AUTO. STANDBY The Resource Block is in the operating mode O/S. ONLINE LINKING The configured links among the function blocks are still not set up.
SET_FSTATE **D** **Index: 29** **Access:** r, w	Allows the Fault State condition of the Analog Output Function Block to be manually initiated by selecting Set.
SHED_RCAS S **Index: 26** **Access:** r, w	Determines monitoring time for checking the link between the fieldbus host system and the PID Block in the RCAS mode. After the monitoring time has elapsed, the PID Block changes from RCAS mode to the mode selected in SHED_OPT.
SHED_ROUT S **Index: 27** **Access:** r, w Default:	Determines monitoring time for checking the link between the fieldbus host system and the PID Block in the ROUT mode. After the monitoring time has elapsed, the PID Block changes from ROUT mode to the mode selected in SHED_OPT. 640000 1/32 ms
SW_REVISION N Index: 42 Access: r	Firmware version (communication/positioner)
STRATEGY S Index: 3 Access: r, w Default:	The strategy field can be used to identify grouping of blocks to allow a faster analysis of the blocks. Enter the same number in the STRATEGY parameter of each block to group blocks. 0 Note: This data is not checked or processed by the Resource Block.
ST_REV N Index: 1 Access: r	Shows the revision level of the static data. Note: The revision level will be incremented each time a static parameter in the block is changed.
TAG_DESC S Index: 2 Access: r, w Default:	For entering a user-specfic text of max. 32 characters to clearly identify and assign the block. No text
TEST_RW D Index: 8 Access: r, w	Note: This parameter is only required for conformity tests and has no meaning in standard operation.
TEXT_INPUT_1 N Index: 50 Access: r, w	Freely available space for entering text
TEXT_INPUT_2 N Index: 51 Access: r, w	Freely available space for entering text

TEXT_INPUT_3 N Index: 52 Access: r,w	Freely available space for entering text.
UPDATE_EVT D Index: 35 Access: r	This alert is generated by any change to the static data, including date and time.
WRITE_ALM D Index: 40 Access: r, w	Shows status of the write protection alarm. Note: This alert is generated if the write lock parameter is cleared. In addition, the active write protection alarm can be manually acknowledged in this parameter group.
WRITE_LOCK S Index: 34 Access: r, w Option:	For hardware write protection: Shows status of the write protection For software write protection: Enable/clear write protection LOCKED NOT LOCKED
WRITE_PRI S Index: 39 Access: r, w Input: Default:	Determines the handling when a write protection alarm is generated (parameter "WRITE_ALM"). 0 The write protection alarm is not interpreted 1 The fieldbus host system is not alerted when a write protection alarm is generated 2 Reserved for block alarms 3...7 The write protection alarm is issued with the corresponding priority (3 = low priority, 7 = high priority) to notify the user. 8...15 The write protection alarm is issued with the corresponding priority (8 = low priority, 15 = high priority) as a critical alarm. 0
WRITE_PROTECT_SWITCH D Index: 49 Access: r	Position of the write protection switch in the device 0 = Not write-protected 1 = Write-protected

7.4.2 Transducer Block

The Transducer Block enables the input and output variables of a function block to be influenced. In this way, measured and control data can be calibrated, characteristics can be linearized or physical variables can be converted with the aid of process data.
Parameters of the Transducer Blocks include, for example, information about the actuator type, attachment, engineering units, start-up, diagnostics as well as device-specific data.
The Standard Advanced Positioner Valve Transducer Block receives a correction value from an upstream connected Analog Output Function Block. This value is used to position a control valve. The Block contains parameters for adaptation to actuator and valve, for start-up and for control valve diagnosis.

Parameters of the Standard Advanced Positioner Valve Transducer Block

This Block contains parameters for descriptions about actuator and valve, to which the positioner is attached. The parameters of this block are used to adapt the positioner to the valve and for start-up and diagnosis of the control valve.

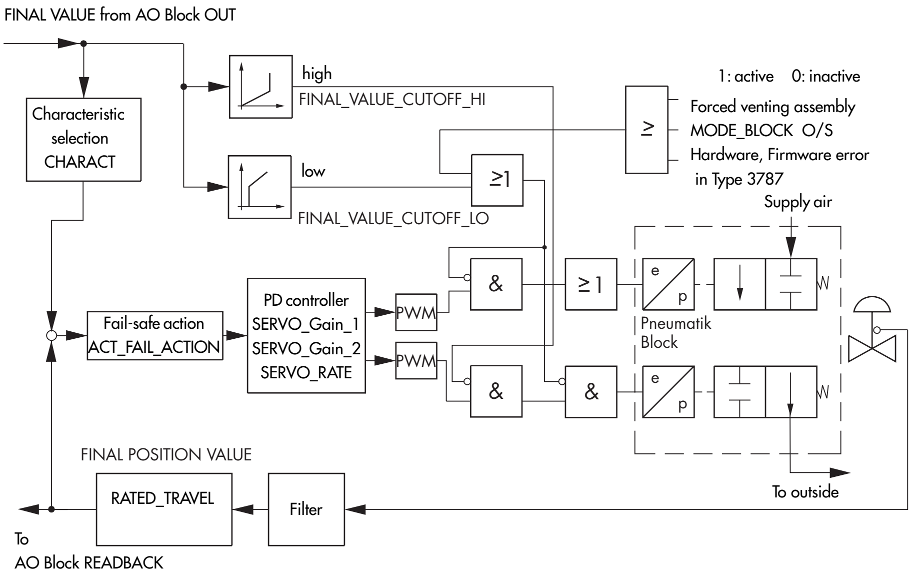


Fig. 13 · Transducer Block

Note:
When initialization based on maximum range (default) is selected, the positioner can be started up directly after being attached to the control valve via the SELF_CALIB_CMD parameter.
The results of the initialization are saved in SELF_CALIB_STATUS. When this type of initialization is used, other parameters in this block generally do not require any adaptation.

ACT_FAIL_ACTION Index: 21 Access: r Display:	S	Fail-safe position of the actuator when the auxiliary power fails. It is determined automatically during initialization. UNINITIALIZED Not initialized, undefined SELF-CLOSING Closing (in direction 0 % position) SELF-OPENING Opening (in direction 100 % position) INDETERMINATE None
ACT_MAN_ID **Index: 22** **Access:** r, w	S	Manufacturer of actuator Clearly identifies the manufacturer of the actuator associated with the positioner.
ACT_MODEL_NUM Index: 23 Access: r, w	S	Type / version of the actuator associated with the positioner.
ACT_SN Index: 24 Access: r,w	S	Serial number of the actuator associated with the positioner.
ACT_STROKE_TIME_DEC Index: 59 Access: r	S	Minimum transit time CLOSED position The minimum transit time CLOSED (in direction 0 % position) is the actual time in seconds which the positioner, actuator and valve need to move through the rated travel/nominal angle to close the valve (measured during initialization).
ACT_STROKE_TIME_INC Index: 60 Access: r	S	Minimum transit time OPEN position The minimum transit time OPEN (in direction 100 % position) is the actual time in seconds which the positioner, actuator and valve need to move through the rated travel/nominal angle to open the valve (measured during initialization).
ACTUATOR_TYPE Index: 46 Access: r Display:	N	Type of actuator associated with the positioner. ELECTRO PNEUMATIC
ACTUATOR_VERSION Index: 48 Access: r, w Input: Default:	S	Actuator design with or without spring-return mechanism. SINGLE ACTING single acting, with spring-return mechanism DOUBLE ACTING double acting, without spring-return mechanism SINGLE ACTING

ALERT_KEY S Index: 4 Access: r, w Input: Default:	The identification number of the plant unit. This information can be used by the fieldbus host system to sort the alarms and events. 1...255 0 Note: The value 0 (default) is not a tolerated value and is therefore rejected with an error message when writing to the device.
ATTACHMENT S Index: 47 Access: r, w Input: Default:	Defines the attachment of the positioner to the control valve (with linear actuator). INTEGRATED Attachment used with SAMSON Type 3277 Actuator. NAMUR Attachment acc. to DIN /IEC 534 (NAMUR). INTEGRATED Note: Only the attachment acc. to VDI /VDE 3845 (NAMUR) is possible with rotary actuators. In this case, the parameter has no effect.
BINARY_INPUT D Index: 41 Access: r Display:	Status of the binary input. NOT ACTIVE ACTIVE NOT EVALUATED
BLOCK_ALARM D Index: 8 Access: r, w	Shows the current block status with information about configuration, hardware and system errors. Note: Additionally, the active block alarm can be manually acknowledged in this parameter group.
BLOCK_ERR D Index: 6 Access: r Display:	Shows active block error. OUT OF SERVICE DEVICE NEEDS MAINTENANCE NOW (electronics defective) DEVICE NEEDS MAINTENANCE SOON (Zero error, control loop distrubed or total valve travel exceeded). LOCAL OVERRIDE Positioning value over TROVIS-VIEW for on-site operation or option forced venting or zero calibration or initialization in progress. INPUT FAILURE Position feedback defective or device not initialized OUTPUT FAILURE Device not initialized MEMORY FAILURE LOST STATIC DATA Checksum error

CHARACT S Index: 42 Access: r, w Input: Default:	Selection of characteristics to assign the correction value to the travel range/angle of rotation. LINEAR EQUAL PERCENTAGE EQUAL PERCENTAGE REVERSE SAMSON BUTTERFLY LINEAR SAMSON BUTTERFLY EQUAL PERCENTAGE VETEC ROTARY LINEAR VETEC ROTARY EQUAL PERCENTAGE LINEAR
COLLECTION_DIRECTORY Index: 12 Access: r	Note: This parameter is not processed in the Type 3787.
DEADBAND S Index: 35 Access: r, w Range: Default:	Dead band in percent of the rated travel /nominal angle. 0.1 ... 10 % 0.5 %
DELAY_TIME S Index: 37 Access: r, w Range: Default:	Reset criteria for running control loop monitoring. If the DELAY_TIME entered is exceeded and the system deviation is not within the TOLERANCE_BAND, a control loop fault is reported. It is determined from the minimum transit time during initialization. 1 ... 240 s 10 s
DEVIATION D Index: 34 Access: r	Deviation of the positioner
FINAL_VALUE N Index: 13 Access: r	This parameter contains the correction value received from the upstream connected Analog Output Function Block.
FINAL_VALUE_CUTOFF_HI S Index: 15 Access: r, w Range: Default:	Final position if the set point exceeds the entered value, the valve is moved towards the final position that corresponds to 100 % of the manipulated variable. This is done by completely venting or filling the actuator (depending on the fail-safe position). 0 ... 125 % 99 % Note: The function is cleared when −2.5 % is entered. Since the actuator is completely filled or vented when this function is activated, the control valve moves to its absolute final position. Limitations in the functions "travel range" or "mechanical limit stops" do not apply here. In case, impermissibly high positioning forces arise due to this, the function must be cleared.

FINAL_VALUE_CUTOFF_LO S Index: 16 Access: r, w Range: Default:	Final position if the set point falls below the entered value, the valve is moved towards the final position that corresponds to 0 % of the manipulated variable. This is done by completely venting or filling the actuator (depending on the fail-safe position). –2.5 ... 100 % 1 % Note: The function is cleared when –2.5 % is entered. Since the actuator is completely filled or vented when this function is activated, the control valve moves to its absolute final position. Limitations in the functions "travel range" or "mechanical limit stops" do not apply here. In case, impermissibly high positioning forces arise due to this, the function must be cleared.
FINAL_VALUE_RANGE S Index: 14 Access: r	This parameter contains the range of the manipulated variable (XD_SCALE) used in the upstream connected Analog Output Function Block.
FINAL_POSITION_VALUE D Index: 17 Access: r	Current valve stem position in the FINAL_VALUE_RANGE unit.
IDENT_BINARY_INPUT N Index: 44 Access: r, w Input: Default:	Describes whether and how the binary input is evaluated: NOT EVALUATED ACTIVELY OPEN ACTIVELY CLOSED NOT EVALUATED
IDENT_FORCED_VENTING N Index: 43 Access: r Display:	Describes whether the option forced venting is activated: NOT IMPLEMENTED Option not granted, input is not evaluated IMPLEMENTED Option granted, input is evaluated
IDENT_LIMIT_SWITCHES N Index: 45 Access: r, w Input: Default:	Describes whether the option including the limit switches is installed. It is not automatically recognized: NOT IMPLEMENTED Not installed IMPLEMENTED Installed Depends on the hardware
INIT_METHOD S Index: 54 Access: r Input: Default:	Initialization method based on maximum range or on nominal range. Only the range of manipulated variables below the rated travel/nominal angle is taken into account on initialization based on nominal range (e.g. globe valve with a mechanical limit stop on one side). The maximum range of manipulated variable is used on initialization based on maximum range (e.g. three-way valves with mechanical limit stops on both sides). MAXIMUM RANGE Initialization based on maximum range NOMINAL RANGE Initialization based on nominal range MAXIMUM RANGE

MAX_HUB N Index: 58 Access: r	Maximum possible travel /angle of rotation Maximum travel/angle of rotation detected during initialization stated in percent of the rated travel/nominal angle.
MODE_BLK N Index: 5 Access: r, w Option:	Shows/used to select the actual operating mode of the Resource Block, permitted operating modes supported by the Transducer Block and the normal operating mode. AUTO O/S The Transducer Block supports the following operating modes: **AUTO** (Automatic) In this operating mode, a position value is calculated from the correction value received from the AO Function Block and the control valve is positioned correspondingly. **O/S** (Out of Service) In this operating mode, the correction value received from the AO Function Block is not used, the control valve moves to the fail-safe position determined in ACT_FAIL_ACTION. The activation of the forced venting likewise causes the mode to change to O/S. **LO** (Local Override) When functions such as initialization or zero calibration are activated as well as during on-site operation of the device (TROVIS-VIEW) the mode changes to LO. After exiting this mode, the mode changes to the preset target mode.
MOUNTING_POSITION S Index: 49 Access: r, w Input: Default:	Position of the positioner in relation to the actuator (with linear actuators) (Standard setting: integral attachment -> arrow pointing towards the actuator, NAMUR attachment -> arrow pointing away from the actuator). ARROW POINTING AWAY FROM THE ACTUATOR ARROW POINTING TOWARDS THE ACTUATOR ARROW POINTING TOWARDS THE ACTUATOR Note: This parameter has no effect with rotary actuators.
RATED_TRAVEL S Index: 50 Access: r, w Range: Default:	Rated travel [mm] or nominal angle in degree [grad] of the control valve. 0 ... 255.9 15.0 mm Note: The unit [mm] or [grad] depends on VALVE_TYPE parameter.
SELF_CALIB_CMD Index: 55 Access: r, w Option:	Command to start calibration in the field device. NO TEST, STANDARD OPERATION ZERO CALIBRATION INITIALIZATION RESET TOTAL VALVE TRAVEL RESET "CONTROL LOOP FAULT" RESET TRANSDUCER BLOCK TO DEFAULT ABORT PROCESS IN ACTION

SELF_CALIB_STATUS D Index: 56 Access: r Display:	Status of sequence started with SELF_CALIB_CMD. UNDETERMINED RUNNING ABORTED RANGE ERROR DEFECTIVE MECHANICS / PNEUMATICS TIMEOUT PROPORTIONAL RANGE RESTRICTED RATED TRAVEL OR TRANSMISSION ERROR MECHANICAL ERROR PNEUMATICAL ERROR INITIALIZATION STATUS: DETERMINATION OF MECHANICAL STOPS INITIALIZATION STATUS: DETERMINATION OF MINIMUM PULSES NITIALIZATION STATUS: DETERMINATION OF MINIMUM TRANSIT TIMES INITIALIZATION ABORTED DUE TO ACTIVATED FORCED VENTING OPTION ZERO ERROR SUCCESSFUL NO VALID DATA FROM APPLICATION
SELF_CALIB_WARNING D Index: 57 Access: r Display:	Additional alert messages of the sequence started with SELF_CALIB_CMD UNDETERMINED WRONG SELECTION OF RATED TRAVEL OR TRANSMISSION AIR LEAKAGE OF PNEUMATIC SYSTEM SUCCESSFUL NO VALID DATA FROM APPLICATION
SERVO_GAIN_1 S Index: 18 Access: r, w Range: Default:	Proportional-action coefficient for filling 0.01...10.0 0.5
SERVO_GAIN_2 S Index: 19 Access: r, w Range: Default:	Proportional-action coefficient for venting 0.01...10.0 1.2
SERVO_RATE S Index: 20 Access: r, w Range: Default:	Gain factor of derivative element 0...1 0.12

STRATEGY S Index: 3 Access: r, w Default:	The strategy field can be used to identify grouping of blocks to allow a faster analysis of the blocks. Enter the same number in the STRATEGY parameter of each block to group blocks. 0 Note: This data is not checked or processed by the Transducer Block.
ST_REV N Index: 1 Access: r	Shows the revision level of the static data. Note: The revision level will be incremented each time a static parameter in the block is changed.
TAG_DESC S Index: 2 Access: r, w Default:	For entering a user-specific text of max. 32 characters to clearly identify and assign the block. No text
TOL_OVERSHOOT S Index: 36 Access: r, w Range: Default:	Tolerated overshoot 0.1...10 % 0.5 %
TOLERANCE_BAND S Index: 38 Access: r, w Range: Default:	Tolerance band Reset criteria for running control loop monitoring. Enter the system deviation allowed for it. See also DELAY_TIME. 0.1...10 % 5 %
TOTAL_VALVE_TRAVEL S Index: 39 Access: r	Total valve travel Sum of the rated load cycles (double travels), sum of valve travels.
TOT_VALVE_TRAV_LIM S Index: 40 Access: r, w Range: Default:	Total valve travel limit 0...16 500 000 1 000 000
TRANSDUCER_DIRECTORY Index: 9 Access: r	Note: This parameter is not processed in the Type 3787.

TRANSDUCER_STATE Index: 32 Access: r Display:	D	State of Transducer Block. SEE ACTUAL MODE OF TRANSDUCER BLOCK FORCED VENTING ACTIVE LOWER TRAVEL LIMIT ACTIVE UPPER TRAVEL LIMIT ACTIVE END POSITION ACTIVE AT < END POSITION ACTIVE AT >
TRANSDUCER_TYPE Index: 10 Access: r	S	Type of transducer, here "Standard Advanced Positioner Valve"
TRANSM_CODE Index: 51 Access: r, w Input: Input:	S	Transmission code **(only for linear actuators with integral positioner attachment)** Determines the size of the travel pick-off when the positioner is integrally attached. D1, Lever 64 mm D2, Lever 106 mm Transmission code **(only for rotary actuators)** Maximum opening angle of the selected segment of the cam disk installed. S90, 90 degrees segment S120, 120 degrees segment Note: This parameter has no effect with rotary actuators.
TRANSM_LENGTH Index: 52 Access: r, w Range: Default:	S	Transmission length **(only for linear actuators with NAMUR attachment)** Lever length, distance between travel pick-off and pivot of the lever. 0 ... 1023 mm 42 mm Note: This parameter is only used with linear actuators with NAMUR attachment; it has no effect on other types of actuators.
TRANSM_PIN_POS Index: 53 Access: r, w Input: Default:	S	Transmission pin position **(only for linear actuators with NAMUR attachment)** Position of the pin on the lever of the positioner. See marking on the positioner lever. A B A Note: This parameter is only used with linear actuators with NAMUR attachment; it has no effect on other types of actuators.
UPDATE_EVT Index: 7 Access: r	D	This alert is generated by any change to the static data, including date and time.
VALVE_MAN_ID Index: 25 Access: r, w	S	Clear identification of the manufacturer of the valve associated with the positioner.

VALVE_MODEL_NUM S Index: 26 Access: r, w	Type/version of the valve associated with the positioner.
VALVE_SN S Index: 27 Access: r, w	Serial number of the valve associated with the positioner.
VALVE_TYPE S Index: 28 Access: r, w Input: Default:	Valve type UNINITIALIZED Undefined LINEAR (Control valve with a straight moving plug, globe valve) ROTARY (Control valve with a rotating plug, part-turn, rotary motion) OTHER linear Note: Type 3787 differentiates merely between linear and rotary control valves. "Undefined" and "other" are treated as globe valves.
XD_CAL_LOC S Index: 29 Access: r, w	Location of last calibration.
XD_CAL_DATE S Index: 30 Access: r, w	Date of last calibration.
XD_CAL_WHO S Index: 31 Access: r, w	The person who carried out the last calibration.
XD_ERROR D Index: 11 Access: r Display:	Error message of the Transducer Block NONE (0) No error. UNSPECIFIED ERROR (Device not initialized, initialization or zero calibration running or total valve travel exceeded). GENERAL ERROR (General device error) CALIBRATION ERROR (Zero, internal control loop or initialization error). CONFIGURATION ERROR (Parameter or characteristic error). ELECTRONICS FAILURE MECHANICAL FAILURE DATA INTEGRITY ERROR (Checksum error). ALGORITHM ERROR Dynamic values outside of range.

XD_ERROR_EXT D Index: 33 Access: r Display:	Extended error messages of the Transducer Block. NONE (0) FAILURE MECHANICS FAILURE IN MEASUREMENT NOT INITIALIZED SELFCALIBRATION FAILED ZERO POINT ERROR INTERNAL CONTROL LOOP DISTURBED (Reset over SELF_CALIB_CMD -> RESET 'CONTROL LOOP FAULT'). TRAVEL TIME EXCEEDED (Automatic reset of control loop error message) CHARACTERIZATION INVALID FORCED VENTING ACTIVE DEVICE UNDER SELFTEST (Initialization or zero calibration) TOTAL VALVE TRAVEL LIMIT EXCEEDED

7.4.3 Function Blocks

The Function Blocks contain the fundamental automation functions of the fieldbus device.
There are various types of function blocks such as Analog Input Function Block , Analog Output Function Block and PID Block.
Each of these function blocks is used to process various application functions (automation tasks) in the entire system. In this way, local control functions, for example, can be carried out directly in the field, self-diagnosis of the device can be performed and device errors such as a control loop fault can be reported automatically to the automation system.
The function blocks process the input values according to their specific algorithm and their parameters internally available. They create output values which are made available by connecting individual function blocks among one other to further process them in other function blocks.

7.4.3.1 Analog Output Function Block

The Analog Output Function Block processes an analog signal received from an upstream connected block (e.g. PID Block) into a correction value that can be used for the downstream connected Transducer Block (e.g. valve positioner). For this purpose, it contains scaling functions and ramp functions.

The AO Block receives its set point depending on the mode (MODE_BLK) from the CAS_IN, RCAS_IN or SP input variables. Taking into account the PV_SCALE, SP_HI_LIM and SP_LO_LIM, an internal operating set point is formed from the SP_RATE_UP and SP_RATE_DN.
An output value OUT is formed corresponding to the IO_OPTS and XD_SCALE parameters. The output value is passed on to the downstream connected Transducer Block over the CHANNEL.

The AO Block has a fault state handling. It is initiated when a fault condition (of the valid set point) exists longer than the time determined in FSTATE_TIME or the SET_FSTATE parameter in the Resource Block is enabled.
FSTATE_TIME, FSTATE_VAL and IO_OPTS determine the fault state handling.

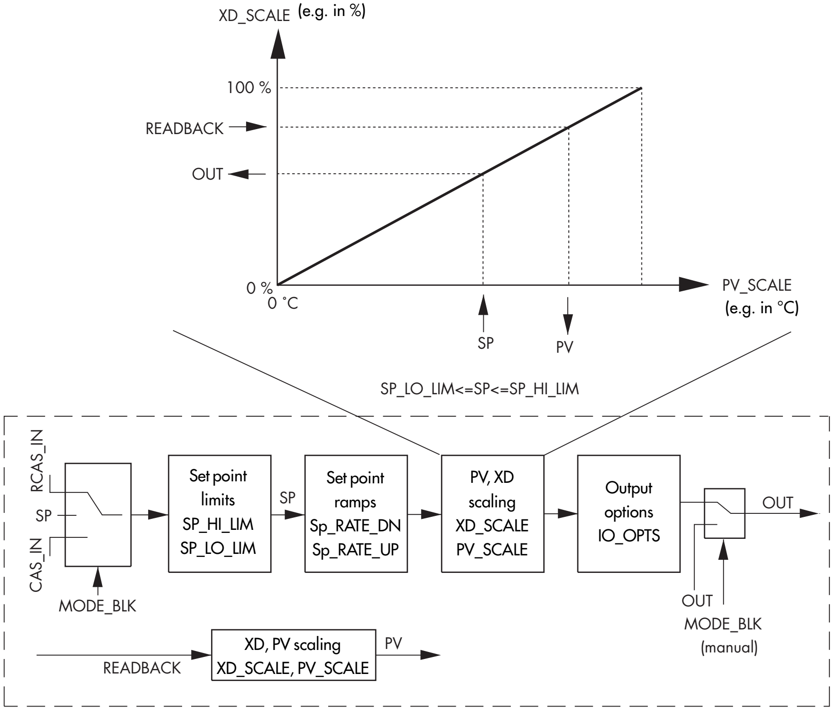


Fig. 14 · Analog Output Function Block

Parameters of the Analog Output Function Block

ALERT_KEY Index: 4 Access: r, w Input: Default:	S	The identification number of the plant unit. This information may be used in the fieldbus host system for sorting alarms and events. 1...255 0 Note: The value 0 (default) is not a tolerated value and is therefore rejected with an error message when writing to the device.
BKCAL_OUT Index: 25 Access: r	D	Shows the analog output value and status which is passed on to BKCAL_IN of the upstream function block with a cascade control. This value prevents reset windup and provides bumpless transfer to closed loop control.
BLOCK_ALM Index: 30 Access: r, w	D	Shows the current block status with information about existing configuration, hardware or system errors including data about when the alarm was generated (date and time) due to an error occurring. Note: Additionally, the active block alarm can be manually acknowledged in this parameter group.
BLOCK_ERR Index: 6 Access: r Display:	D	Shows the active block error. OUT OF SERVICE — The block mode is O/S. CONFIGURATION_ERROR INPUT FAILURE — PV (position feedback) has BAD status, e.g. because the Transducer Block is in O/S mode. OUTPUT FAILURE — Correction value OUT cannot be issued, e.g. because the Transducer Block is not initialized or is in LO mode.
CAS_IN Index: 17 Access: r, w	N	Shows/determines the analog reference variable and its status taken over from an upstream connected function block.
CHANNEL Index: 22 Access: r, w in O/S Default:	S	Assignment among the output of each Analog Output Function Block and the logical hardware channels (Transducer Block). 1 Note: CHANNEL must be set to a valid value before the AO Function Block can be put into operation. This value must be set to "1" as there is only one Transducer Block (Standard Advanced Positioner Valve) available in the Type 3787.
FSTATE_TIME Index: 23 Access: r, w Default:	S	The time in seconds from detection of a fault of the valid set point for the AO Function Block in the current mode until the fault state is activated. If the fault still exists after this time interval has elapsed, the fault state is activated. 0 Note: The fault state of the AO Function Block is determined in IO_OPTS of this block.

FSTATE_VAL S Index: 24 Access: r, w Input: Default:	Determines set point for the AO Function Block to be used when the fault state is activated. Value and range of PV_SCALE±10 % 0 Note: This value is used when the option "Fault State to value" is selected in IO_OPTS.
GRANT_DENY D Index: 13 Access: r, w	Grant or limit the access of a fieldbus host system to the field device. Note: This parameter is not evaluated by the Type 3787.
IO_OPTS S Index: 14 Access: r, w in O/S Option:	Used to select the input/output block processing of the AO Block SP-PV Track in MAN: SP follows PV in (ACTUAL_MODE) MAN mode SP-PV Track in LO: SP follows PV in (ACTUAL_MODE) LO mode SP Track retained target: SP follows RCAS_IN or CAS_IN depending on the preset TARGET_MODE in (ACTUAL_MODE) LO or MAN mode. This option has priority over SP_PV Track in MAN /LO modes. Increase to close: Inversion of output value to the Transducer Block (corresponds with the direction of action). Fault State to value: When the fault state is activated, FSTATE_VAL is used as the set point (see FSTATE_VAL, FSTATE_TIME). Use Fault State Value on restart: When the device is started up, FSTATE_VAL is used as the set point default until there is a valid value. Target to MAN if Fault State activated: When the fault state is activated, the TARGET_MODE is set to MAN. The original target mode is lost. After leaving the fault state, the block remains in MAN and the user must set it to the required mode. Use PV for BKCAL_OUT: PV is returned instead of the operating set point over BKCAL_OUT. If the option OUT READBACK is selected in FEATURES_SEL of the Resource Block, the current valve stem position is then reported back over BKCAL_OUT.

MODE_BLK N Index: 5 Access: r, w Display:	Shows the actual mode of the AO Block, the target modes, permitted modes supported by the AO Block and normal mode. RCAS CAS AUTO MAN O/S The AO Block supports the following modes: **O/S** (Out of Service) The AO algorithm of the block is not executed. The last value or the value determined during active fault state handling is issued at the OUT parameter. **MAN** (Manual) The output value of the AO Block can be directly preset by the user over the OUT parameter. **AUTO** (Automatic) The set point preset by the user is used on executing the AO Block via the SP parameter. **CAS** (Cascade) The AO Function Block receives the reference variable for internal calculation of the manipulated variable directly from an upstream connected Function Block via CAS_IN. The AO Block is executed. **RCAS** (Remote cascade) The AO Function Block receives the reference variable for internal calculation of the manipulated variable directly from the fieldbus host system via CAS_IN. The AO Block is executed.
OUT N Index: 9 Access: r, w in MAN, O/S	Shows the manipulated variable, value, limit and status of the AO Function Block. Note: If the MAN mode in MODE_BLK is selected, the output value OUT can be entered manually here. The unit used is taken over by the XD_SCALE parameter group. The input range corresponds to OUT_SCALE±10 %.
PV D Index: 7 Access: r	Shows the process variable including status used for the function blocks. The unit used is taken over by the PV_SCALE parameter group. Note: If the option OUT READBACK in FEATURES_SEL in the Resource Block is activated, PV contains the current valve stem position (corresponding to FINAL_POSITION_VALUE).
PV_SCALE S Index: 11 Access: r, w in MAN, O/S Default:	Definition of the range (lower range and upper range value), engineering unit and number of digits behind the decimal place of the process variable (PV). 0...100 %
RCAS_IN N Index: 26 Access: r, w	Shows and used to input the analog reference variable (value and status) provided by the fieldbus host system and used as the set point to calculate the manipulated variable. Note: This parameter is only active in RCAS mode.

RCAS_OUT D Index: 28 Access: r	Shows the analog reference variable (value and status) after ramping. This value is made available to the fieldbus host system to perform back calculations when the operating mode changes or with limited signals. Note: This parameter is only active in RCAS mode.
READBACK D Index: 16 Access: r	Shows current valve stem position. The value is calculated from FINAL_POSITION_VALUE of the associated Transducer Block. The unit used is taken over by the XD_SCALE parameter group.
SHED_OPT S Index: 27 Access: r, w	Used to select the action to be taken when the monitoring time is exceeded (see SHED_RCAS in Resource Block) during the checking of the link between the fieldbus host system and the AO Block in RCAS mode. After the monitoring time has elapsed, the AO Block changes from RCAS mode to the mode selected here. The action to be taken after the fault state is completed is likewise determined.
Option:	Uninitialized NormalShed_NormalReturn: Changes to next possible mode, after leaving the error condition, returns to RCAS mode. NormalShed_NoReturn: Changes to next possible mode, after leaving the error condition, the block remains in this mode. ShedToAuto_NormalReturn Changes to AUTO mode, after leaving the error condition, returns to RCAS mode. ShedToAuto_NoReturn: Changes to AUTO mode, after leaving the error condition, the block remains in AUTO mode. ShedToManual_NormalReturn: Changes to MAN mode, after leaving the error condition, returns to RCAS mode. ShedToManual_NoReturn: Changes to MAN mode, after leaving the error condition, the block remains in MAN mode. ShedToRetainedTarget_NormalReturn: Change to next possible mode, after leaving the error condition, returns to RCAS mode. ShedToRetainedTarget_NoReturn: Change to next possible mode, after leaving the error condition, the block remains in this mode.
Default:	Uninitialized Note: This parameter is only active in the AO Block in the RCAS mode. If it is set to "Uninitialized", the AO Block cannot be put into the RCAS mode.

SIMULATE D Index: 10 Access: r, w	Using the simulation the value and status of the process variable PV of the block can be simulated. Note: During simulation, the value of OUT is not passed onto the Transducer Block. The Transducer Block keeps the last valid value stored before the simulation was activated. The simulation can only be activated by enabling the switch in the device (see also Resource Block).
SP N Index: 8 Access: r, w in AUTO, MAN, O/S Input:	Used to input the set point (reference variable) in AUTO mode. The unit used is taken over by the PV_SCALE parameter group. Value and range of the PV_SCALE±10 %
SP_HI_LIM S Index: 20 Access: r, w Input: Default:	Used to input the high limit of the set point (reference variable). Value and range of the PV_SCALE±10 % 100 Note: If the high limit of the set point is changed in PV_SCALE, this value should be adapted accordingly.
SP_LO_LIM S Index: 21 Access: r, w Input: Default:	Used to input the low limit of the set point (reference variable). Value and range of the PV_SCALE±10 % 0 Note: If the low limit of the set point is changed in PV_SCALE, this value should be adapted accordingly.
SP_RATE_DN S Index: 18 Access: r, w Default:	Used to input the ramp rate at which downward set point changes are acted on in AUTO mode. 3402823466 x 10^{38} Note: If the ramp rate is set to "0", the set point will be used immediately. The rate limiting will apply for output blocks in AUTO and CAS modes.
SP_RATE_UP S Index: 19 Access: r, w Default:	Used to input the ramp rate at which upward set point changes are acted on in AUTO mode. 3402823466 x 10^{38} Note: If the ramp rate is set to "0", the set point will be used immediately.
ST_REV N Index: 1 Access: r	Shows the revision level of the static data. Note: The revision level will be incremented each time a static parameter is changed.

STATUS_OPTS S Index: 15 Access: r, w in O/S Option: Default:	Used to select available status options to determine the treatment and processing of the status: Uninitialized Propagate Fault Backward Status of the Transducer is passed on to the upstream connected Block using the status of BKCAL_OUT. Uninitialized
STRATEGY S Index: 3 Access: r, w Default:	The strategy field can be used to identify grouping of blocks to allow a faster analysis of the blocks. Enter the same number in the STRATEGY parameter of each block to group blocks. 0 Note: This data is not checked or processed by the AO Function Block.
TAG_DESC S Index: 2 Access: r, w Default:	For entering a user-specific text of max. 32 characters to clearly identify and assign the block. No text
UPDATE_EVT D Index: 29 Access: r	This alert is generated by any change to the static data, including date and time.
XD_SCALE S Index: 12 Access: r, w in MAN, O/S Default:	Definition of the range (lower range and upper range value) of the engineering unit and the number of digits behind the decimal point of the manipulated variable (OUT). Specified in [%], [mm] or [grad]. 0.0...100.0 % Note: On using [%], the value for OUT is scaled based on 100 %. For [mm] (globe valves) or [grad] (rotary valves), the value currently set in RATED_TRAVEL in the Transducer Block is scaled as 100 %.

7.4.3.2 PID Function Block (PID controller)

A PID Function Block includes the input channel processing, the PID control and the analog output channel processing.
The configuration of the PID Block (PID controller) is dependent on each automation task. Simple control loops, feedforward controls, cascade control and cascade control with limits can be implemented in combination with a further controller block.
The following options exist for processing the measured variable within the PID Function Block (PID controller):
Signal scaling, signal limits, control of the modes, feedforward control, limit control, alarm detection and passing on the signal status.

The PID Block (PID controller) can be used for various automation strategies. The Block has a flexible control algorithm which can be configured depending on the application.

The PID Block receives its set point depending on the operating mode (MODE_BLK) from the CAS_IN, RCAS_IN or SP input variables. PV_SCALE, SP_HI_LIM, SP_LO_LIM, SP_RATE_UP and SP_RATE_DN are used to form an internal operating set point.

The Block receives the actual value over the IN input variable. The process variable PV is formed from this, taking into account the PV_SCALE and the filter of the first order PV_FTIME.

These values are fed to the internal PID algorithm. This algorithm consists of a proportional, an integral and a derivative component. The manipulated variable is calculated from the set point value SP, from the process variable PV (actual value) and from the system deviation.

The individual PID components are included in the calculation of the manipulated variable as follows:

- Proportional component:
  The proportional component reacts immediately and directly when the set point SP or the process variable PV (actual value). The manipulated variable is changed by the proportional factor GAIN. This change corresponds to the system deviation multiplied by the gain factor. If a controller works only with a proportional component, the control loop has a permanent system deviation.
- Integral component:
  The system deviation resulting from the calculation of the manipulated variable using the proportional component is integrated over the integral component of the controller until it is negligible. The integral function corrects the manipulated variable depending on the size and duration of the system deviation. If the value for the integration time RESET is set to zero, the controller works as a P or PD controller. The influence of the integral component on the control loop increases when the value of the integration time is reduced.
- Derivative component:
  In controlled systems with long delay times, e.g. in temperature control loops, it makes sense to use the derivative component RATE of the controller. Using the derivative compo-

nent RATE, the manipulated variable is calculated depending on the rate of change of the system deviation.

An output value OUT is formed from the calculated manipulated variable corresponding to the OUT_SCALE, OUT_HI_LIM and OUT_LO_LIM parameters. This output value can be passed on to a downstream connected Function Block.

The status of the output value OUT can be influenced by the STATUS_OPTS parameter depending on the status of the input variable of the PID Block. This allows, for example, the fault state of a downstream connected output block to be activated.

The BYPASS parameter allows the internal set point to be directly transferred to the correction value.

Feedforward is possible over the FF_VAL input variable. TRK_IN_D and TRK_VAL allow the output value to be directly tracked.

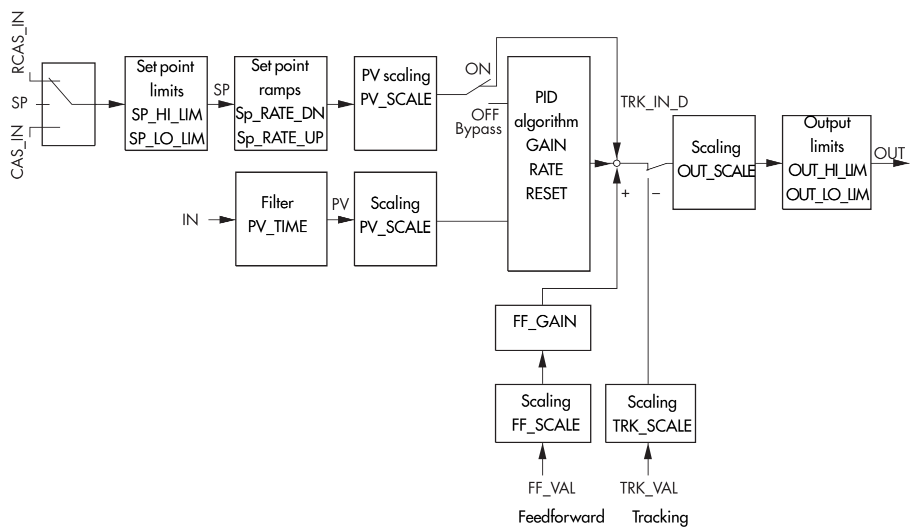


Fig. 15 · PID Function Block (PID controller)

Parameters of the PID Function Block

ACK_OPTION S Index: 46 Access: r, w Option: Default:	This parameter allows you to choose whether an alarm should be automatically acknowledged in the device, i.e. without any influence from the fieldbus host system. Undefined — No option HI_HI_ALM — High high alarm HI_ALM — High alarm LO_LO_ALM — Low low alarm LO_ALM — Low alarm DV_HI_ALM — Limit alarm for upper range deviation DV_LO_ALM — Limit alarm for lower range deviation BLOCK ALM — Block alarm Undefined Note: The alarm is sent to the fieldbus host system, but not acknowledged by it.
ALARM_HYS S Index: 47 Access: r, w Input: Default:	Used to input the hysteresis for the high and low alarm limits. The alarm conditions remain active as long as the measured value is within the hysteresis. The hysteresis value has an effect on the following alarm limits of the PID Function Block: HI_HI_LIM HI_LIM LO_LO_LIM LO_LIM DV_HI_LIM DV_LO_LIM 0...50 % 0.5 % Note: The hysteresis value in percent applies to the range of the PV_SCALE parameter group in the PID Function Block.
ALARM_SUM S + D Index: 45 Access: r, w Display:	Shows the current status of process alarms in the PID Function Block HI_HI_ALM — Violation of the high high alarm HI_ALM — Violation of the high alarm LO_LO_ALM — Violation of the low low alarm LO_ALM — Violation of the low alarm DV_HI_ALM — Violation of the limit alarm for the upper range deviation DV_LO_ALM — Violation of the limit alarm for the lower range deviation BLOCK ALM — Block alarm Note: Additionally, the process alarm can be cleared in this parameter group.

ALERT_KEY S Index: 4 Access: r, w Input: Default:	The identification number of the plant unit. This information may be used in the fieldbus host system for sorting alarms and events. 1...255 0 Note: The value 0 (default) is not a tolerated value and is therefore rejected with an error message when writing to the device.
BAL_TIME S Index: 25 Access: r, w Default:	Used to input the time constant at which the integral term will move to obtain balance when the output is limited (calculated manipulated variable > OUT_HI_LIM or < OUT_LO_LIM). 0 Note: When 0 (default) is set, the balance is immediately reduced.
BKCAL_HYS S Index: 30 Access: r, w Input: Default:	Used to input the hysteresis value for the upper and lower limits of the manipulated variable range OUT_HI_LIM and OUT_LO_LIM. If the calculated manipulated variable exceeds or falls below the range defined by the range limits, this range violation is indicated in the OUT parameter and passed on to the downstream connected blocks. The range violation remains active as long as the value of the calculated manipulated variable does not exceed or fall below the hysteresis value again. 0...50 % 0.5 %
BKCAL_IN N Index: 27 Access: r, w	Shows the analog input value and status which is taken over from the BKCAL_OUT parameter of the downstream connected Function Block with a cascade control. This value provides bumpless transfer to closed loop control by tracking the output.
BKCAL_OUT D Index: 31 Access: r, w	Shows the analog input value and status which is passed on from the BKCAL_IN parameter of the upstream connected Function Block with a cascade control. This value prevents reset windup and provides bumpless transfer to closed loop control by tracking the output.
BLOCK_ALM D Index: 44 Access: r, w	Shows the current block status with information about existing configuration, hardware or system errors including data about when the alarm was generated (date and time) due to an error occurring. Note: Additionally, the active block alarm can be manually acknowledged in this parameter group.
BLOCK_ERR D Index: 6 Access: r Display:	Shows the active block error. OUT OF SERVICE CONFIGURATION_ERROR

BYPASS S Index: 17 Access: r, w in MAN, O/S Option: Default:	This parameter allows the calculation of the manipulated variable by means of the PID control algorithm to be switched on or off. Unintialized — Same as ON OFF — Bypass switched off: the manipulated variable determined by the PID control algorithm is issued over the OUT parameter. ON — BYPASS switched on: the value of the reference variable SP is issued directly over the OUT parameter. OFF Note: On setting "Uninitialized", the block remains in the "O/S" mode. To activate the bypass (ON), the bypass must be enabled in the CONTROL_OPTS parameter.
CAS_IN N Index: 18 Access: r, w	Shows/defines the analog reference variable and its status taken over from an upstream connected Function Block.
CONTROL_OPTS S Index: 13 Access: r, w in MAN, O/S Option: Default:	Used to select the available controller options to determine the automation strategy. Bypass Enable Direct Acting Track Enable Track in Manual PV for BKCAL_OUT No OUT Limits in Manual None
DV_HI_ALM D Index: 64 Access: r, w	Shows status of alarm for the high deviation including details about alarm time (date, time) and about the value which triggered the alarm. The controlled variable exceeds the reference variable by more than the value determined in the DV_HI_LIM parameter. Note: Additionally, the active block alarm can be manually acknowledged in this parameter group.
DV_HI_LIM S Index: 57 Access: r, w Default:	Used to input the limit for the high deviation. If the controlled variable exceeds the reference variable by this value, the deviation alarm DV_HI_ALM is generated. $3402823466 \times 10^{38}$
DV_HI_PRI S Index: 56 Access: r, w Input:	Determines the action to be taken when the high deviation alarm (DV_HI_LIM) is exceeded. 0 The violation of the limit for the high deviation is not evaluated. 1 No message issued when a violation of the limit for the high deviation occurs.

      Default:	2 Reserved for block alarms. 3...7 The violation of the limit for the high deviation is issued with the corresponding priority (3= low priority, 7= high priority) to notify the user. 8...15 The violation of the limit for the high deviation is issued with the corresponding priority (8= low priority,15= high priority) as a critical alarm. 0
DV_LO_ALM D Index: 65 Access: r, w	Shows status of alarm for the low deviation including details about alarm time (date, time) and about the value which triggered the alarm. The controlled variable falls below the reference variable by more than the value determined in the DV_LO_LIM parameter. Note: Additionally, the active block alarm can be manually acknowledged in this parameter group.
DV_LO_LIM S Index: 59 Access: r, w Default:	Used to input the limit for the low deviation. If the controlled variable falls below the reference variable by this value, the low deviation alarm DV_LO_ALM is generated. $-3402823466 \times 10^{38}$
DV_LO_PRI S Index: 58 Access: r, w Input: Default:	Determines the action to be taken when the low deviation alarm (DV_LO_LIM) is exceeded. 0 The violation of the limit for the low deviation is not evaluated. 1 No message issued when a violation of the limit for the low deviation occurs. 2 Reserved for block alarms. 3...7 The violation of the limit for the low deviation is issued with the corresponding priority (3= low priority, 7= high priority) to notify the user. 8...15 The violation of the limit for the low deviation is issued with the corresponding priority (8= low priority,15= high priority) as a critical alarm. 0
FF_GAIN S Index: 42 Access: r, w in MAN, O/S Default:	Used to input the gain of the feedforward control. 0 Note: The feedforward gain is multiplied by feedforward input (FF_VAL). The result is added to the output value OUT.
FF_SCALE S Index: 41 Access: r, w in MAN, O/S Default:	Defines the measuring range (low and high limits), the engineering unit and the number of digits behind the decimal point of the disturbance variable (FF_VAL). 0...100 %

FF_VAL Index: 40 Access: r, w Input:	N	Used to input and displays the feedforward value and status. Range and unit of the FF_SCALE Note: The feedforward input is multiplied by the gain (FF_GAIN) before it is added to the calculated output value OUT.
GAIN Index: 23 Access: r, w Default:	S	Used to input the proportional gain (factor). 1.0 Note: The parameter must be set to a value unequal to 0, otherwise a configuration error is set in the BLOCK_ERR parameter and the block goes into O/S mode.
GRANT_DENY Index: 12 Access: r, w	D	Grant or deny access of a fieldbus host system to the field device. Note: This parameter is not evaluated by the Type 3787.
HI_ALM Index: 61 Access: r, w	D	Shows the status of the alarm for the high alarm limit (HI_LIM), including details about the alarm timing (date, time) and the value which triggered the alarm. Note: The unit of the alarm status parameter is taken on by the PV_SCALE parameter. Additionally, the active alarm can be manually acknowledged in this parameter group.
HI_HI_ALM Index: 60 Access: r, w	D	Shows the status of the alarm for the high high alarm limit (HI_HI_LIM), including details about the alarm timing (date, time) and the value which triggered the alarm. Note: The unit of the alarm status parameter is taken on by the PV_SCALE parameter. Additionally, the active alarm can be manually acknowledged in this parameter group.
HI_HI_LIM Index: 49 Access: r, w Input: Default:	S	Input of the alarm limit for the high high alarm (HI_HI_ALM). If the value PV exceeds this limit, the HI_HI_ALM alarm status parameter is issued. Range and unit of the PV_SCALE 3402823466 x 10^{38}
HI_HI_PRI Index: 48 Access: r, w Input: Default:	S	Determines the action to be taken when the high high alarm limit (HI_HI_LIM) is exceeded. 0 The violation of the high high alarm limit is not evaluated. 1 No message issued when a violation of the high high alarm occurs. 2 Reserved for block alarms. 3...7 The violation of the high high alarm is issued with the corresponding priority (3= low priority, 7= high priority) to notify the user. 8...15 The violation of the high high alarm is issued with the corresponding priority (8= low priority,15= high priority) as a critical alarm. 0
HI_LIM Index: 51 Access: r, w Input: Default:	S	Input of the alarm limit for the high warning alarm (HI_ALM). If the value PV exceeds this limit, the HI_ALM alarm status parameter is issued. Range and unit of the PV_SCALE 3402823466 x 10^{38}

HI_PRI S Index: 50 Access: r, w Input: Default:	Determines the action to be taken when the high alarm limit (HI_LIM) is exceeded. 0 The violation of the high alarm limit is not evaluated. 1 No message issued when a violation of the high alarm occurs. 2 Reserved for block alarms. 3...7 The violation of the high alarm is issued with the corresponding priority (3= low priority, 7= high priority) to notify the user. 8...15 The violation of the high warning alarm is issued with the corresponding priority (8= low priority,15= high priority) as a critical alarm. 0
IN N Index: 15 Access: r, w	Shows/determines the analog controlled variable with details about status and value.
LO_ALM D Index: 62 Access: r, w	Shows the status of the alarm for the low alarm limit (LO_LIM), including details about the alarm timing (date, time) and the value which triggered the alarm. Note: The unit of the alarm status parameter is taken over by the PV_SCALE parameter.
LO_LO_ALM D Index: 63 Access: r, w	Shows the status of the alarm for the low low alarm limit (LO_LO_LIM), including details about the alarm timing (date, time) and the value which triggered the alarm. Note: The unit of the alarm status parameter is taken over by the PV_SCALE parameter. Additionally, the active alarm can be manually acknowledged in this parameter group.
LO_LO_LIM S Index: 55 Access: r, w Input: Default:	Input of the alarm limit for the low low alarm (LO_LO_ALM). If the PV value exceeds this limit, the LO_LO_ALM alarm status parameter is issued. Range and unit of the PV_SCALE -3402823466 x 10^{38}
LO_LO_PRI S Index: 54 Access: r, w Input: Default:	Determines the action to be taken when the value falls below the low low alarm limit (LO_LO_LIM) . 0 The violation of the low low alarm limit is not evaluated. 1 No message issued when a violation of the low low alarm occurs. 2 Reserved for block alarms. 3...7 The violation of the low low alarm is issued with the corresponding priority (3= low priority, 7= high priority) to notify the user. 8...15 The violation of the low low alarm is issued with the corresponding priority (8= low priority,15= high priority) as a critical alarm. 0

LO_LIM S Index: 53 Access: r, w Input: Default:	Input of the alarm limit for the low alarm (LO_ALM). If the PV value exceeds this limit, the LO_ALM alarm status parameter is issued. Range and limit of the PV_SCALE $-3402823466 \times 10^{38}$
LO_PRI S Index: 52 Access: r, w Input: Default:	Determines the action to be taken when the value falls below the low alarm limit (LO_LIM). 0 The violation of the low alarm limit is not evaluated. 1 No message issued when a violation of the low alarm occurs. 2 Reserved for block alarms. 3...7 The violation of the low alarm is issued with the corresponding priority (3= low priority, 7= high priority) to notify the user. 8...15 The violation of the low alarm is issued with the corresponding priority (8= low priority,15= high priority) as a critical alarm. 0
MODE_BLK S Index: 5 Access: r, w Display:	Shows the actual operating mode of the PID Block, the target modes, permitted modes supported by the PID Block and normal operating mode. ROUT RCAS CAS AUTO MAN OOS The PID Block supports the following modes: **O/S** (Out of Service) The PID Algorithm of the Block is not executed. The last value or the value determined during the active state fault is issued at the OUT parameter. **MAN** (Manual) The output value of the Block can be preset by the user directly over the OUT parameter. **AUTO** (Automatic) The set point preset by the user is used on executing the PID algorithm via the SP parameter. **CAS** (Cascade) The PID Function Block receives the reference variable for internal calculation of the manipulated variable directly from an upstream connected Function Block via CAS_IN. The internal PID algorithm is executed. **RCAS** (Remote cascade) The PID Function Block receives the reference variable for internal calculation of the manipulated variable directly from the fieldbus host system via RCAS_IN. The internal PID algorithm is executed. **ROUT** (Remote output) The PID Function Block receives the reference variable for internal calculation of the manipulated variable directly from the fieldbus host system via ROUT_IN. The manipulated variable is reissued over the OUT parameter, without executing the internal PID algorithm.

OUT Index: 9 Access: r, w in MAN, O/S	N	Shows the manipulated variable, value, limit and status of the PID Function Block. Note: If the MAN mode in MODE_BLK is selected, the output value OUT can be entered manually here. The unit used is taken on by the OUT_SCALE parameter group. The input range corresponds to OUT_SCALE±10 %.
OUT_HI_LIM Index: 28 Access: r, w Input: Default:	S	Used to input the maximum value of the analog manipulated variable (OUT). Range of OUT_SCALE ±10 %, unit of OUT_SCALE 100
OUT_LO_LIM Index: 29 Access: r, w Input: Default:	S	Used to input the minimum value of the analog manipulated variable (OUT). Range of OUT_SCALE ±10 %, unit of OUT_SCALE 0
OUT_SCALE Index: 11 Access: r, w in MAN, O/S Default:	S	Defines the range (lower range and upper range), the engineering unit and the number of digits behind the decimal point of the manipulated variable (OUT). 0...100 %
PV Index: 7 Access: r	D	Shows the process variables, including the status, used for executing the block. Note: The unit used is taken over by the PV_SCALE parameter group.
PV_FTIME Index: 16 Access: r, w Default:	S	Used to input the filter time constant (in seconds) of the digital filter of first order. This time is required to allow 63 % of a change of the controlled variable to become effective at the input IN in the PV value. 0 s
PV_SCALE Index: 10 Access: r, w in MAN, O/S Default:	S	Defines the range (lower range and upper range), the engineering unit and the number of digits behind the decimal point of the process variable (PV). 0...100 %
RATE Index: 26 Access: r, w Default:	S	Used to input the time constant for the derivative function. 0 s
RCAS_IN Index: 32 Access: r, w	N	Used to input and display the analog reference variable (value and status) provided by the fieldbus host system and used as the set point to calculate the manipulated variable. Note: This parameter is only active in the RCAS mode.
RCAS_OUT Index: 35 Access: r	D	Shows the analog reference variable (value and status) after ramping. This value is provided by the fieldbus host system to perform back calculations when the operating mode changes or with limited signals. Note: This parameter is only active in the RCAS mode.

RESET S Index: 24 Access: r, w Default:	Used to input the time constant for the integral function. 3402823466 x 10^{38} (maximum possible value) Note: The integral function is cleared by setting to 0 seconds.
ROUT_IN N Index: 33 Access: r, w	Used to input and display the manipulated variable (value and status) provided by the fieldbus host system. Note: This parameter is only active in ROUT mode.
ROUT_OUT D Index: 36 Access: r	Shows the analog reference variable (value and status) which is supplied via the ROUT_IN parameter. This value is made available to the fieldbus host system to perform back calculations when the operating mode changes or with limited signals. Note: This parameter is only active in ROUT mode.
SHED_OPT S Index: 34 Access: r, w Option:	Used to select the action to be taken when the monitoring time is exceeded (see SHED_RCAS in Resource Block) during the checking of the link between the fieldbus host system and the PID Block in RCAS or ROUT mode. After the monitoring time has elapsed, the PID Block changes from RCAS or ROUT mode to the mode selected here. The action to be taken after the fault state is completed is likewise determined. Uninitialized NormalShed_NormalReturn: Changes to next possible mode, after leaving the error condition, returns to RCAS or ROUT mode. NormalShed_NoReturn: Changes to next possible mode, after leaving the error condition, the block remains in this mode. ShedToAuto_NormalReturn Changes to AUTO mode, after leaving the error condition, returns to RCAS or ROUT mode. ShedToAuto_NoReturn: Changes to AUTO mode, after leaving the error condition, the block remains in AUTO mode. ShedToManual_NormalReturn: Changes to MAN mode, after leaving the error condition, returns to RCAS or ROUT mode. ShedToManual_NoReturn: Changes to MAN mode, after leaving the error condition, the block remains in MAN mode. ShedToRetainedTarget_NormalReturn: Changes to next possible mode, after leaving the error condition, returns to RCAS or ROUT mode. ShedToRetainedTarget_NoReturn: Changes to next possible mode, after leaving the error condition, the block remains in this mode.

Default:	Uninitialized Note: This parameter is only active in the PID Block in the RCAS and ROUT modes. If it is set to "Uninitialized", the PID Block cannot be placed into RCAS or ROUT modes.
SP N Index: 8 Access: r, w in AUTO, MAN, O/S Input:	Used to input the set point (reference variable) in AUTO mode. Value and range of the PV_SCALE±10 %
SP_HI_LIM S Index: 21 Access: r, w Input: Default:	Used to input the upper range of the set point (reference variable). Value and range of the PV_SCALE±10 % 100 Note: If the lower range setting is changed in PV_SCALE, this value should be adapted accordingly.
SP_LO_LIM S Index: 22 Access: r, w Input: Default:	Used to input the lower range of the set point (reference variable). Value and range of the PV_SCALE±10 % 0 Note: If the lower range setting is changed in PV_SCALE, this value should be adapted accordingly.
SP_RATE_DN S Index: 19 Access: r, w Default:	Used to input the ramp rate at which downward set point changes are acted on in the operating mode AUTO. $3402823466 \times 10^{38}$ Note: If the ramp rate is set to "0", the set point will be used immediately. The rate limit is active for control blocks in the AUTO mode only.
SP_RATE_UP S Index: 20 Access: r, w Default:	Used to input the ramp rate at which upward set point changes are acted on in AUTO mode. $3402823466 \times 10^{38}$ Note: If the ramp rate is set to "0", the set point will be used immediately. The rate limit is active for control blocks in the AUTO mode only.
ST_REV S Index: 1 Access: r	Shows the revision level of the static data. Note: The revision level will be incremented each time a static parameter is changed.

STATUS_OPTS Index: 14 Access: r, w in O/S Option: Default:	Used to select available status options to determine the treatment and processing of the status: Uninitialized IFS if Bad IN — Fault state of the downstream connected AO Function Block initiated, if the controlled variable (IN) changes the status to BAD. IFS if Bad CAS_IN — Fault state initiated if the external reference variable (CAS_IN) changes to status to BAD. Use Uncertain as Good The status UNCERTAIN is used as GOOD. Target In Manual if Bad IN Transition to MAN mode if the controlled variable changes the status to BAD. Uninitialized
STRATEGY S Index: 3 Access: r, w Default:	The strategy field can be used to identify grouping of blocks to allow a faster analysis of the blocks. Enter the same number in the STRATEGY parameter of each block to group blocks. 0 Note: This data is not checked or processed by the PID Function Block.
TAG_DESC S Index: 2 Access: r, w Default:	For entering a user-specific text of max. 32 characters to clearly identify and assign the block. No text
TRK_IN_D N Index: 38 Access: r, w	Shows/determines the discrete input (value and status) which initiates external or output tracking. After initiating tracking, the mode is changed to LO. During which, the manipulated variable at the output OUT takes over the value predetermined via the input TRK_VAL.
TRK_SCALE S Index: 37 Access: r, w in MAN, O/S Default:	Defines the range (lower range and upper range), the engineering unit and the number of digits behind the decimal place of the external track value (TRK_VAL). 0...100 %
TRK_VAL N Index: 39 Access: r, w	Shows/determines the analog input value and its status entered from another Function Block for external tracking function.
UPDATE_EVT D Index: 43 Access: r	This alert is generated by any change to the static block data, including date and time.

7.5 Other parameters

7.5.1 Stale counter

The stale counter is used to assess the "quality" of a process variable received via a cyclically configured link (publisher subscriber link).
The process variables that are "connected" among various function blocks are transferred using these links.
For this purpose, the preceding block (Publisher) sends the process variable on the bus at a defined point in time. The successive block(s) (subscriber) "listen" at this point in time on the bus. The receiving blocks check whether there is a valid value at the configured point in time. A value is valid when it has the status "Good" at the expected point in time.
The stale counter defines how many successive stale (bad) values are accepted until the fault state mechanism of the block is enabled.

When the stale counter is set to "0", this monitoring function is cleared.

7.5.2 Link objects

Link objects are used to link Function Block inputs and outputs (configurable cyclic links).
22 link objects can be configured for each positioner.

7.5.3 LAS capabilities

The number of projectable links and schedules is matched to the requirements and possibilities in the DeltaV System from FISHER-ROSEMOUNT.

Functioning as LAS the positioner can support the following:

- 1 schedule
- 1 subschedule
- 25 sequences per subschedule
- 25 elements per sequence

8. Diagnostic messages

8.1 Messages of the XD_ERROR_EXT parameter (Transducer Block)

Failure mechanics
This message is issued when the entered rated travel is not reached on initialization.
- Check mechanics and pneumatics in the valve
- Compare the specifications in the Transducer Block, which describe the valve as well as the actuator and the mechanical structure, with the actual valve.
  Reinitialize.

Failure in measurement
The internal A/D converter does not work properly within its time interval, or the measured values are outside of the physical measured range limit of the A/D converter. If a warm start does not reset the data, repair is necessary.

Not initialized
The device has not been initialized.

Selfcalibration failed
Initialization could not be successfully completed. Exact details about the causes are supplied by the SELF_CALIB_STATUS parameter.

Zero point error
This message indicates any changes exceeding or falling below the value determined during the initialization or zero calibration by more than ± 5%.
Possible sources of error:
Worn-out valve plug/seat
Impurities between valve plug/seat
Automatic reset after initialization has been successfully completed.

Internal control loop disturbed
This message is issued when the positioner is not able to control in the set delay time within the set tolerance band.

Reset using SELF_CALIB_CMD - "Reset Control Loop Fault".

Travel time exceeded
The travel time determined during initialization has been exceeded.

- **Forced venting active**
  Forced venting is activated, i.e. the signal at terminals +81 and -82 is smaller than 3V. The control valve moves to the fail-safe position irrespective of the control loop. It is automatically reset as soon as there is a 6V to 24 V DC signal at terminals +81 and -82.

- **Device under Selftest**
  This message is issued when the device is undergoing initialization or electric zero calibration.

- **Total valve travel limit exceeded**
  The current value for the total valve travel exceeds the entered or preset limit. Reset using "SELF_CALIB_CMD = Reset total valve travel".

8.2 Messages of the XD_ERROR parameter (Transducer Block)

- **Unspecified Error**
  The device has not been initialized or the total valve travel has been exceeded.

- **General Error**
  No production calibration completed.

- **Calibration Error**
  This message is issued when a zero point error occurs, the control loop is disturbed or an error occurred during initialization.

- **Calibration Error**
  Error on transmitting the characteristic to the device.
  Automatic reset after a correct characteristic has been transmitted.

- **Electronics Failure**
  This message is issued if a defect is detected in the electronics module during the cyclic check. Repair necessary.

- **Mechanical Failure**
  This message is issued when the entered rated travel is not at least reached on initialization.

- Check mechanics and pneumatics in the valve
- Compare the specifications in the Transducer Block, which describe the valve as well as the actuator and the mechanical structure, with the actual valve.
  Reinitialize.

- **Data Integrity Error**
  Checksum error

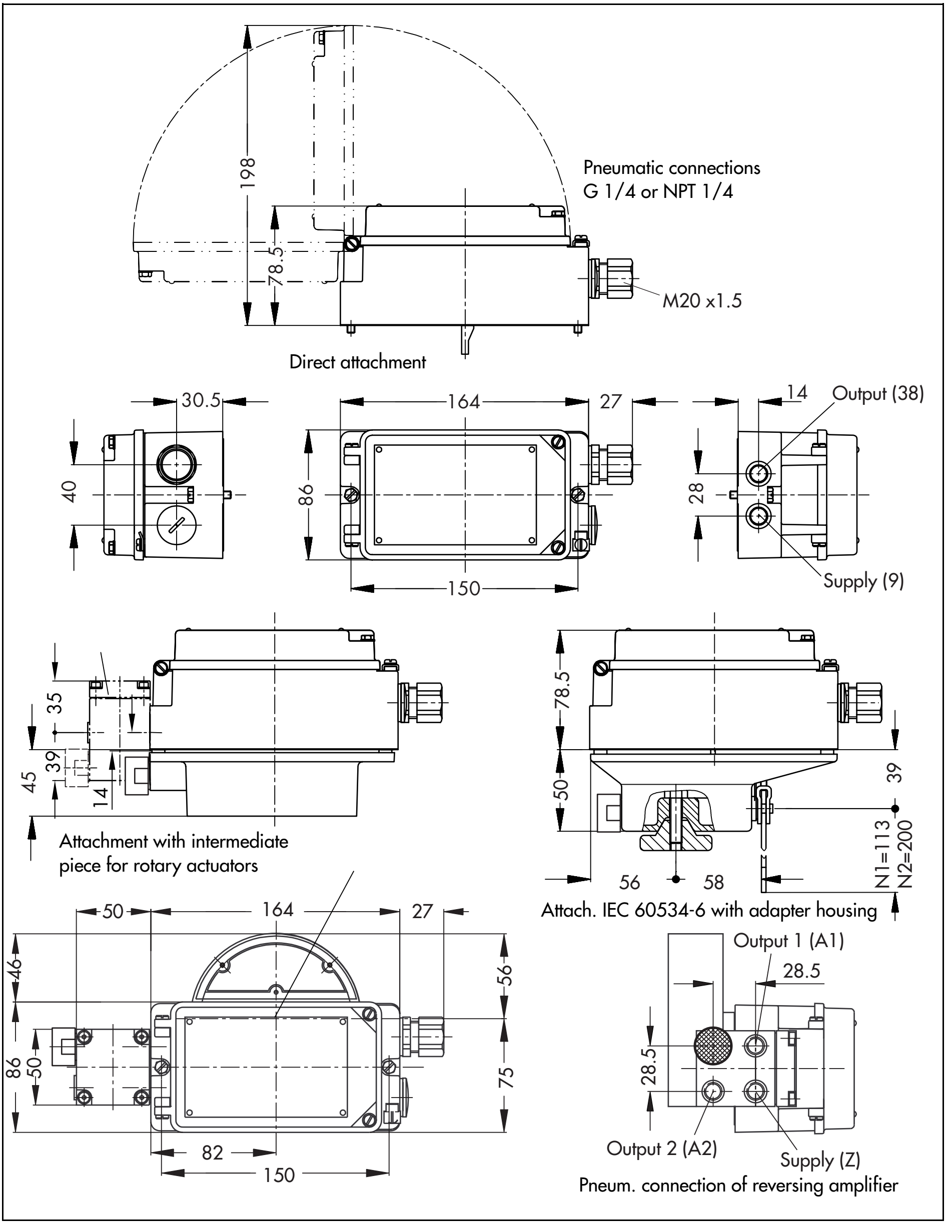
- **Algorithm Error**
  Set point value - actual value error

8.3 Messages of the SELF_CALIB_STATUS parameter (Transducer Block)

- Proportional band restricted too much

Even the smallest permissible pulses still cause excessive changes in travel. Initialization aborted.

- Possible sources of error:
  - Supply pressure too high
  - Signal pressure throttle missing in actuator with a small volume
  - Mechanical failure, especially with attachment according to IEC 60534-6 (NAMUR)
  - If a booster valve is mounted with an actuator with a large volume, the bypass should be opened further.


198
78.5
Pneumatic connections
G 1/4 or NPT 1/4
M20 x1.5
Direct attachment
30.5
40
164
27
86
150
14
Output (38)
28
Supply (9)
35
39
45
14
Attachment with intermediate
piece for rotary actuators
78.5
50
39
56
58
N1=113
N2=200
Attach. IEC 60534-6 with adapter housing
50
164
27
46
56
86
50
75
82
150
Output 1 (A1)
28.5
28.5
Output 2 (A2)
Supply (Z)
Pneum. connection of reversing amplifier

(1) **EC TYPE EXAMINATION CERTIFICATE**

(2) Equipment and Protective System Intended for Use in Potentially Explosive Atmospheres - Directive 94/9/EC

(3) EC Type Examination Certificate Number

PTB 01 ATEX 2105

(4) Equipment: **Model 3787-1 . . . Positioner**

(5) Manufacturer: SAMSON AG

(6) Address: Weismüllerstraße 3,
D-60314 Frankfurt am Main, Germany

(7) This equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) The Physikalisch-Technische Bundesanstalt, notified body number 0102 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March, 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given i Annex II to the Directive.

The examination and test results are recorded in confidential report No. **PTB Ex 01-21074**.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with

EN 50014: 1997+A1+A2 EN 50020: 1994

(10) If the sign "X" places after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) According to the Directive 94/9/EG, this EC Type EXAMINATION CERTIFICATE relates only to the design and construction of the specified equipment. If applicable, further requirements of this Directive apply to the manufacture and supply of the equipment.

(12) The marking of the equipment shall include the following:

II 2 G EEx ia IIC T6

Zertifizierungsstelle Explosionsschutz
By order

Braunschweig, 06 August 2001

(Signature) (Seal)

Dr.-Ing. U. Johannsmeyer
Oberregierungsrat

Physikalisch-Technische Bundesanstalt
Braunschweig and Berlin

(13) **S c h e d ul e**

(14) **EC TYPE EXAMINATION CERTIFICATE No. PTB 01 ATEX 2105**

(15) **Description of Equipment**

The Model 3787-1 . . . Positioner is a bus powered field device with communication capability intended for attachment to pneumatic control valves.
Communiction is optionally either according to the FOUNDATION^{TM} Fieldbus Specification or according to the FISCO Concept.
The Model 3787-1 . . . Positioner is a passiv two-terminal network that may be connected to any certified intrinsically safe circuit, provided the permissible values of U_i, I_i and P_i are not exceeded.

For pneumatic auxiliary power non-combustble media are used.

The device is intended for use inside and outside of hazardous area.

The correlation between temperature classification and the permissible ambient temperature ranges is shown in the table below:

EEx ia IIC/IIB	Permissible ambient temperature range
T6	+60°C
T5	-40°C ≤ T ≤ +70°C
T4	+80°C

The correlation between temperature classification and the permissible ambient temperature ranges maximum short-circuit currents and maximum power for analyzers is shown in the table below

Schedule to the EC Type Examination Certificate No. PTB 01 ATEX 2105

Temperature class	Permissible ambient temperature range	I_o / P_o
T6 T5 T4	+45°C -40°C ≤ T_a ≤ +60°C +75°C	52mA / 169mW
T6 T5 T4	+60°C -40°C ≤ T ≤ +80°C +80°C	25mA / 64mW

Electrical Data

Bus connection signal circuit ....Type of protection. Intrinsic safety EEx ia IIC
(terminals 11/12) or EEx ia IIB

only for connection to a certified intrinsically safe circuit.

The correlation between the type of protection and the electrical data is shown in the table below:
Maximum values:

FOUNDATION^{TM} Fieldbus	
EEx ia IIC	**EEx ia IIB**
U_i = 24V DC I_i = 360mA P = 1,04W	U_i = 24V DC I_i = 380mA P = 2,58W
FISCO Concept	
U = 20V DC I_i = 360mA P_i = 1,54W	U = 24V DC I_i = 380mA P_i = 2,58W
C_i = 5 nF; L_i = 10 μH	

Schedule to the EC Type Examination Certificate No. PTB 01 ATEX 2105

Limit switches
(terminals 41/42 and 51/52)

Type of protection: Intrinsic safety EEx ia IIC or EEx ia IIB

Only for connection to a certified intrinsically safe circuit.

Maximum values:

U_i = 16 V
I_i = 52 mA
P_i = 169 mW

The effective internal capacitance is C_i = 60 nF
The effective internal inductance is L = 200 μH
or

U = 16 V
I = 25 mA
P_i = 64 mW

The effective internal capacitance is C_i = 60 nF
The effective internal inductance is L = 200 μH

Forced venting function
(terminals 81/82)

Type of protection. Intrinsic safety EEx ia IIC or EEx ia IIB

Only for connection to a certified intrinsically safe circuit.

Maximum Values:

U_i = 28 V
I = 115 mA
P_i = 0,5W

The effective internal capacitance is C_i = 5 nF
The effective internal inductance is negligible.

Binary input
(terminals 85/86)

Type of protection: Intrinsic safety EEx ia IIC or EEx ia IIB

Maximum Values:

U_o = 5.88 V
I_o = 1 mA
P = 7,2 mW

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

PTB

Schedule to the EC Type Examination Certificate No. PTB 01 ATEX 2105

The correlation between the typ of protection and the permissible maximum allowed capacitance and the inductance is shown in the table below:

Maximum values:	
EEx ia IIC	**EEx ia IIB**
C_o = 43μF L_o = 1 H	C_o = 1000μF L_o = 1 H

Programming jack

Type of protection: Intrinsic safety EEx ia IIC

Maximum values:

U_o = 5,88 V
I_o = 55 mA
P_o = 298 mW

The effective internal capacitance is C_o = 42μF
The effective internal inductance is L_o = 10 mH

U_i = 20 V
I_i = 60 mA
P_i = 250 mW

C_i negligible, L_i negligible

The rules for interconnecting intrinsically safe circuit shall be complied with.

(16) **Report No.: PTB Ex 01-21074**

(17) **Special conditions for safe use**
non

(18) **Essential Health and Safety Requirements**
In compliance with standards specified above.

Zertifizierungsstelle Explosionsschutz
By order

Braunschweig, 06 August 2001

(Signature) (Seal)
Dr.-Ing. U. Johannsmeyer
Oberregierungsrat

T R A N S L A T I O N

(1) **Statment of Conformity**

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres – **Directive 94/9/EC**

(3) Test Certificate Number

PTB 01 ATEX 2117 X

(4) Equipment: Model 3787-8.. Positioner

(5) Manufacturer: SAMSON AG

(6) Address: Weismüllerstr. 3, D-60314 Frankfurt, Germany

(7) The equipment and any acceptable variation thereof are specified in the schedule to this certificate and the documents referred to therein.

(8) The Physikalisch-Technische Bundesanstalt, certified body number 0102 in according to Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirement relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential report.
PTB Ex 21206.

(9) The Essential Health and Safety Requirements are satisfied by compliance with

EN 50021: 1999

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) In compliance with the Directive 94/9/EC, this Statement of Conformity relates only to the design and construction of the equipment specified. Further requirements of this Directive apply to the manufacture and marketing of the equipment.

(12) The marking of the equipment shall include the following:

II 3 G EEx nA II T6

Zertifizierungsstelle Explosionsschutz
By order

Braunschweig, 05. April 2002

(Signature) (Seal)

Dr. Ing. U. Klausmeyer
Regierungsdirketor

Test Report PTB Ex 01-21206

(13) **S c h e d u l e**

(14) **Statement of Conformity PTB 01 ATEX 2117 X**

(15) **Description of Equipment**

The Model 3787-8.. Positioner is a bus-powered filed device with communication capability intended for attachment to pneumatic control valves.

Communication is optionally either according to the FOUNDATION™ Fieldbus Specification or according to the FISCO Concept.

The device is intended for use inside and outside of hazardous area locations

The correlation between temperature classification and the permissible ambient temperature ranges is shown in the table below:

Temperature classification	Permissible ambient temperature range
T6	60°C
T5	-40°C 70°C
T4	80°C

The same ambient temperature ranges apply to the version with metallic cable entry.

Electrical data

Bus connection, signal circuit (terminals 11/12)	Type of protection EEx nA II
Limit Switches (terminals 41/42 and 51/52)	Type of protection EEx nA II
Forced ventilation (terminals 81/82)	Type of protection EEx nA II
Binary input (terminals 85/86	Type of protection EEx nA II
Serial interface	Type of protection EEx nA II

Test Report PTB Ex 01-21206

(16) **Test-Report PTB Ex 01-21206**

(17) **Special conditions for safe use**

The signal circuit (terminals 11/12 shall be provided with a series connected fuse complying with IEC 60127-2/II 250 V F or IEC 60127-2/VI, 250 V T with a maximum current rating $I_N \leq 200$ mA, to be installed outside of the hazardous location.

The serial interface circuit in the V connection shall be provided with a series-connected fuse complying with IEC 60127-2/II 250 V F or IEC 60127-2/VI 250 V T with a maximum current rating IN ≤ 50 mA, to be installed outside of the hazardous location.

The program interface adapter shall be installed outside of the hazardous location.

The Model 3878-8.. Positioner shall be installed in an enclosure providing at least degree of protection IP 54 in compliance with IEC Publication 60529:1989.

The wiring shall be connected in such a manner that the connection facilities re not subjected to pull and twisting.

(18) **Basic health and Safety Requirements**

Are satisfied by compliance with the standard specified herein.

Zertifizierungsstelle Explosionsschutz Braunschweig, 05 April 2002
By order

(Signature) (seal)

Dr. Ing. U. Klausmeyer
Regierungsdirektor

Installation Manual for apparatus certified by CSA for use in hazardous loctions.

The <u>FISCO Concept</u> allows interconnection of intrinsically safe apparatus to associated apparatus not specifically examined in such combination. The criteria for interconnection is that the voltage **(**U_i**)** the current **(Ii)** and the power **(Pi)** which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal or greater than the voltage **(Uo)** the current **(**I_o**)** and the power **(Po)** levels which can be delivered by the associated apparatus, considering faults and applicable factors. In addition, the maximum unprotected capacitance **(Ci)** and inductance **(Li)** of each apparatus (other than the termination) connected to the fieldbus must be less than or equal to **5 nF** and **10 µH** respectively.

In each segment only one active device, normally the associated apparatus, is allowed to provide the necessary energy for the fieldbus system The allowed voltage **Uo** of the associeted apparatus is limited to the range of **14V DC**. to **24V DC**. All other equipment connected to the bus cable has to be passive, meaning that they are not allowed to provide energy to the system, except to a leakage current of 50 mA for each connected device. Separately powered equipment needs a galvanic isolation to assure that the intrinsically safe fieldbus circuit remains passive.

The cable used to interconnect the devices need to have the parameters in the following range:

Loop resistance R‘:	15 ... 150 Ohm/km
Inductance per unit length L‘:	0,4 ... 1 mH/km
Capacitance per unit length C‘:	80 ... 200 nF/km

C‘ = C‘ line/line + 0,5 C‘ line/screen, if both lines are floating or, C‘ = C‘ line/line + C'line/screen, if the screen is connected to one line

Length of spur cable:	≤ 30 m
Length of trunk cable:	≤ 1 km

At each end of the trunk cable an approved infallible line termination with the following parameters is suitable:

R = 90 ... 100 Ohm C = 0 ... 2,2 µF

One of the allowed terminations might already be intergrated in the associated apparatus.

The number of passive devices connected to the bus segment is not limited due to I.S. reasons. If the above rules are respected, the inductance and capacitance of the cable will not impair the intrinsic safety of the installation.

<u>Notes:</u>

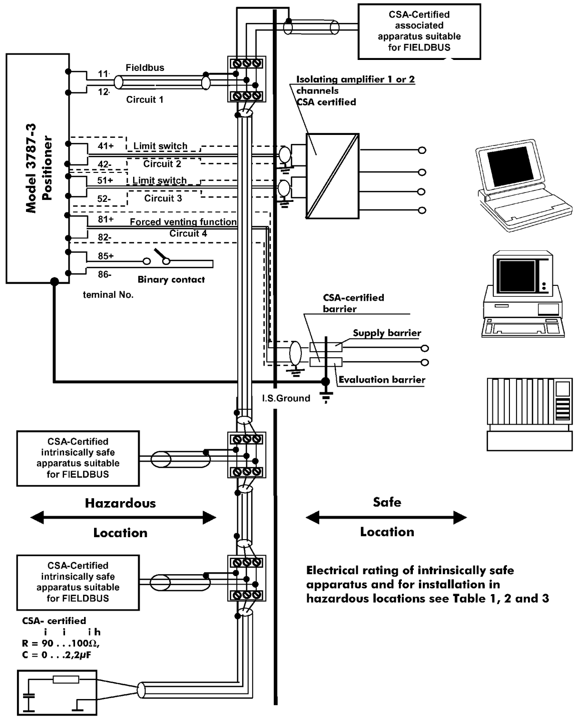
1. Approved associated apparatus must be installed in accordance with manufacturer instructions
2. Approved associated apparatus must meet the following requirements:
   Uo or Voc ≤ Ui or V**max**, **I**o or **Isc ≤** Ii or **I**max, Po ≤ Pi or P**max**
3. The maximum non-hazardous area voltage must not exceed 250 V.
4. The installation must be in accordance with the Canadian Electrical code Part 1.
5. Each set of wires must be provided with grounded shield. The shield must extend asclose to the terminal(s) as possible and it must be grounded shield at I. S. Barrier ground.
6. Caution: Use only supply wires suitable for 5 °C above surrounding.
7. Warning: Substitution of components may impair intrinsic safety. PE = I. S. Ground
8. The polarity for connecting 11 and 12 is of no importance due to an internal rectifier.
9. FISCO concept applies to fieldbus / circuit only.
10. Entity parameters apply to circuit 2, 3 and 4 and further required to meet the following conditions: Co ≥ C_i + C**cable**; Lo ≥ Li + L**cable**

Intrinsically safe if installed as specified in manufactureres installation manual.

<u>**CSA-certified for use in hazardous locations:**</u>

Class I, Zone 0 Ex ia IIC T6
Class I, Division 1, Groups A, B, C, D; Class II, Division 1, Groups F + G

Fieldenclosure: Type 4 Enclosure



Installation Manual for apparatus certified by CSA for use in hazardous loctions.

Electrical rating of intrinsically safe apparatus and apparatus for installation in hazardous locations.

Table 1: Maximum values

	Fieldbus				Limit-switches Induktiv	Forced venting-function	Binary-input	Serial-Interface	
	Entity		FISCO					activ	passive
Circuit No.	1		1		2 and 3	4	5	6	6
Terminal No.	11 / 12		11 / 12		41 / 42 and 51 / 52	81 / 82	85 / 86	plug	
Groups	A, B IIC	C, D IIB	A, B IIC	C, D IIB	#/#	#/#	#/#	#/#	#/#
U_i or V_{max} [V]	24	24	20	24	16	28	V_{0C} 5,88	V_{0C} 5,88	V_{max} 20
I_i or I_{max} [mA]	360	430	360	430	25	115	I_{SC} 1	I_{SC} 55	I_{max} 60
P_i or P_{max} [W]	1,04	2,58	1,54	2,58	64 [mW]	#/#	7,2 [mW]	298 [mW]	250 [mW]
C_i [nF]	5				60	5,3	[43 µF]	[42 µF]	0
L_i [µH]	10				100	0	[1 H]	[10 mH]	0

Notes:

1. Entity parameters must meet the following requirements:

   U_0 or $V_{0C} \le U_i$ or V_{max} , I_0 or $I_{0C} \le I_i$ or I_{max} ,$P_0 \le P_i$ or P_{max}
   C_0 or $C_a \ge C_i + C_{cable}$ and L_0 or $La \ge L_i + L_{cable}$

2. Install in accordance with the Canadian Electrical Code Part I

3. Cable entry M 20 x1,5 or metalconduit acc. to dwg. No. 1050-0539 or 1050-0540

Table 2: CSA – certified barrier parameters of circuit 4

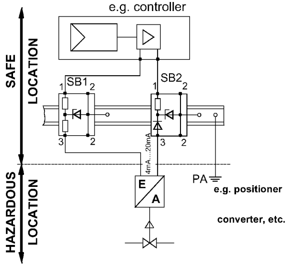
Barrier	Supply barrier				Evaluation barrier		
	V	R	I	P	V	R	I
circuit 4	≤28V	≥300	≤115mA	≤1W	≤28V	#	0mA

The correlation between temperature classification and permissible ambient temperature ranges is shown in the table 3 below:

Table 3:

Temperatur class	Permissble ambient temperature range
T6	+60°C
T5	-40°C ≤ T_a ≤+70°C
T4	+80°C

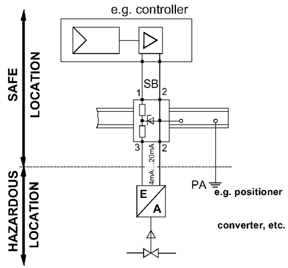
Circuit diagram of a ground- free signal circuit. *(forced venting function circuit 4)*



Ground-free control signal circuit with two barriers

In grounded signal circuits with only one barrier, the return line must be grounded or included in the potential equalization network of the system.

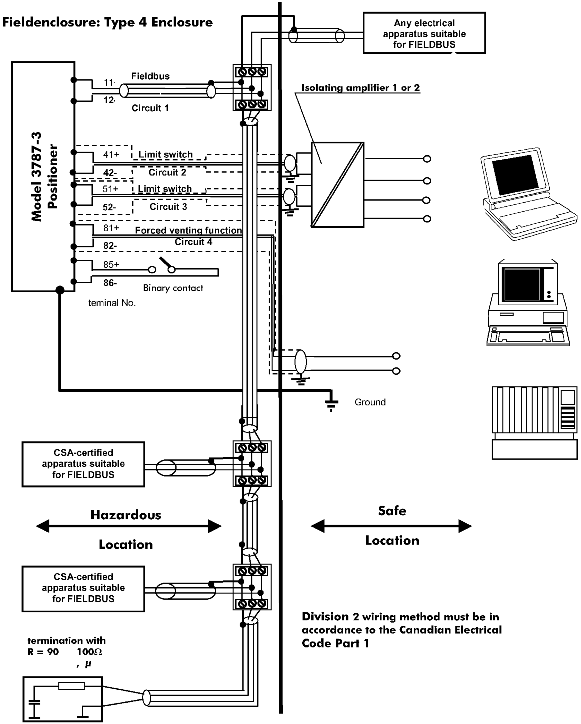
Circuit diagram of a grounded signal circuit ***(forced venting function circuit 4)***



Ground signal circuit with one barriers

CSA certified for hazardous locaions:
Class I, Zone 2, Ex nA IIC T6
Class I, II, Division 2, Groups A, B, C, D, F + G

Fieldenclosure: Type 4 Enclosure



Division 2 wiring method must be in accordance to the Canadian Electrical Code Part 1

Installation Manual for apparatus approved by FM for use in hzardous loctions.

The **FISCO Concept** allows interconnection of intrinsically safe apparatus to associated apparatus not specifically examined ir such combination. The criteria for interconnection is that the voltage **(Ui)** the current **(Ii)** and the power **(Pi)** which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal or greater than the voltage **(U0)** the current **(I0)** and the power **(P0)** levels which can be delivered by the associated apparatus, considering faults and applicable factors. In addition, the maximum unprotected capacitance **(Ci)** and inductance **(Li)** of each apparatus (other than the termination) connected to the fieldbus must be less than or equal to **5 nF** and **10 µH** respectively.

In each segment only one active device, normally the associated apparatus, is allowed to provide the necessary energy for the fieldbus system The allowed voltage **Uo** of the associeted apparatus is limited to the range of **14V DC**. to **24V DC**. All other equipment connected to the bus cable has to be passive, meaning that they are not allowed to provide energy to the system, except to a leakage current of **50 µA** for each connected device. Separately powered equipment needs a galvanic isolation to assure that the intrinsically safe fieldbus circuit remains passive.

The cable used to interconnect the devices need to have the parameters in the following range:

Loop resistance R':	15 ... 150 Ohm/km
Inductance per unit length L':	0,4 ... 1 mH/km
Capacitance per unit length C':	80 ... 200 nF/km

C' = C' line/line + 0,5 C' line/screen, if both lines are floating or, C' = C' line/line + C'line/screen, if the screen is connected to one line

Length of spur cable:	≤ 30 m
Length of trunk cable:	≤ 1 km

At each end of the trunk cable an approved infallible line termination with the following parameters is suitable:

R = 90 ... 100 Ohm C = 0 ... 2,2 µF

One of the allowed terminations might already be intergrated in the associated apparatus.

The number of passive devices connected to the bus segment is not limited due to I.S. reasons. If the above rules are respected, the inductance and capacitance of the cable will not impair the intrinsic safety of the installation.

Notes:

1. Approved associated apparatus must be installed in accordance with manufacturer instructions
2. Approved associated apparatus must meet the following requirements:

   Uo or Voc or Vt ≤ Ui or Vmax, Io or Isc or Ii or Imax, Po or Pmax ≤ Pi or Pmax
3. The maximum non-hazardous area voltage must not exceed 250 V.
4. The installation must be in accordance with the National Electrical Code (ANSI/NFPA 70) and (ANSI/ISA RP 12.06.01)
5. Each set of wires must be provided with grounded shield. The shield must extend asclose to the terminal(s) as possible and it must be grounded shield at I. S. Barrier ground.
6. Caution: Use only supply wires suitable for 5 °C above surrounding.
7. Warning: Substitution of components may impair intrinsic safety. PE = I. S. Ground
8. The polarity for connecting 11 and 12 is of no importance due to an internal rectifier.
9. FISCO concept applies to fieldbus / circuit only.
10. Entity parameters apply to circuit 2, 3 and 4 and further required to meet the following conditions: Co ≥ C_i + Ccable; Lo ≥ Li + Lcable

Installation Manual for apparatus approved by FM for use in hazardous loctions.

Electrical rating of intrinsically safe apparatus and apparatus for installation in hazardous locations.
Maximum values

Table 1:

	Fieldbus				Limit-switches Induktiv	Forced venting-function	Binary-input	Serial-Interface	
	Entity		FISCO					activ	passive
Circuit No.	1		1		2 and 3	4	5	6	6
Terminal No.	11 / 12		11 / 12		41 / 42 and 51 / 52	81 / 82	85 / 86	plug	
Groups	A, B IIC	C, D IIB	A, B IIC	C, D IIB	#/#	#/#	#/#	#/#	#/#
U_i or V [V]	24	24	20	24	16	28	V_{0C} 5,88	V_{0C} 5,88	V_{max} 20
I_i or I_{max} [mA]	360	430	360	430	25/52	115	I_{SC} 1	I_{SC} 55	I_{max} 60
P_i or P_{max} [W]	1,04	2,58	1,54	2,58	64/169 [mW]	#/#	7,2 [mW]	298 [mW]	250 [mW]
C_i [nF]	5				60	5,3	[43 µF]	[42 µF]	0
L [µH]	10				100	0	[1 H]	[10 mH]	0

Notes:

1. Entity parameters must meet the following requirements:

   U_0 or V_{0C} or V ≤ U or V , I_0 or I_{0C} or I ≤ I or I , P_0 or P ≤ P or P
   C_a ≥ C_i + C_{cable} and L_a ≥ L_i + L_{cable}

2. Installation must be in accordance with the National Electrical Code ANSI/NFPA 70 and ANSI/ISA RP 12.06.01

3. Cable entry metal conduit acc. to dwg. No. 1050-0539 or 1050-0540 ½-14NPT (standard) optional M 20 x 1,5

Installation Manual for apparatus approved by FM for use in hazardous loctions.

Electrical rating of intrinsically safe apparatus and apparatus for installation in hazardous locations.
Maximum values

Table 1:

	Fieldbus				Limit-switches Induktiv	Forced venting-function	Binary-input	Serial-Interface	
	Entity		FISCO					activ	passive
Circuit No.	1		1		2 and 3	4	5	6	6
Terminal No.	11 / 12		11 / 12		41 / 42 and 51 / 52	81 / 82	85 / 86	plug	
Groups	**A, B IIC**	**C, D IIB**	**A, B IIC**	**C, D IIB**	**#/#**	**#/#**	**#/#**	**#/#**	**#/#**
U_i or V [V]	24	24	20	24	16	28	**V_{OC}** 5,88	**V_{OC}** 5,88	**V_{max}** 20
I_i or I_{max} [mA]	360	430	360	430	25/52	115	**I_{SC}** 1	**I_{SC}** 55	**I_{max}** 60
P_i or P_{max} [W]	1,04	2,58	1,54	2,58	64/169 [mW]	**#/#**	7,2 [mW]	298 [mW]	250 [mW]
C_i [nF]	5				60	5,3	[43 µF]	[42 µF]	0
L [µH]	10				100	0	[1 H]	[10 mH]	0

Notes:

1. Entity parameters must meet the following requirements:

   U_0 or V_{0C} or V ≤ U or V , I_0 or I_{0C} or I ≤ I or I , P_0 or P ≤ P or P
   C_a ≥ C_i + C_{cable} and L_a ≥ L_i + L_{cable}

2. Installation must be in accordance with the National Electrical Code ANSI/NFPA 70 and ANSI/ISA RP 12.06.01

3. Cable entry metal conduit acc. to dwg. No. 1050-0539 or 1050-0540 ½-14NPT (standard) optional M 20 x 1,5

FM – Approved barrier parameters of circuit 4

Table 2:

Barrier	Supply barrier				Evaluation barrier		
	V	**R**	**I**	**P**	**V**	**R**	**I**
circuit 4	≤28V	≥300Ω	≤115mA	≤1W	≤28V	#	0mA

The correlation between temperature classification and permissible ambient temperature ranges is shown in the table 3 below:

Table 3:

Temperatur classification	Permissble ambient temperature range
T6	+60°C
T5	-40°C ≤ T_a ≤+70°C
T4	+80°C

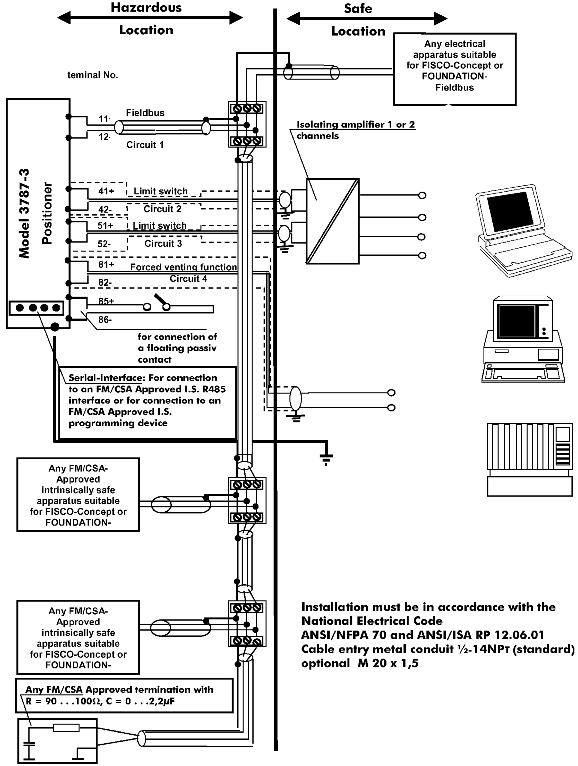
For the Model 3787–32 . . . Positioner the correlation between temperatur classification, permissible ambient temperature ranges and maximum short- circuit current and the permissible maximum power P_{max} is shown in the table 4 below:

Table 4:

Temperture class	Permissible ambient temperature range	Maximum short-circuit current and the maximum power
T6	- 40°C ... 45°C	52mA/169mW
T5	- 40°C ... 60°C	
T4	- 40°C ... 75°C	
T6	- 40°C ... 60°C	25mA/64mW
T5	- 40°C ... 80°C	
T4	- 40°C ... 80°C	

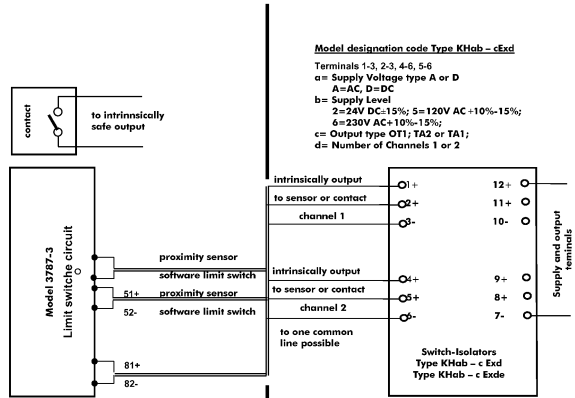
FM-Approved for hazardous locations:
Class I, Zone 2, A Ex nA IIC T6
Class I, II, Division 2, Groups A, B, C, D, F + G

Field enclosure: NEMA Type 4X



Installation must be in accordance with the National Electrical Code
ANSI/NFPA 70 and ANSI/ISA RP 12.06.01
Cable entry metal conduit ½-14NPT (standard) optional M 20 x 1,5

Installation drawing Control Relay Hab – cEx de with proximity sensors typ SJ-b-N



Model designation code Type KHab – cExd

Terminals 1-3, 2-3, 4-6, 5-6
a= Supply Voltage type A or D
A=AC, D=DC
b= Supply Level
2=24V DC±15%; 5=120V AC +10%-15%;
6=230V AC+10%-15%;
c= Output type OT1; TA2 or TA1;
d= Number of Channels 1 or 2

Model designation code Type KHab – cExde

a= Supply Voltage type A or D
A=AC, D=DC
b= Supply Level
2=24V DC±15%; 5=120V AC +10%-15%;
6=230V AC+10%-15%;
c= Output type RTA/; RW1/; SS1/; SS2/; RS1/; SR/; ST-or SOT
d= Number of Channels 1 or 2
e= Power rail designation, P, 2S.P or GS.P (includes Model KHD2-EB-PB Power Feed Modul) or Blank

maximum capacitance of each inductive sensor 60nF
maximum inductance of each inductive sensor 200µH

The total series inductance and shunt capacitance of shield wiring must be restricteto the following maximum values

Terminal No. y	Groups	[mH]	[µF]	[V]	[mA]
1-3; 2-3 4-6; 5-6	C + E	299	3,82	12,9	19,8
	D F G	744	10 2		

SAMSON AG · MESS- UND REGELTECHNIK
Weismüllerstraße 3 · 60314 Frankfurt · Germany
Phone: +49 69 4009-0 · Fax: +49 69 4009-1507
Internet: http://www.samson.de

S/Z 2004-02

Mounting and Operating Instructions

Solenoid Valves Type 3963

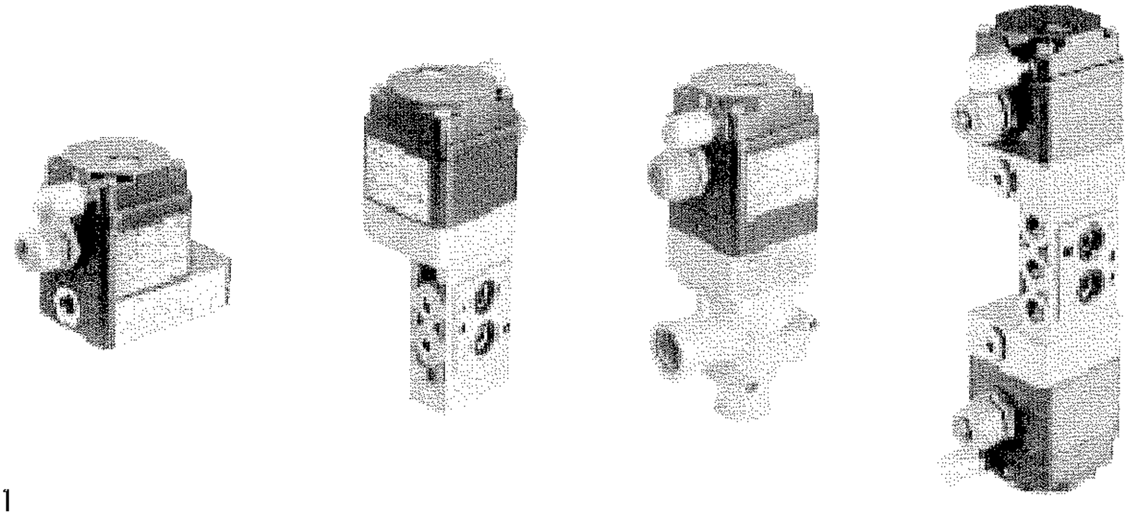


Fig. 1

General

Assembly, commissioning and operation of these devices may only be performed by experienced personnel. Proper shipping and appropriate storage are assumed.
The air supply may not exceed the maximum permissible pressure and, if necessary, it must be limited by a pressure reducer.

The devices can be mounted in any desired position. The filter in the enclosure cover and the cable gland Pg 13.5 must be installed hanging downwards, or if this is not possible, horizontally.
On mounting, it is important that a clearance of ≥ 300 mm above the enclosure cover is kept.
If the device is mounted to a rotary actuator or linear actuator with positioner, it is necessary to change over the air supply to an external supply at connection 9 (see page 7 ff.).
The minimum permissible ambient temperature is −25 °C (for Type 3963-....0/-....2 and 3756-1203/-6203) and −40 °C (for Type 3963-....1/-....3 and 3756-1213/-6213/-3.../-8...).

The maximum permissible ambient temperature of +80 °C is lowered for intrinsically safe devices in accordance with the Certificate of Conformity PTB No. Ex-90.C.2100 (see page 10).
Technical data, ordering data, spare parts and accessories see Data Sheet T 963 EN.

Contents

Mounting

Mounting rails

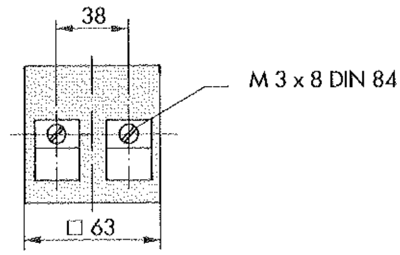
▶ Type 3963-..14/-..27/-..28/-..54/-..64
These devices can be attached with two mounting bases for G-profile 32 according to EN 50035 or top hat rail 35 according to EN 50022 (Fig. 2).

Wall mounting

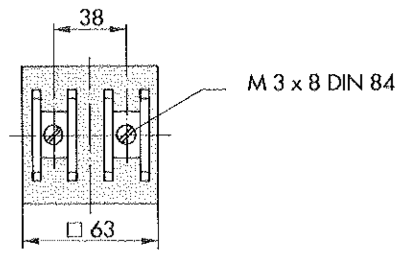
▶ Type 3963-..14/-..27/-..28/-..54/-..64
These devices can be attached to a wall mounting plate (Fig. 2).

▶ Type 3963-..25, combined with
Type 3756-1203/-6203/-1213/-6213
▶ Type 3963-..76, combined with
Type 3756-3205/-8205/-3206/-8206/
-3325/-8325/-3335/-8335/
-3345/-8345/-3355/-8355
These devices can be attached with screws through bore holes (Fig. 3).

Mounting base for G-profile 32 (Order No. 1400-5930)



Mounting base for top hat rail 35 (Order No. 1400-5931)



Wall mounting plate (Order No. 1400-6726)

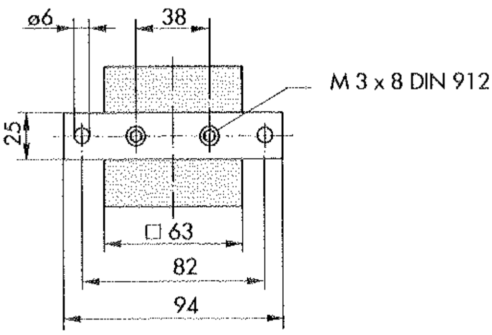
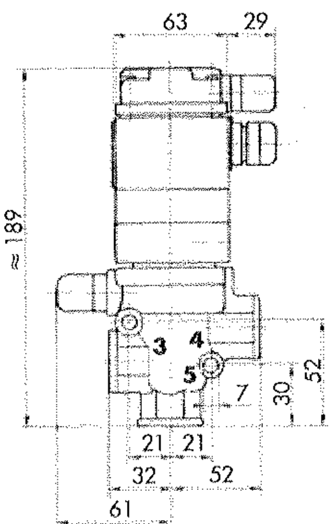


Fig. 2 · Dimensions in mm

Type 3963-..25, combined with Type 3756-1203/-6203/-1213/-6213



Type 3963-..76, combined with Type 3756-3205/-8205/-3206/-8206/ -3325/-8325/-3335/-8335/ -3345/-8345/-3355/-8355

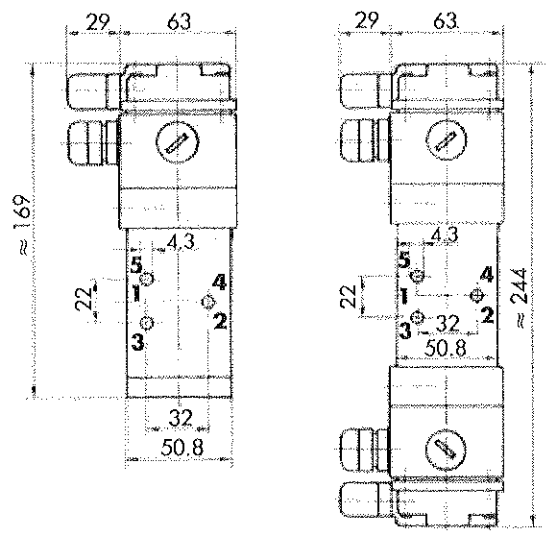


Fig. 3 · Dimensions in mm

Mounting to rotary actuators with NAMUR interface according to VDI/VDE 3845

- Type 3963-..11/-..12/-..21/-..22/-..23/ -..52/-..62
- Type 3963-..76, combined with Type 3756-3207/-8207/-3208/-8208/ -3327/-3827/-3337/-3837/ -3347/-3847/-3357/-3857

These devices can be directly attached to rotary actuators with NAMUR interface (Fig. 4). Before mounting, check that the two O rings are positioned correctly. The operation direction is determined by a threaded coding pin M 5×10 DIN 916 on the mounting flange of the rotary actuator. The device is attached with two screws M 5×35 DIN 912. The mounting accessories are delivered together with the device.

Mounting to restrictor block for rotary actuators with NAMUR interface according to VDI/VDE 3845

- Type 3963-..76, combined with Type 3756-3207/-8207/-3208/-8208

These devices can be attached to a restrictor block for rotary actuators with NAMUR interface (Fig. 5). The restricting function can be identified from the symbol indicated on the device. Different closing and opening times can be adjusted in a ratio of 1:15 by turning the restricting screws to the left or to the right respectively with a screw driver.

NAMUR interface according to VDI/VDE 3845

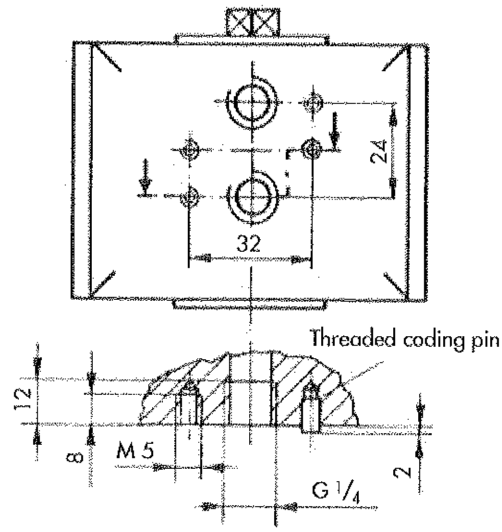
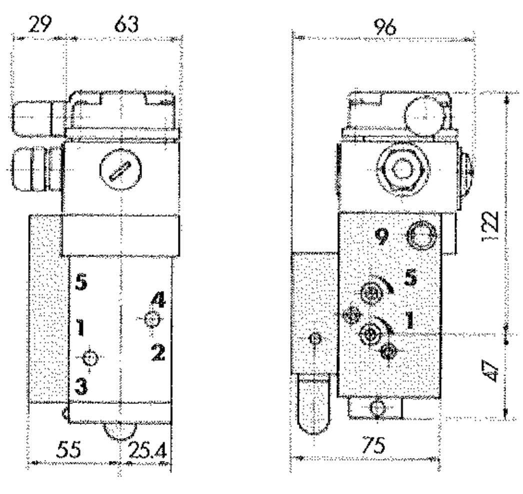


Fig. 4 · Dimensions in mm

Mounting to restrictor block for single-acting rotary actuators (Order No. 1400-6763)



Mounting to restrictor block for double-acting rotary actuators (Order No. 1400-6764)

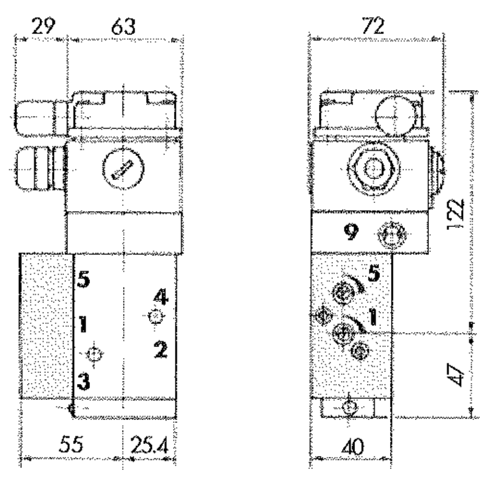


Fig. 5 · Dimensions in mm

Mounting with adapter plate to linear actuators with NAMUR rib according to DIN IEC 534

- Type 3963-..11/-..12/-..21/-..22/-..23/ -..52/-..62
- Type 3963-..76, combined with Type 3756-3207/-3208

These devices can be mounted with an adapter plate (Fig. 6) to linear actuators with NAMUR rib. When positioners or limit switches with long lever are to be mounted on linear actuators ≤DN 50 at the same time a bracket (Order No. 0320-1416) is required.

Mounting with screwed pipe connection of CrNiMo to linear actuators

- Type 3963-..27/-..28/-..54
- Type 3963-..25, combined with Type 3756-1203/-1213
- Type 3963-..76, combined with Type 3756-3205/-3206

These devices can be mounted with a screwed pipe connection to linear actuators, e. g. SAMSON Type 271 or 3277 (Fig. 7). Mounting instructions for SAMSON devices see Mounting and Operating Instructions EB 8310 EN and EB 8311 EN.

Adapter plate
NAMUR rib/NAMUR interface
(Order No. 1400-6751)

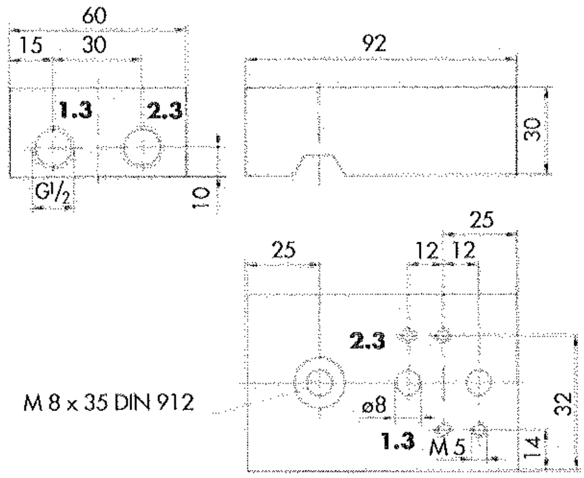
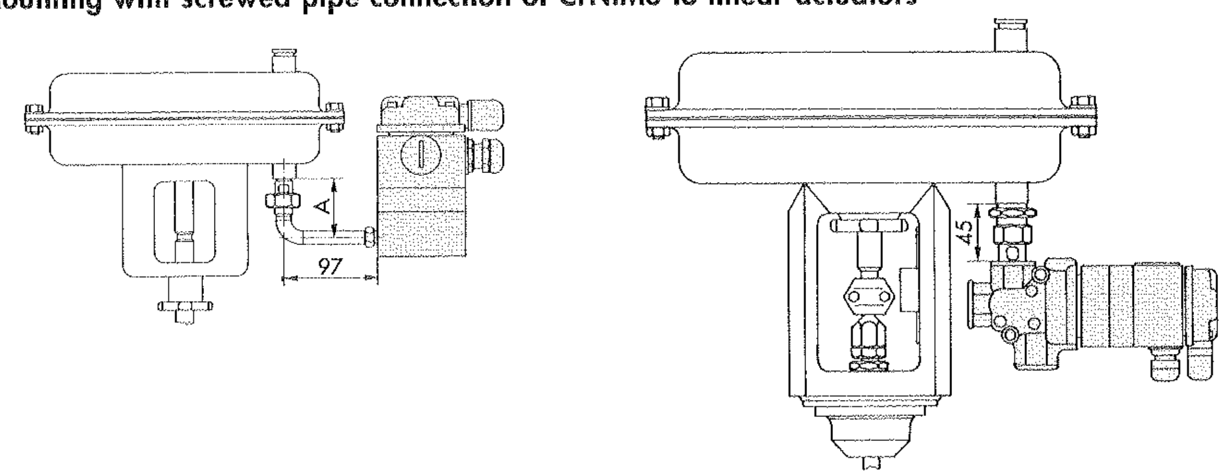


Fig. 6 · Dimensions in mm

Mounting with screwed pipe connection of CrNiMo to linear actuators



Actuator size	Connection	A	Order No.
80/240 cm²	G 1/4 / 1/4	64	**1400-6759**
350/700 cm²	G 3/8 / 1/4	75	**1400-6761**
	G 3/8 / 1/2	64	**1400-6735**

Actuator size	Connection	Order No.
1400 cm²	G 3/4 / 1/2	**1400-6736**
2100 cm²	G 1 / 1/2	**1400-6737**
2800 cm²		

Fig. 7 · Dimensions in mm

Mounting to connection block for Linear Actuator SAMSON Type 3277

▶ Type 3963-..29/-..55
These devices can be mounted to connection block for Linear Actuator SAMSON Type 3277 with Positioner SAMSON Type 3766, 3767 or 3780 (Fig. 8). Before mounting, check that the four O-rings are positioned correctly on the mounting flange. The device is attached with two screws M 5 ×60 DIN 912. The mounting accessories are delivered together with the device. Mounting instructions for SAMSON devices see Mounting and Operating Instructions EB 8311 EN, EB 8355 EN and EB 8380 EN.

Mounting to linear actuators with NAMUR rib according to DIN IEC 534

▶ Type 3963-..53
These device can be directly mounted to a linear actuator with NAMUR rib. The device is attached with one screw M 8 ×45 DIN 912 which is delivered with the device.

Mounting to connection block for Linear Actuator SAMSON Type 3277

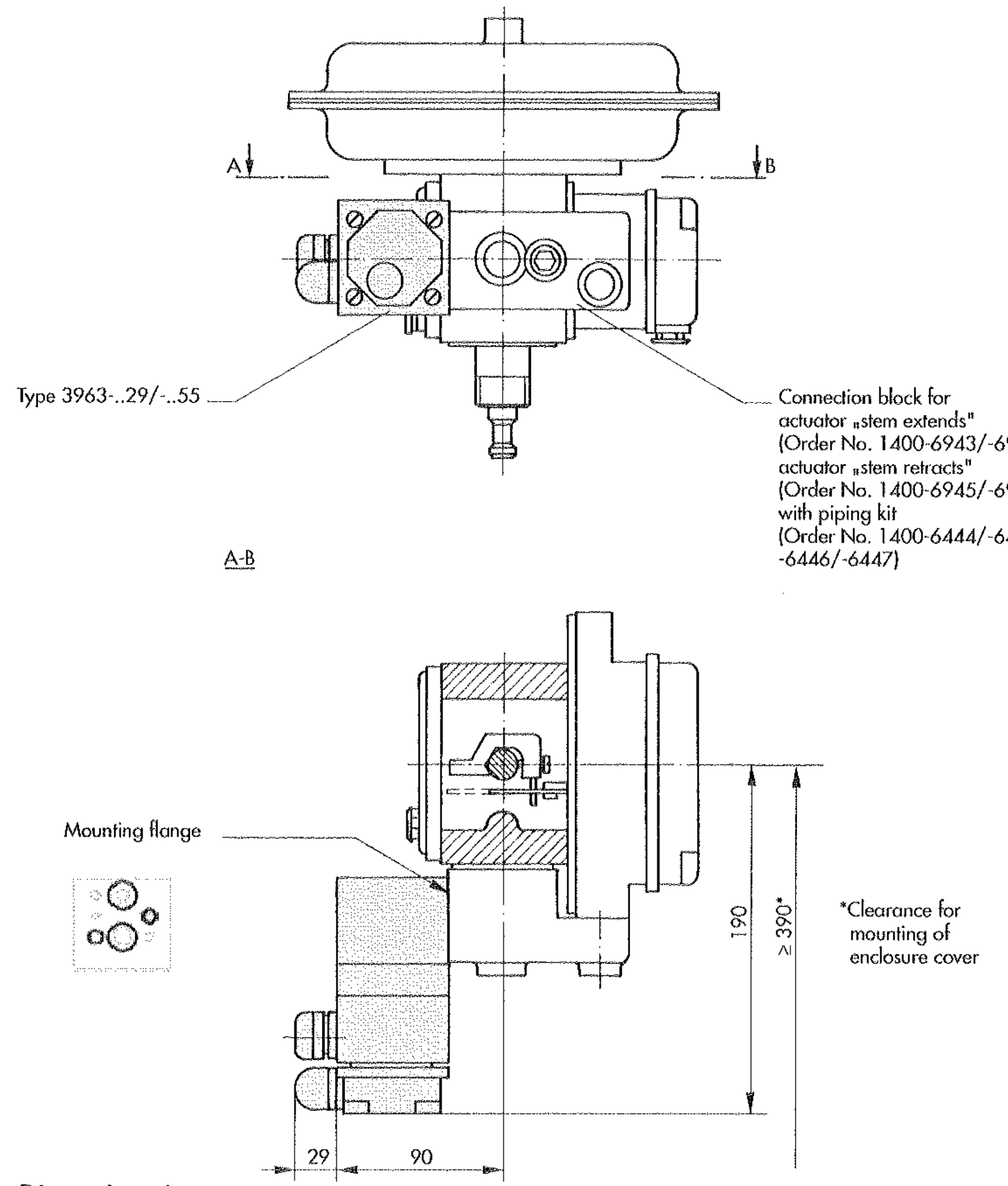


Fig. 8 · Dimensions in mm

Air connection

The air supply pipes and screw joints may only be laid and assembled by experienced personnel. They must be regularly checked for leaks and damage, and if necessary, repaired. Before starting any repair work, all supply pipes which are to be opened must be depressurized.

The air connections are G (NPT) $^{1}/_{4}$ or G (NPT) $^{1}/_{2}$ tapped holes depending on the version.

Note: The K_{vs} value of a pressure reducer connected upstream must be at least 1.6 times larger than the K_{vs} value of the device.

Supply pipe

Nominal size (Supply pipe length ≤2 m)				
Press-ure	K_{vs} value			
	0.16 0.32	1.4	4.3	–
	Connection			
(bar)	4	1 and 3	4	9
≥1.4	≥DN 6	≥DN 8	≥DN 10	≥DN 4
≥2.5	≥DN 4	≥DN 6	≥DN 8	
≥6		≥DN 4	≥DN 6	

Note: For supply pipes length ≥2 m larger nominal sizes must be provided.

▶ Type 3963-..25, combined with Type 3756-1203/-6203/-1213/-6213

With the above listed devices, it is possible to check whether the nominal size of the supply pipe is sufficient as follows:

1. Unscrew the screw plug covering connection 9 and connect a pressure gauge.
2. The nominal size of the supply pipe proves to be sufficient when there is a pressure of ≥1.3 bar during the switching process.

Air supply instrument air 1.4 ... 6 bar			
Ambient temperature (°C)	Particle size (µm)	Dew point (°C)	Oily residues (mg/m^3)
+15 ... +35	≤5	+10	≤0.1
–15		–20	
–32		–40	
–60		–70	

Working medium

Instrument air 1.4 ... 6 bar for internal air supply (as-delivered condition).

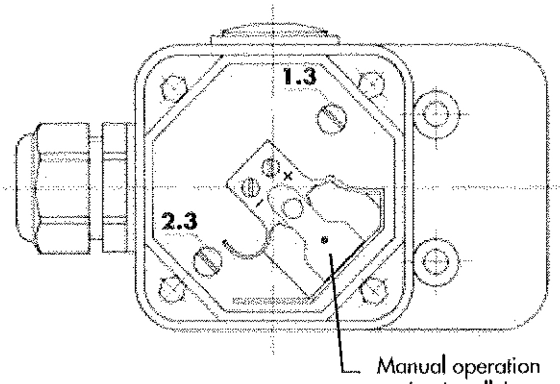
Instrument air, oil-containing air or non-aggressive gases of 0 ... 6 bar (10 bar with Type 3756) for external air supply across connection 9 (see page 7 ff.).

Exhaust air restrictors

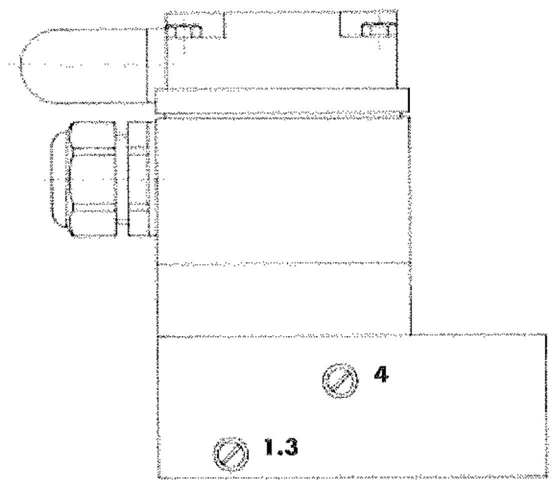
▶ Type 3963-..12/-..22/-..23/-..28/-..29

These devices have one or two exhaust air restrictors. The restricting function can be identified from the symbol indicated on the device. Different closing and opening times can be adjusted in a ratio of 1:15 by turning restricting screws to the right or to the left respectively with a screw driver. The restricting screws can be found underneath the enclosure cover or at the adapter plate (Fig. 9).

Setting of the exhaust air restrictors



Type 3963-..12/-..22/-..28/-..29



Type 3963-..23

Fig. 9

Conversion to external air supply across connection 9

▶ Type 3963-..25, combined with
Type 3756-1203/-6203/-1213/-6213

To these devices air supply in the as-delivered condition is to be connected internal via connection 4. Conversion to external air supply via connection 9 is effected as follows:

1. Remove pilot valve enclosure cover after removal of four filister head screws.
2. Remove pilot valve from booster valve after removal of three hexagon socket head screws.
3. Remove plate with flat gasket [1] after removal of a filister head screw (Fig. 10).
4. Turn flat gasket [1] by 90°. After assembly, the **tab** of the gasket [1] is **not visible from the outside.**
5. Conversion to external air supply is determined only by turning the flat gasket [1]. Prior to assembly, install flat gasket [3] between pilot valve and booster valve as follows (Fig. 12):
   Type 3963 with index -01, -02, -04 and -06
   The **white mark in the slots** of the flat gasket [3] is **not visible.**
   Type 3963 with index -03, -05 and -10
   The **tab** of the flat gasket [3] is placed **in cutout "Int" of the enclosure.**

▶ Type 3963-..76, combined with
Type 3756-3205/-8205/-3206/-8206/
-3207/-8207/-3208/-8208/
-3325/-8325/-3327/-8327/
-3335/-8335/-3337/-8337/
-3345/-8345/-3347/-8347/
-3355/-8355/-3357/-8357

To these devices air supply in the as-delivered condition is to be connected internal via connection 1 or 3. Conversion to external air supply via connection 9 is effected as follows:

1. Remove plate with flat gasket [2] from the connecting plate after removal of a filister head screw.
2. Turn flat gasket [2] by 180°. The **tab** of flat gasket [2] is then placed **in cutout "9" of the connecting plate** (Fig. 11).

Note: In the case of bilaterally actuated booster valves, both pilot valves must be converted.

Installation of flat gasket [1]

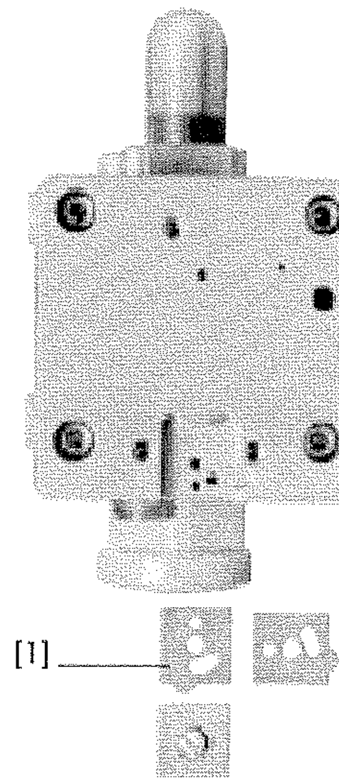


Fig. 10

Installation of flat gasket [2]

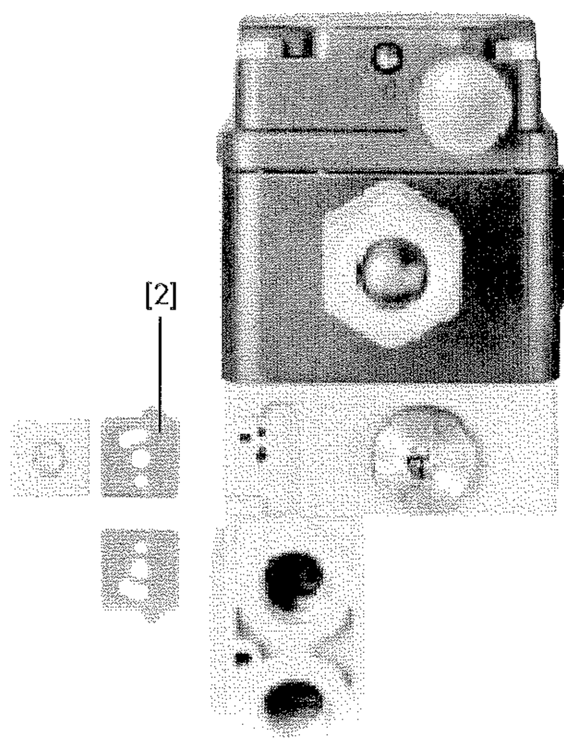


Fig. 11

▶ Type 3963-..14/-..52/-..53/-..54
To these devices air supply in the as-delivered condition is to be connected internal via connection 4. Conversion to external air supply via connection 9 is effected as follows:

1. Remove enclosure cover after removal of four filister head screws.
2. Remove solenoid valve from adapter plate after removal of three hexagon socket head screws.
   Type 3963 with index -01, -02, -04 and -06
3. Turn flat gasket [3] by 180°. The **white mark** is then **visible in the slots** (Fig. 12).
   Type 3963 with index -03, -05 and -10
   Turn flat gasket [3] by 180°. The **tab** of the flat gasket [3] is then placed **in cutout "9" of the enclosure** (Fig. 12).

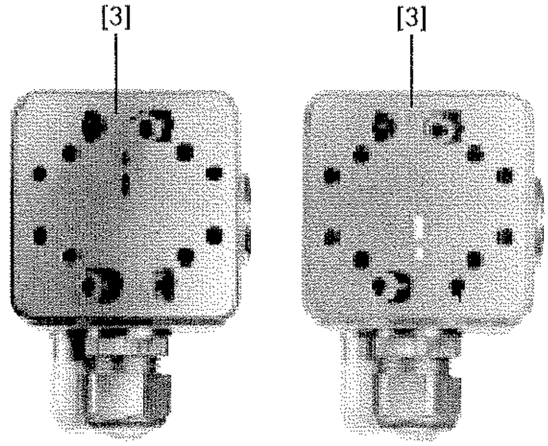
▶ Type 3963-..11/-..12/-..21/-..22/-..27/
-..28/-..29/-..55/-..62
To these devices the air supply cannot be changed. The flat gasket [3], if provided, must be installed in accordance with the as-delivered condition (Fig. 12).

Exhaust air return

▶ Type 3963-..76, combined with
Type 3756-3206/-8206
To these devices, in the as-delivered condition connection 4 is closed with a threaded plug. If the exhaust air return is used for spring-loaded actuators, the threaded plug must be removed and connection 4 must be connected to the spring chamber of the actuator by a hose with nominal size DN 4 to 10 (depending on the actuator size).

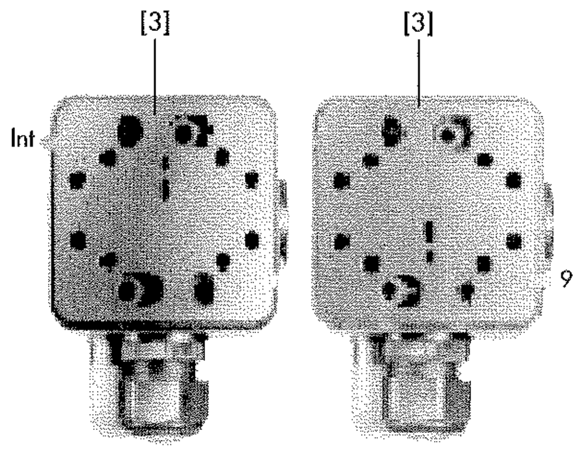
Installation of flat gasket [3]

Type 3963 with index -01, -02, -04 and -06



Internal air supply via connection 4 (as-delivered condition) | External air supply via connection 9

Type 3963 with index -03, -05 and -10



Internal air supply via connection 4 (as-delivered condition) | External air supply via connection 9

Fig. 12

Electrical connection

As far as the electrical installation of the device is concerned, the relevant VDE regulations and the accident prevention regulations of the employers' liability insurance association must be observed.
For installation in hazardous areas, the respective national regulations of the country in which the device is to be used must be observed. In Germany this is VDE 0165.
When connected to DC voltage signals, correct polarity must be ensured.
For connection of intrinsically safe circuits, the Certificate of Conformity PTB No. Ex-90.C.2100 applies **(see page 10).**
The coated screws in the enclosure may not be tampered with.

The power supply is connected, depending on version, either through a cable gland Pg 13.5 to the terminals in the enclosure, with a Harting connector, a socket in accordance to DIN 43 650 or a cable socket M 12×1 (Fig. 13).

Cable

It is recommended that connecting cables with a conductor cross-section of ≥ 0.5 mm^2 are used. Connecting cables with an external diameter of 6 ... 12 mm are suitable for the cable gland Pg 13.5.

Degree of protection

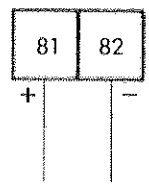
The devices can be changed from degree of protection IP 54 (Order No. 8504-0066) to degree of protection IP 65 (Order No. 1099-1103) by exchanging the filter in the enclosure cover.

Manual operation

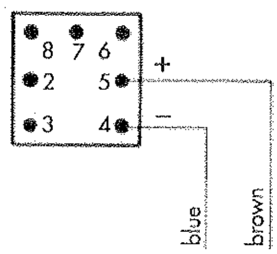
The devices have a manual operation as an alternative to allow the device to be manually operated when a nominal signal is not available:
- Switch outside of the enclosure
- Push button outside of the enclosure
- Switch in the enclosure cover
- Pushbutton underneath enclosure cover (see page 6, fig. 9)

Note: For **safety circuits,** only devices **without manual operation** should be used.

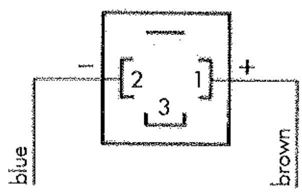
Connection diagrams



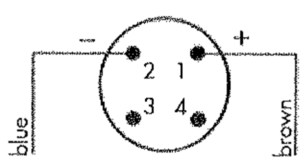
Terminals in the enclosure



Harting connector



Socket in accordance to DIN 43 650



Cable socket M 12×1

Fig. 13

Certificate of Conformity PTB No. Ex-90.C.2100 (Extract)

for the electric apparatus Solenoid Valve Type 3963-1... index -02 and -03

Class EEx ia IIC T6

dated 06.09.1990
1. Addendum dated 28.06.1991
2. Addendum dated 11.04.1994
3. Addendum dated 10.10.1995

The following table shows the maximum permissible ambient temperature within the temperature classes:

Nominal signal	Type	Permissible maximum ambient temperature T 6	T 5	T 4
6 V	3963-11	+60 °C	+70 °C	+80 °C
12 V	3963-12			
24 V	3963-13			
22 mA	3963-14			
7.5 V	3963-17	+65 °C	+80 °C	

Note: Minimum permissible ambient temperature −45 °C. This is limited to −25 °C (for Type 3963-1...0/-1...2) and −40 °C (for Type 3963-1...1/-1...3) due to the materials used.

To connect to a certified intrinsically safe electric circuit, refer to the maximum permissible values for voltage U_0, current I_k and power P in the following table:

Type	**3963-11**		**3963-12**		**3963-13**			**3963-14**		**3963-17**	
U_0 (V)	13	27	25	28	32	32	28	8	15	28	32
I_k (mA)	150	125	150	115	70	90	115	150	200	115	90
P (mW)	*)	400	*)	400	*)	250	*)	*)	400	*)	350

*) No power limit

Note: Internal capacitance and internal inductance are negligible.

Certificate of Conformity PTB No. Ex-90.C.2100 (Extract)

for the electric apparatus Solenoid Valve Type 3963-1... index -04 and up

Class EEx ia IIC

4. Addendum dated 11.07.1997

The following table shows the maximum permissible ambient temperature within the temperature classes:

Temperature class		T6	T5	T4
Ambient temperature	maximum	+60 °C	+70 °C	+80 °C
	minimum	−45 °C *)		

*) Limited to −25 °C (for Type 3963-1...0/-1...2) and −40 °C (for Type 3963-1...1/-1...3) due to the materials used.

To connect to a certified intrinsically safe circuit, refer to the maximum permissible values for voltage U_0, current I_0 and power P in the following table:

U_0 (V)	25 V	27 V	28 V	30 V	32 V
I_0 (mA)	150 mA	125 mA	115 mA	100 mA	90 mA
P	no power limit				

Note: Internal capacitance and internal inductance are negligible.

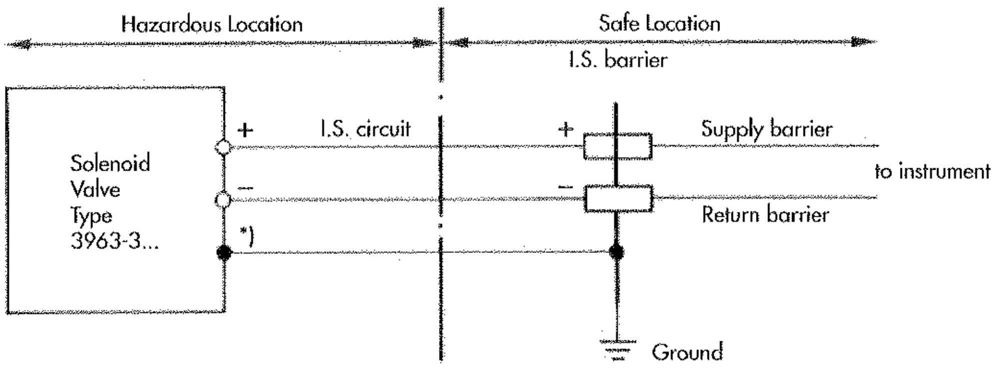
Installation Directions for Devices for Use in Hazardous Locations in Compliance with CSA Approval

The devices may be installed in intrinsically safe circuits when connected with CSA approved intrinsically safe barriers (Fig. 14). In case of doubt as regards barrier selection, contact the manufacturer. For maximum values of V_{max}, R_{min} and I_{max} of the various devices see the following table:

Type	V_{max} [V DC]	R_{min} [Ω]	I_{max} [mA]
3963-31	13	94	150
3963-32	25	168	150
3963-33	28	256	110
3963-34	9	60	150
3963-37	28	256	110

Connection diagrams

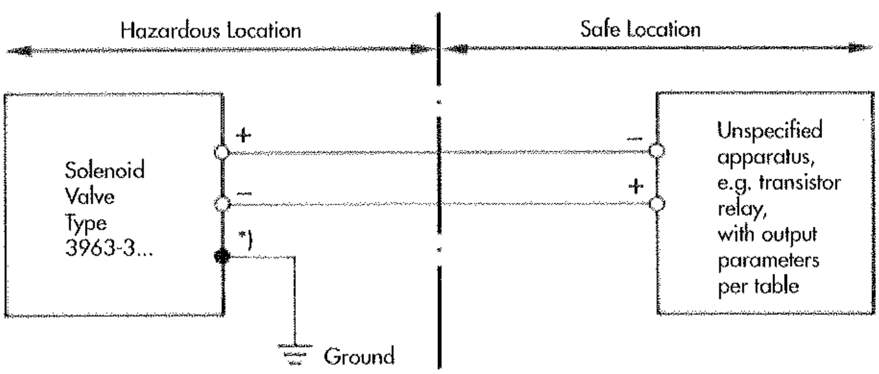
CSA certified for Hazardous Locations: Class I; Division 1; Groups A, B, C, D



*) Only for metal enclosure

Cable entry Pg 13,5 or metal conduit according to assembly drawing No. 3963-3... and drawing No. 1150-6016 T-3

CSA certified for Hazardous Locations: Class I; Division 2; Groups A, B, C, D



*) Only for metal enclosure

Cable entry only rigid metal conduit according to drawing No. 1150-6016 T-3

Fig. 14

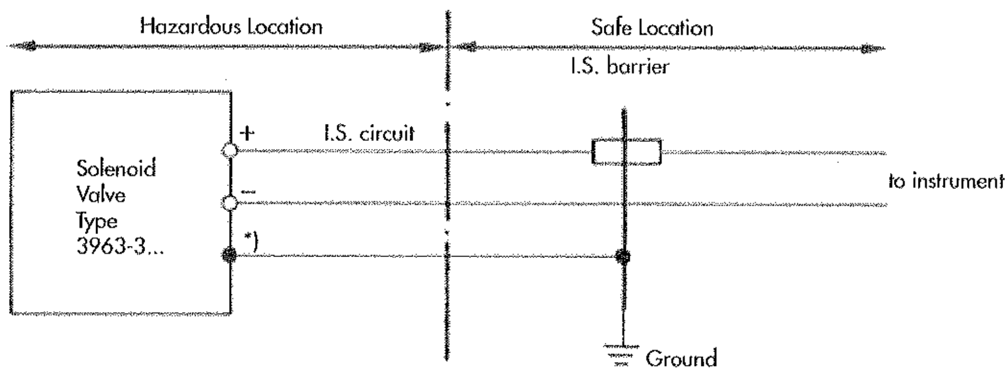
Installation Directions for Devices for Use in Hazardous Locations in Compliance with FM Approval

The devices may be installed in intrinsically safe circuits when connected with FM approved intrinsically safe barriers (Fig. 15). In case of doubt as regards barrier selection, contact the manufacturer. For maximum values of V_{max} and I_{max} of the various devices see the following table:

Type	V_{max} [V DC]	I_{max} [mA]
3963-31	13	150
3963-32	25	150
3963-33	28	110
3963-34	9	150
3963-37	28	110

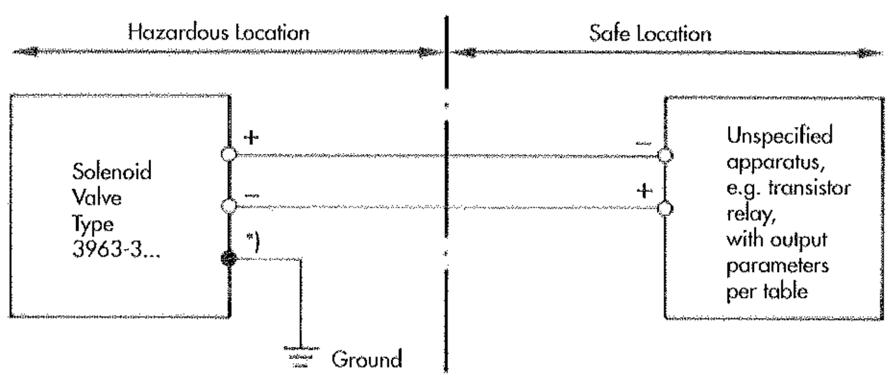
Connection diagrams

FM certified for Hazardous Locations: Class I, II, III; Division 2; Groups A, B, C, D, E, F, G



*) Only for metal enclosure

FM certified for Hazardous Locations: Class I, II, III; Division 1; Groups A, B, C, D, E, F, G



*) Only for metal enclosure

Fig. 15

(Specifications subject to change without notice)

SAMSOMATIC
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GMBH

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Fisher Controls

Instruction Manual

Type 122A Three-Way Switching Valve

May 1980 Form 2279

INTRODUCTION

Scope of Manual

This instruction manual includes installation, adjustment, maintenance, and parts information for the Type 122A three-way switching valve.

Description

The Type 122A valve (figure 1) is a three-way switching valve used for on-off applications.

Refer to figure 2. In operation, the spring (key 3) holds the disc (key 22) against the seat ring at connection B (key 37), and flow is from connection A to C (diverging service). Control pressure registers under the diaphragm (key 9) through connection D. When the force of the control pressure exceeds the force of the spring, the valve disk begins to stroke away from the connection B seat ring toward the connection C seat ring. After the valve has stroked completely, connection C is shut off, and flow is from connection A to connection B.

Figure 1. Type 122A Three-Way Switching Valve

Specifications

Specifications for the Type 122A valve are shown in table 1.

Table 1. Specifications

MAXIMUM INLET PRESSURE	150 psig (10.3 bar)	**MATERIAL TEMPERATURE CAPABILITIES**	-20 to +150°F (-29 to +66°C)
SPRING RANGES	See table 2	**CONTROL CONNECTION**	1/4-in. NPT female
MAXIMUM CONTROL PRESSURE TO DIAPHRAGM	150 psig (10.3 bar)	**APPROXIMATE WEIGHT**	5 lb (2.3 kg)

Table 2. Spring Selection

SPRING RANGE		DIAPHRAGM PRESSURE CHANGE REQUIRED FOR FULL STROKE		SPRING PART NUMBER	SPRING COLOR CODE
Psig	Bar	Psi	Bar		
3-15	0.2-1.0	10	0.7	1D8923 27022	Red
5-20	0.3-1.4	13.5	0.9	1D7515 27022	Cadmium
5-35	0.3-2.4	22	1.5	1D6659 27022	Blue
30-60	2.1-4.1	30	2.1	1D7455 27142	Green
40-100	2.8-6.9	54	3.7	1E5436 27142	Yellow
60-150	4.1-10.3	66	4.6	1R9013 27022	Brown

INSTALLATION

WARNING

To avoid personal injury or equipment damage caused by bursting of pressure-retaining parts or explosion of accumulated gas, do not exceed the pressure or temperature limits in table 1, and do not use the Type 122A valve for installations where water hammer can be experienced.

1. The switching valve may be installed in any position. Position the vent (key 29, figure 2) so that the vent opening is facing downward. Protect the vent opening against the entrance of moisture or any other material that could plug the vent.

2. Apply pipe compound to male pipeline threads. Connect piping to the body connections.

3. Connect the control pressure line to the 1/4-inch NPT connection in the lower diaphragm case.

ADJUSTMENT

Refer to the nameplate (key 25, figure 2) for the spring range. To change the spring setting, loosen the locknut (key 30, figure 2), and rotate the adjusting screw (key 7, figure 2). Rotating the adjusting screw clockwise into the spring case (key 1, figure 2) increases the control pressure at which the valve switches. Rotating the adjusting screw counterclockwise decreases the switching pressure.

MAINTENANCE

Parts are subject to normal wear and must be inspected and replaced periodically. The frequency of parts inspection and replacement depends upon the severity of service conditions.

Instructions are given below for complete disassembly and assembly. Disassemble the valve only as far as needed. Then, begin the Assembly procedure at the appropriate step.

Key numbers used in these procedures are shown in figure 2.

WARNING

To avoid personal injury and equipment damage caused by sudden release of process pressure or uncontrolled process fluid, isolate the valve from all pressure, and release all pressure from the valve body and diaphragm casing before attempting maintenance.

Disassembly

1. Loosen the locknut (key 30). Rotate the adjusting screw (key 7) counterclockwise until all compression has been relieved from the spring (key 3).

2. Disconnect piping from the bottom connector (key 36). Unscrew and remove the bottom connector.

3. To remove the lower seat ring (key 37), insert a hexagonal bar into the seat ring hole, and use the bar to unscrew the seat ring. The hexagonal hole in the seat ring is 7/16 inch (11 mm) across the flats.

4. Unscrew and remove the spring case cap screws and nuts (keys 26 and 4). Remove the spring case, upper spring seat, and spring (keys 1, 31, and 3).

5. Unscrew the hex nuts (key 4) from the stem (key 5). Remove the spring guide, diaphragm head, diaphragm, O-ring, back-up ring, and washer (keys 6, 8, 9, 12, 13 and 10).

6. Unscrew the remaining hex nuts from the stem, and pull the disk holder assembly (key 22) and attached stem out through the bottom opening.

7. Remove the disc holder from the stem.

8. Disconnect the control line from the diaphragm case (key 2). Unscrew the union nut (key 19), and remove the diaphragm case, snap ring (key 20), and body gasket (key 21) from the body (key 23).

9. Unscrew the self-tapping screws (key 16) from each end of the diaphragm case. Remove the washers and guide bushings (keys 14 and 15).

10. Remove the O-ring and back-up rings (keys 12 and 13) from the diaphragm end of the diaphragm case, and remove the felt washers, flat washer, O-ring, and back-up rings (keys 18, 17, 12 and 13) from the valve end of the diaphragm casing.

11. Use a thin-wall socket wrench to remove the upper seat ring (key 24).

Assembly

1. Screw the upper seat ring (key 24) into the body (key 23).

2. Install the back-up rings and O-rings (key 13 and 12) into each end of the diaphragm case (key 2).

3. Install the washer (key 17) and three felt washers (key 18) into the valve end of the diaphragm case. Replace the guide bushings (key 15) in each end of the diaphragm casing. Carefully insert the stem (key 5) through the diaphragm casing to be sure the parts are aligned. Attach the washers (key 14) with self-tapping screws (key 16). Remove the stem.

4. Replace the body gasket and snap ring (keys 21 and 20). Secure the diaphragm case to the body with the union nut (key 19).

5. Coat the threads on the valve end of the stem with Loctite* 271 or equivalent sealant. Attach the disk holder assembly (key 22) to the stem. Carefully install the stem through the opening of the body.

6. Screw two hex lock nuts onto the stem. Install the back-up ring, washer, O-ring, diaphragm, diaphragm head, and spring guide (keys 13, 10, 12, 9, 8, and 6). Secure with two hex lock nuts (key 4).

7. Set the spring and spring seat (keys 3 and 31) onto the spring guide. Attach the spring case with cap screws and nuts (keys 26 and 4). Evenly tighten the cap screws in a criss-cross pattern.

8. Screw the lower seat ring (key 37) into the bottom connector (key 36). Install the bottom connector into the body.

9. Re-connect piping to the bottom connector and to the control connection in the diaphragm casing.

10. Adjust the spring by following the Adjustment instructions.

PARTS ORDERING

When corresponding with the sales representative about this valve, mention the serial number and all other data stamped on the nameplate. When ordering replacement parts, also state the complete 11-character part number of each part required as found in the following parts list.

*Trademark of Loctite Corp.

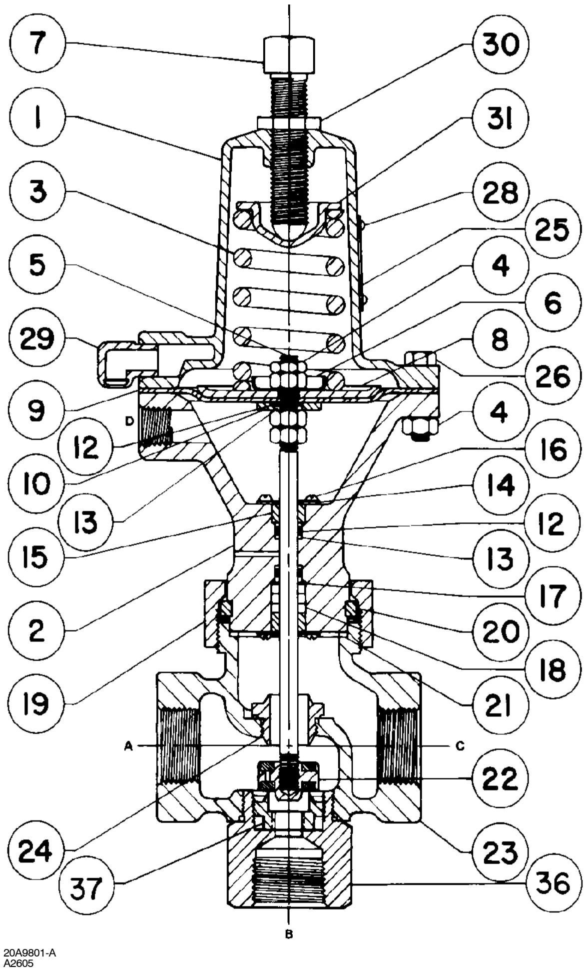

Figure 2. Type 122A Three-Way Switching Valve

PARTS LIST

Key	Description	Part Number
1	Spring Case, aluminum	2P9015 08012
2	Lower Diaphragm Case, cast iron	2L9184 19012
3	Spring	See table 2
4	Hex Nut, pl steel (12 req d)	1A3915 X0022
5	Stem, 316 SST	1R1774 35162
6	Spring Guide, pl steel	1D6666 25072
7	Adjusting Screw, pl steel	1D9954 48702
8	Diaphragm Plate, pl steel	1D6664 28982
9*	Diaphragm, neoprene	1D6663 02102
10	Washer, pl steel	1D7162 28982
12*	O-Ring, nitrile (3 req d)	1E4727 06992
13*	Back-up Ring, leather (5 req d)	1K7868 06992
14	Retaining Washer, SST (2 req d)	1K7869 35022
15	Guide Bushing, iron (2 req d)	1K7870 21052
16	Self-Tapping Screw, pl steel (4 req d)	1J3369 28982
17	Washer, SST	1K7871 35022
18*	Washer, neoprene/felt (3 req d)	1K7872 06992
19	Union Nut, malleable iron	1E4711 19062
20	Snap Ring, pl steel	1A8326 48722
21	Body Gasket, asbestos	1A8325 04032
22*	Disk Holder/Ass y	
	Aluminum/Nitrile	1R1772 000A2
	SST/Nitrile	1R1772 X00A2
23	Body, cast iron	
	3/4 NPT	1D3124 19012
	1 NPT	1D3125 19012
24*	Upper Valve Seat	
	Aluminum	1B8103 09012
	SST	1B8103 X0012
25	Nameplate, aluminum	1E2401 11992
26	Cap Screw, pl steel (8 req d)	1B7209 24052
28	Drive Screw, pl steel (4 req d)	1E5017 28982
29	Vent Ass y	EMY602X1-A12
30	Locknut, Zn pl steel	1D6677 28982
31	Upper Spring Seat, pl steel	1D6671 25072
36	Bottom Flange, pl steel	1R1775 24092
37*	Lower Valve Seat	
	Aluminum	1R1773 09012
	SST	1R1773 X00A2

*Recommended spare parts

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NORGREN

B74G

Installation & Maintenance Instructions

Filter/Regulator

B74G - ★★★ - ★★★ - ★★★

Port	Thread Form	Adjustment	Drain	Bowl	Element	Diaphragm	Spring (Outlet Pressure Range) *	Gauge
3....3/8"	A....PTF	K....Knob	A....Automatic	D....Metal with liquid level indicator	1....5 µm	N....Non-relieving	F....0,3 to 4 bar (5 to 60 psig)	G....With
4....1/2"	B....ISO Rc taper	T....T-bar	Q....Manual, 1/4 turn	P....Transparent with guard	2....25 µm	R....Relieving	M...0,3 to 10 bar (5 to 150 psig)	N....Without
6....3/4"	G....ISO G parallel				3....40 µm		S....0,7 to 17 bar (10 to 250 psig)	

* Outlet pressure can be adjusted to pressures in excess of, and less than, those specified. Do not use these units to control pressures outside of the specified ranges.

TECHNICAL DATA

Fluid: Compressed air
Maximum pressure:
Transparent bowl: 10 bar (150 psig)
Metal bowl: 17 bar (250 psig)
Operating temperature*:
Transparent bowl: -20° to +50°C (0° to +125°F)
Metal bowl: -20° to +80°C (0° to +175°F)
* Air supply must be dry enough to avoid ice formation at temperatures below +2°C (+35°F).
Particle removal: 5 µm, 25 µm, or 40 µm filter element
Air quality: Within ISO 8573-1, Class 3 and Class 5 (particulates)
Typical flow with 10 bar (150 psig) inlet pressure, 6,3 bar (90 psig) set pressure and 1 bar (15 psig) droop from set: 100 dm^3/s (212 scfm)
Nominal bowl size: 0,2 litre (7 fluid ounce)
Manual drain connection: 1/8"
Automatic drain connection: 1/8"
Automatic drain operating conditions (float operated):
Bowl pressure required to close drain: Greater than 0,3 bar (5 psig)
Bowl pressure required to open drain: Less than 0,2 bar (3 psig)
Minimum air flow required to close drain: 1 dm^3/s (2 scfm)
Manual operation: Depress pin inside drain outlet to drain bowl
Gauge ports:
1⁄4 PTF with PTF main ports
Rc1/4 with ISO Rc main ports
Rc1/8 with ISO G main ports
Materials:
Body: Aluminum
Bonnet: Aluminum
Valve: Brass
Bowl:
Transparent with guard: Polycarbonate, steel guard
Metal: Aluminum
Metal bowl liquid level indicator lens: Transparent nylon
Element: Sintered polypropylene
Elastomers: Neoprene and nitrile

REPLACEMENT ITEMS

Service Kit (includes items circled on exploded view):
Relieving..4383-700
Nonrelieving 4383-701
Liquid level lens kit (34, 36, 37, 38) 4380-050
Filter element, 5µm, red speckles (52).....................4338-04
Filter element, 25µm, blue speckles (52) 4338-07
Filter element, 40µm, no speckles (52)....................4338-05
Manual drain (18, 19, 20) (28, 29, 30) 619-50
Automatic drain (21, 22, 23) (31, 32, 33)
1/8 NPT outlet 3000-10
G 1/8 outlet 3000-97
Tamper resistant cover (knob adjustment only).......4355-51

PANEL MOUNTING DIMENSIONS

Panel mounting hole diameter: 52 mm (2.06")
Panel thickness: 2 to 6 mm (0.06" to 0.25")

INSTALLATION

1. Shut off air pressure. Install filter/regulator in air line -
   - vertically (bowl down),
   - with air flow in direction of arrow on body,
   - upstream of lubricators and cycling valves,
   - as close as possible to the device being serviced.
2. Connect piping to proper ports using pipe thread sealant on male threads only. Do not allow sealant to enter interior of unit.
3. Push bowl, or bowl with guard, into body and turn fully clockwise before pressurizing.
4. Flexible tube with 3mm (0.125") minimum I.D. can be connected to the automatic drain. Avoid restrictions in the tube.
5. Install a pressure gauge or plug the gauge ports. Gauge ports can also be used as additional outlets for regulated air.

ADJUSTMENT

1. Before applying inlet pressure to filter/regulator, turn adjustment (1 or 7) counterclockwise to remove all force on regulating spring.
2. Apply inlet pressure, then turn adjustment (1 or 7) clockwise to increase and counterclockwise to decrease pressure setting.
3. Always approach the desired pressure from a lower pressure. When reducing from a higher to a lower setting, first reduce to some pressure less than that desired, then bring up to the desired pressure.

NOTE

With non-relieving filter/regulators, make pressure reductions with some air flow in the system. If made under no flow (dead-end) conditions, the filter/regulator will trap the over-pressure in the downstream line.

4. KNOB ADJUSTMENT. Push knob down to lock pressure setting. Pull knob up to release. Install tamper resistant cover (see ***Replacement Items***) to make setting tamper resistant.
5. T-BAR ADJUSTMENT. Tighten lock nut (8) to lock pressure setting.

SERVICING

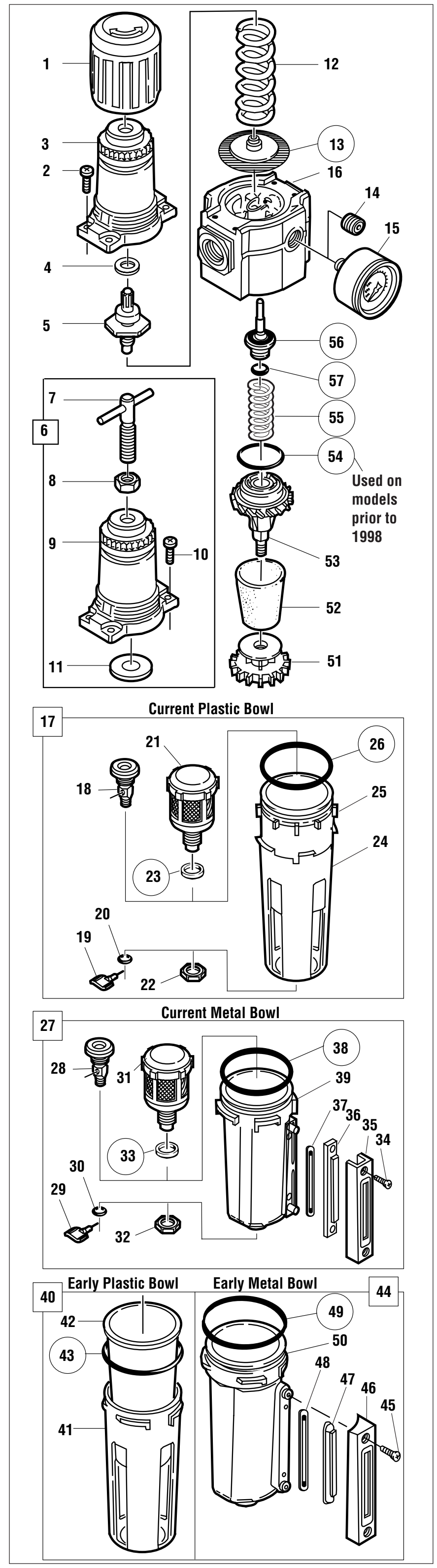
1. Open manual drain to expel accumulated liquids. Keep liquids below baffle (51).
2. Clean or replace filter element when dirty.

DISASSEMBLY

1. Filter/regulator can be disassembled without removal from air line.
2. Shut off inlet pressure. Reduce pressure in inlet and outlet lines to zero.
3. Turn adjustment (1 or 7) fully counterclockwise.
4. Remove bowl - push into body and turn counterclockwise.
5. Disassemble in general accordance with the item numbers on exploded view. Do not remove the drains unless replacement is necessary. Remove and replace only if they malfunction.

CLEANING

1. Clean plastic bowl (25, 42) with warm water only. Clean other parts with warm water and soap.
2. Rinse and dry parts. Blow out internal passages in body (16) with clean, dry compressed air. Blow air through filter element (52) from inside to outside to remove surface contaminants.
3. Inspect parts. Replace those found to be damaged. Replace plastic bowl with a metal bowl if plastic bowl shows signs of cracking or cloudiness.



B74G

Installation & Maintenance Instructions

ASSEMBLY

1. Lubricate the following items with o-ring grease.
   4 (Thrust washer) - outer circumference and both sides.
   5, 7 (Adjusting screw) - threads and tip.
   18, 28 (Manual drain body) - the portion of the body that contacts the bowl, and the hole that accommodates the stem of drain valve (19, 29).
   56 (Valve) - stem.
   26, 38, 43, 49, 54, 57 (O-rings)
2. Assemble the unit as shown on the exploded view. Push bowl, or bowl with guard, into body and turn fully clockwise.
3. Torque Table

Item	Torque in Nm (Inch-Pounds)
2, 10 (Screw)	2,3 to 3,9 (20 to 35)
22, 32 (Nut)	2,3 to 2,8 (20 to 25)
34, 45 (Screw)	1,7 to 2,3 (15 to 20)
53 (Center-post)	2,0 to 2,7 (18 to 24)

CAUTION

Water vapor will pass through these units and could condense into liquid form downstream as air temperature drops. Install an air dryer if water condensation could have a detrimental effect on the application.

WARNING

These products are intended for use in industrial compressed air systems only. Do not use these products where pressures and temperatures can exceed those listed under ***Technical Data***.

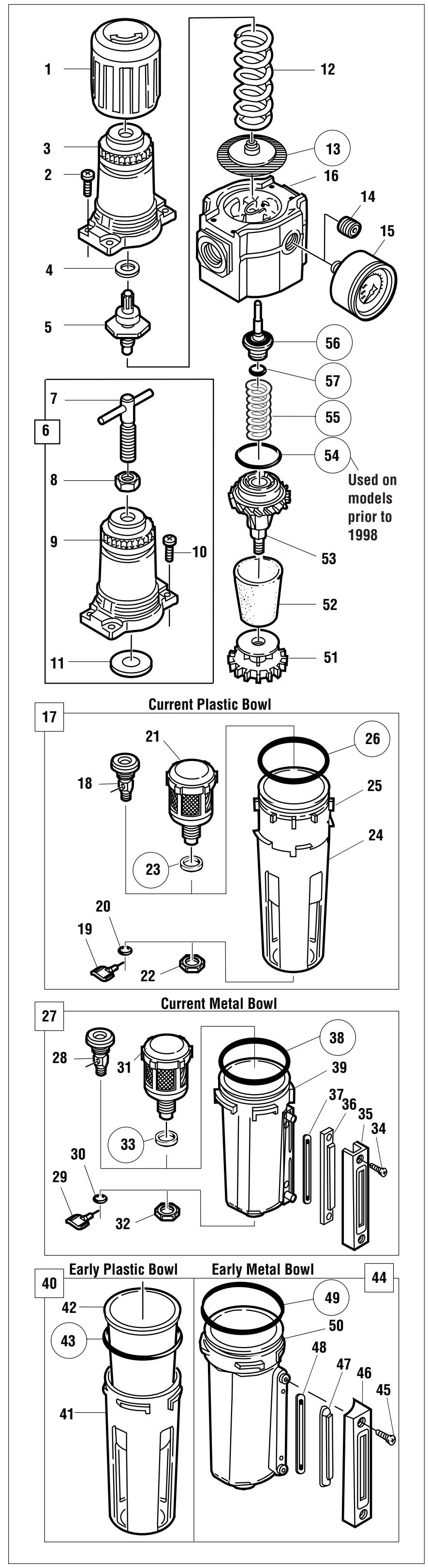
Polycarbonate plastic bowls can be damaged and possibly burst if exposed to such substances as certain solvents, strong alkalies, compressor oils containing ester-based additives or synthetic oils. Fumes of these substances in contact with the polycarbonate bowl, externally or internally, can also result in damage. Clean with warm water only.

Use metal bowl in applications where a plastic bowl might be exposed to substances that are incompatible with polycarbonate.

If outlet pressure in excess of the filter/regulator pressure setting could cause downstream equipment to rupture or malfunction, install a pressure relief device downstream of the filter/regulator. The relief pressure and flow capacity of the relief device must satisfy system requirements.

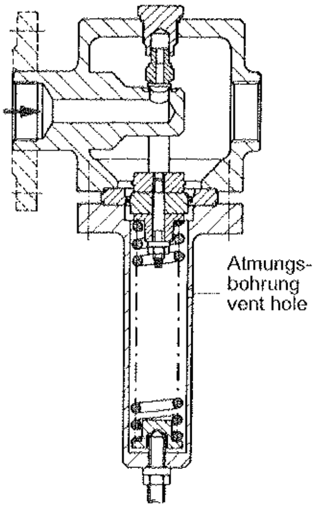
The accuracy of the indication of pressure gauges can change, both during shipment (despite care in packaging) and during the service life. If a pressure gauge is to be used with these products and if inaccurate indications may be hazardous to personnel or property, the gauge should be calibrated before initial installation and at regular intervals during use.

Before using these products with fluids other than air, for non industrial applications, or for life-support systems consult Norgren.

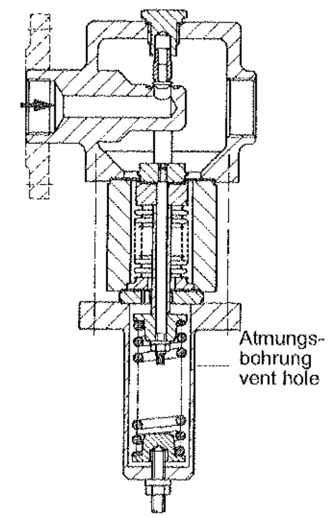


BETRIEBSANLEITUNG / OPERATING INSTRUCTIONS
DRUCKMINDERVENTIL / PRESSURE REDUCER
TYPE 510K, 511K, 516K, 510B, 511B, 516B
Steuerteil mit Kolben oder Faltenbalg / control by piston or bellow

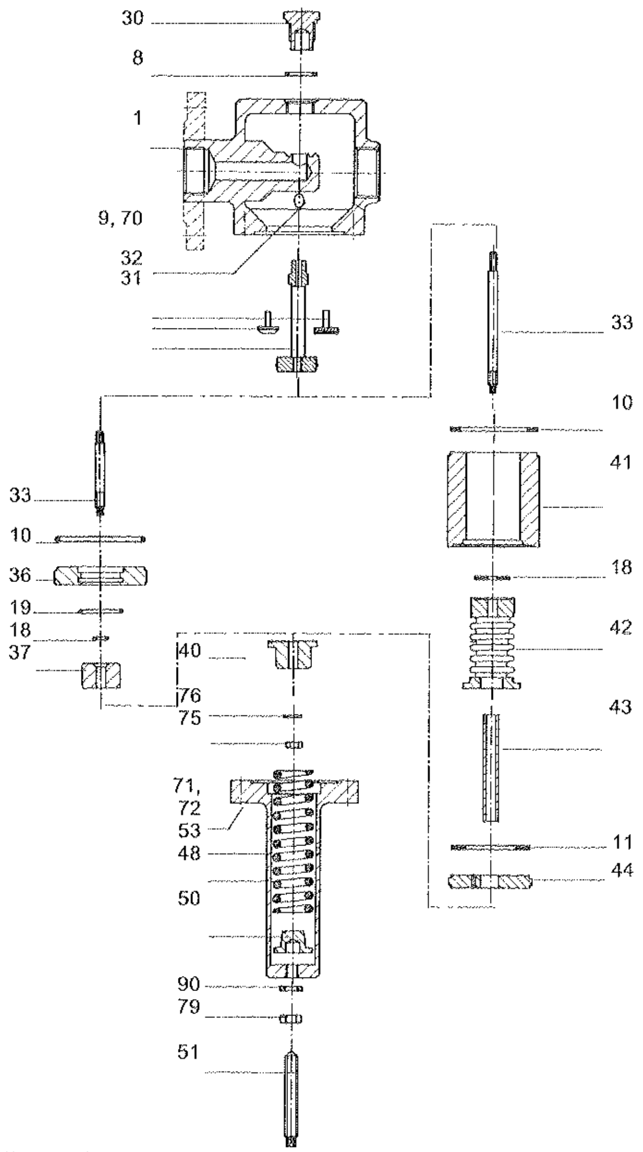
Blatt Nr. / Sheet no.
DM 510K/4.1.89.1.1



Steuerteil mit Kolben / control by piston



Steuerteil mit Faltenbalg / control by bellow



Artikel Nr.	
Fabrik Nr.	
Serial no.	
Auftragsbestätigungs Nr.	
Order confirmation no.	
K_{vs} Wert m^3/h	
K_{vs} value m^3/h	
Hinterdruckbereich bar	
outlet pressure range bar	

• = Wartungssatz / servicing set

Steuerteil mit Kolben / control by piston

1	Gehäuse	body	
8	**Dichtung**	**gasket**	•
9	**Dichtung**	**gasket**	•
10	**Dichtung / O-Ring**	**gasket / O-ring**	•
18	**O-Ring**	**O-ring**	•
19	**O-Ring**	**O-ring**	•
30	Verschluß-Schraube	plug	
31	Bügel	U-bolt	
32	**Kegel**	**cone**	•
33	Bügelbolzen	U-bolt bolt	
36	Kolbenführung	piston guiding	
37	Kolben	piston	
40	Federteller	spring plate	
48	Druckfeder	spring	
50	Federteller	spring plate	
51	Stellschraube	set screw	
53	Federhaube	spring bonnet	
70	Stopfen	plug	
71	Stiftschraube	stud bolt	
72	Sechskantmutter	hexagon nut	
75	Sechskantmutter	hexagon nut	
76	Federscheibe	spring washer	
79	Sechskantmutter	hexagon nut	
90	Dubo Sicherung	Dubo gasket	

Steuerteil mit Faltenbalg / control by bellow

1	Gehäuse	body	
8	**Dichtung**	**gasket**	•
9	**Dichtung**	**gasket**	•
10	**Dichtung**	**gasket**	•
11	**Dichtung**	**gasket**	•
18	**Dichtung**	**gasket**	•
30	Verschluß-Schraube	plug	
31	Bügel	U-bolt	
32	**Kegel**	**cone**	•
33	Bügelbolzen	U-bolt bolt	
40	Federteller	spring plate	
41	Distanzstück	distance piece	
42	**Faltenbalg**	**bellow**	•
43	Distanzrohr	distance tube	
44	Führunsscheibe	guiding washer	
48	Druckfeder	spring	
50	Federteller	spring plate	
51	Stellschraube	set screw	
53	Federhaube	spring bonnet	
70	Stopfen	plug	
71	Stiftschraube	stud bolt	
72	Sechskantmutter	hexagon nut	
75	Sechskantmutter	hexagon nut	
76	Federscheibe	spring washer	
79	Sechskantmutter	hexagon nut	
90	Dubo Sicherung	Dubo gasket	

MANKENBERG	OPERATING INSTRUCTIONS PRESSURE REDUCER TYPE 510K, 511K, 516K, 510B, 511B, 516B control by piston or bellow	Sheet no. DM 510K/5.1.89.1.1

MODE OF OPERATION

The outlet pressure which is to be controlled acts on the control unit. Under normal operating conditions the force of the control unit and of the spring are in equilibrium. When the outlet pressure exceeds the set value, the valve closes; when the outlet pressure drops below the set value, the valve opens. When the line is not pressurized, the valve is open.

INSTALLATION

Before the valve is installed, the line has to be flushed carefully. If foreign bodies and impurities cannot be avoided during operation, it is advisable to install a strainer. Remove package material, including plastic plugs, and install the valve in the non pressurized line in such a way that the arrow on the body points in the direction of flow. The spring cap can point either upwards or downwards, if it is not specified otherwise. When the valve is used for steam or set pressures ≤ 0,2 bar, it has to be installed with the spring cap pointing downwards. The place of installation should be a horizontal section of the line, where the flow is undisturbed. Avoid elbows, shut-off valves or other throttle-like places close to the valve.

SAFETY DEVICES

Pressure reducing valves are not schut-off valves, which guarantee a tight seal. According to VDI-/VDE rule 2174 a leakage rate of 0.05% of the Kvs-value is permissible. For that reason a safety device has to be provided - acc. to the Rules for the Prevention of Accidents, VHB 17 - to prevent the pressure within the system from exceeding maximum permissible value. If it is not specified otherwise, the pressure reducing valve itself has to be secured in such a way that 1.3 times the maximum set value is not exceeded - e. g. with a setting range up to 4 bar, the blow-off pressure of the safety valve can amount to a maximum of 5.2 bar.
It has to be ensured that fluid which escapes from the spring cap in case of a broken copntrol device does not cause any danger. If necessary, a pipe has to be connected at the vent hole to lead escaping fluid away.

START- UP

Functioning and tightness of the valve have been checked at the works. The valve is delivered with released spring. To put the valve into operation the inlet side of the valve has to be opened slowly; at the same time it must be ensured that the fluid is lead away on the outlet side. Avoid pressure shocks. Then the outlet pressure which is to be controlled must be set by means of the adjusting screw. When medium is steam, the control chamber has to be filled up with water before start up.

MAINTENANCE

Depending on the characteristics of the medium and the operating conditions within the system, a maintenace has to be carried out once a year or also at shorter intervals, or the functioning of the valve has to be checked.
In order to carry out a maintenance and also in case of troubles act in the following way : depressurize the valve, release the spring , remove spring cap, check mobility of the control parts. Smooth jamming parts with fine emery cloth.

Leakage or damage of the control device are indicated by medium flowing from the spring cap vent bore.

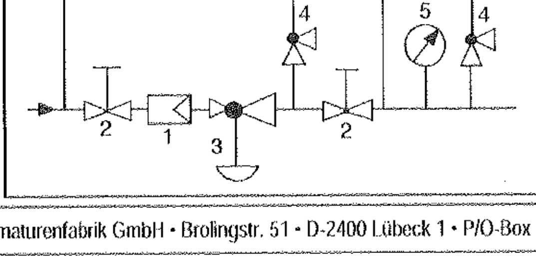
Control device with piston:
Remove spring cap. Remove piston guiding and replace the inside sealing. Replace also the sealing inside the body. Reassembling in opposite succession.

Control device with bellow:
Remove spring cap.Loosen spindle nut. Remove spring plate, guiding washer, distance tube and bellow incl. sealing. Replace bellow and sealing. Replace sealing inside body (underneath the distance tube). Reassembling in opposite succession.

Strongly increasing outlet pressure with low flow rate indicates a defect of cone gasket. Screw offf plug from body bottom, remove spring bonnet and control unit, move the U-bolt with valve cone in outlet direction and take it out. Exchange cone or grind wealing surfaces carefully with metallic seal. Exchange gasket inside body. Reassembling in opposite succession. Take care that U-bolt is in correct position - tectangular to flow direction - and to proper inserting of guiding set of U-bolt into plug hole.

SPARE PARTS

When ordering spare parts give the serial number of the valve, article number and designation, as well as the item numbers of the parts.



1 Strainer *
2 Shut-off valve
3 **Pressure reducer**
4 Safety valve*
5 Pressure gauge *

* use MANKENBERG products

MANKENBERG GmbH

25.01.2005

Order Parts List Structure

Order : 3043528 / 1.000 - STKL: 146097 - DM511 1 *600TX0,2F -4FS

Level	Pos		Article	Description Drawing	Material Standard	Quant.. ME
1			**65090721-9**	**DM511 1 *600TX0,2F -4FS** 6509203		**1,00 pc**
	6	V	9301110S	gasket 80/65 x 1	NOVA-UNI	1,00 pc
	8	V	93040671	O-ring 119 23,47 x 2,62	FPM70	1,00 pc
	15	V	93210781	diaphragm 75/10 x 1,5	FPM	1,00 pc
	30	V	42410156A	lockscrew -1	1.4404	1,00 pc
	31	V	44800166	yoke	1.4404	1,00 pc
	32	V	30810006-2	cone seat -3mm	1.4404/FPM	1,00 pc
	33	V	34420116	bolt 12 x 68	1.4404	1,00 pc
	36	V	40750276A	piston guide	1.4404	1,00 pc
	37		41840162	piston	1.4104	1,00 pc
	38		43110186-2	spring guide disk 29/12 x 5	1.4571	1,00 pc
	48		9060067F	spring 56446	1.1200	1,00 pc
	50		43041006A	spring plate 43	1.4404	1,00 pc
	71		92020817A	screw M 12 x 45	5.6-A2A	4,00 pc
	75		9241012GA	6kt nut M 12	5-2-A2A	1,00 pc
	76		92520121	spring washer M 12	1.0600-A2A	1,00 pc
	79		9241012GA	6kt nut M 12	5-2-A2A	1,00 pc
	90		9257012Q	Dubo-slide 207 M 12	PA6	1,00 pc
2	**1**	V	**02680135A-3**	02680135A-3	**1.0460**	**1,00 pc**
2	**51**	V	**36240236**	36240236	**A4-70**	**1,00 pc**
2	**53**	V	**11330818A-31**	11330818A-31	**1.0XXX**	**1,00 pc**

MANKENBERG GmbH 25.01.2005

Spare Part List

Order: 3043528 / 1.000 - STKL: 146097 - DM511 1 *600TX0,2F -4FS

Level	Z-Pos.	Article Drawing	Description	material	Quant.. ME	Price [EUR]
1		65090721-9	DM511 1 *600TX0,2F -4FS		2,000 ST	
1	6	9301110S	gasket 80/65 x 1	NOVA-UNI	1,000 ST	2,00
1	8	93040671	O-ring 119 23,47 x 2,62	FPM70	1,000 ST	2,00
1	15	93210781	diaphragm 75/10 x 1,5	FPM	1,000 ST	25,00
1	32	30810006-2	cone seat -3mm	1.4404/FPM	1,000 ST	34,00

Assembly drawing 6509203 Price [EUR] / net: 63,00

Index of Revisions

Rev.	Sheet	Prepared, revised		Checked	Approved			Remark, kind of revision
		Name	Date	Name	Name	Date	Status	
00	1 to 415	V12/sro	2005-01-10	V12/lf	V12/di	2005-01-20	IFR	FIRST ISSUE / FINAL ISSUE