

Operating Instructions

Pneumatic Control Valve

Type 8021 Series GS1, GS2 and GS3



**With: Digital Positioner Type 8048
Electro-pneumatic Positioner Type 8047
Pneumatic Positioner Type 8047**

Version: 09/2004

Manual-8021E.doc
Art.-Nr: 1128021

TetraTec Instruments GmbH
Gewerbestraße 8, D-71144 Steinenbronn

Tel.: 07157 / 5387- 0, Fax: 07157 / 5387- 10
www.tetratec.de info@tetratec.de

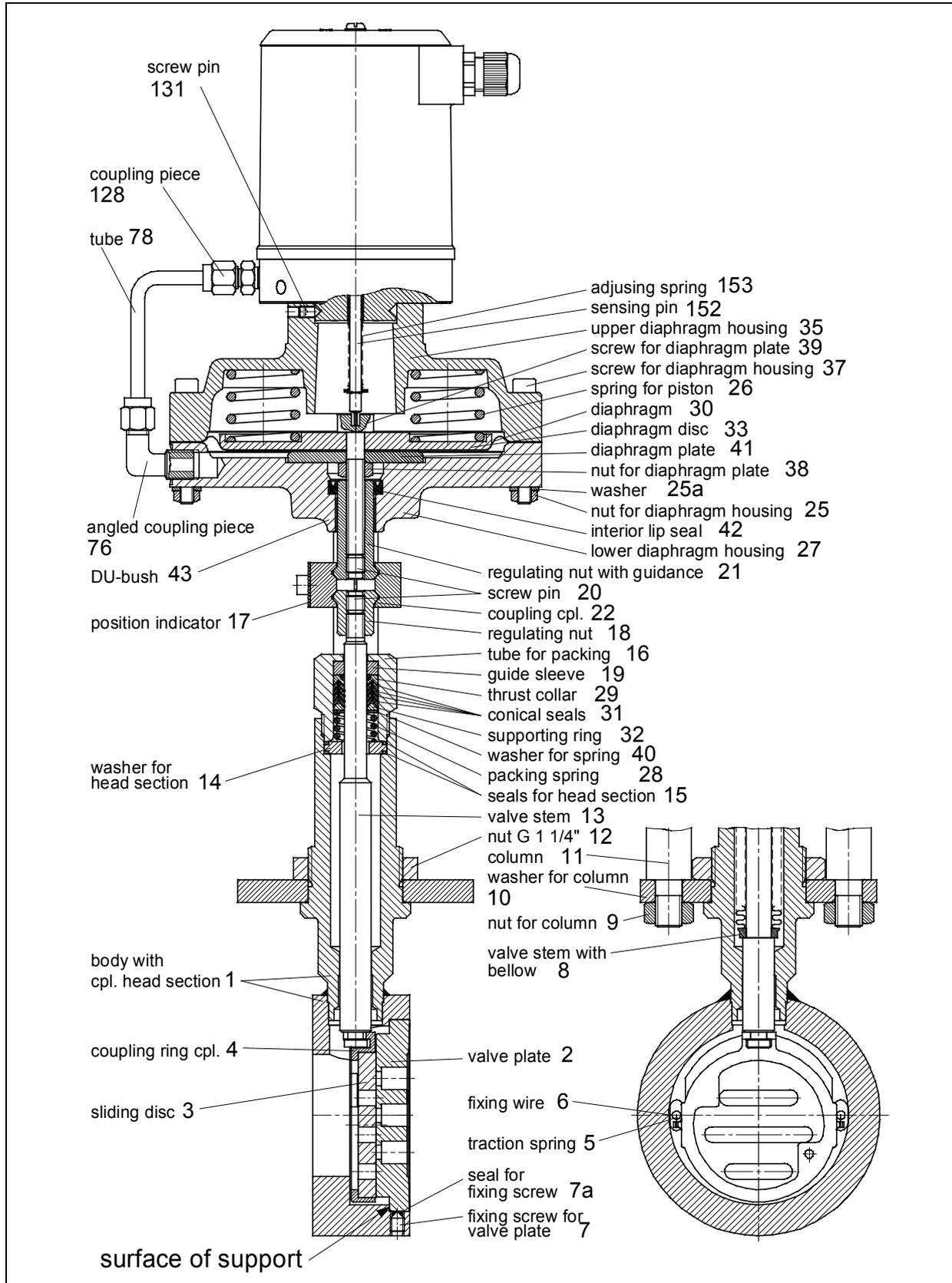
Content

1	Spare Parts List Series GS1.....	3
2	Spare Parts List Series GS2 and GS3.....	4
3	Technical Data.....	5
4	Mounting.....	6
5	Connection and Start-Up.....	7
5.1	Valves With Pneumatic Positioner.....	7
5.2	Valves With Electro-pneumatic Positioner.....	7
5.3	Valves With Digital Positioner Type 8048.....	8
6	Adjusting The Positioner.....	11
6.1	Pneumatic Positioner.....	11
6.1.1	Readjusting Zero Point.....	11
6.1.2	Adjusting Stroke.....	11
6.1.3	Adjusting Supply Air Flow.....	11
6.2	Electro-Pneumatic Positioner Type 8047.....	12
6.2.1	Adjusting ZERO.....	12
6.2.2	Adjusting SPAN.....	12
6.2.3	Adjustment Versions.....	13
6.2.4	Adjusting Supply Air Flow.....	14
6.3	Digital Positioner Type 8048.....	14
6.3.1	Self Adjustment.....	14
6.3.2	Manual Operation.....	15
6.3.3	Configuration.....	15
7	Replacing The Positioner.....	16
7.1	Pneumatic Positioner.....	16
7.2	Electro-Pneumatic Positioner Type 8047.....	16
7.3	Digital Positioner Type 8048.....	16
7.4	Replacing p/p- or i/p- to Digital Positioners.....	17
8	Replacing the Functional Unit.....	17
8.1	Series GS1.....	17
8.1.1	Dismounting.....	17
8.1.2	Mounting.....	17
8.2	Series GS2 and GS3.....	18
8.2.1	Dismounting.....	18
8.2.2	Mounting.....	18
9	Dismounting and Mounting Of Valve.....	19
9.1	Dismounting the Lower Valve Part.....	19
9.2	Dismounting the Actuator.....	19
9.3	Mounting the Actuator.....	19
9.4	Mounting the Lower Valve Part and the Complete Valve.....	20
10	Lubrication and Bonding Plan.....	23

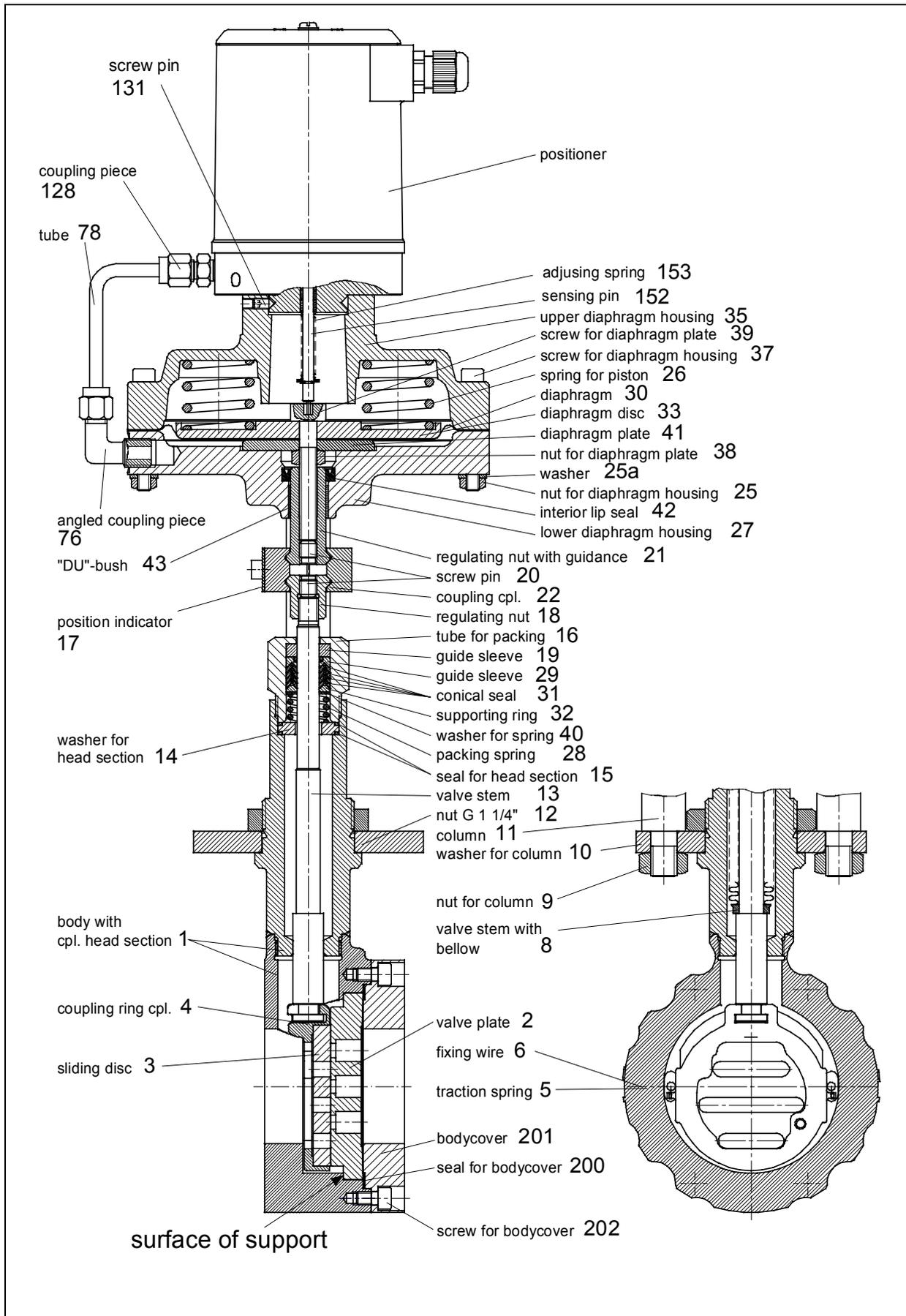
1 Spare Parts List Series GS1



(Use original Schubert & Salzer Control Systems spare parts only!)



2 Spare Parts List Series GS2 and GS3





Depending on the mounted positioner the connecting parts may differ from the parts shown in the spare parts list.
If necessary please ask for a detailed spare parts list.

Besides the individual spare parts repair kits are available for all valves containing all sealing and wear parts.

3 Technical Data

Technical data (valve):

Series GS1	wafer-type design (body length acc. DIN EN 558-1 series 20)	
Series GS2 and GS3	wafer-type design	
Nominal sizes	DN 15 up to DN 200 (1/2" up to 8")	
Nominal pressure acc. DIN	PN 40 (fits also to PN 10-25)	DN 15 - DN 150
	PN 100 (GS3-series only)	DN 15 - DN 80
	PN 16 (GS3 series only)	DN 200
Nominal pressure acc. ANSI	ANSI 150 (GS3 series only)	1/2" - 8"
	ANSI 300 (GS3 series only)	1/2" - 6"
	ANSI 600 (GS3 series only)	1/2" - 3"
Supply pressure	6 bar (90 psi) max.	
Fluid pressure	(GS1 series, carbon steel) -10°C up to +300°C (14F up to 572F)	
	(GS1, GS2 and GS3 series, stainless steel) -60°C up to +350°C (-76F up to 662F)	
Ambient temperature	-10°C up to +80°C (14F up to 176F)	
Rangeability	40 : 1	
Leakage rate (% of Kvs/Cv-value)	Functional unit carbon- stainless steel	Functional unit STN2
	< 0,0001	< 0,001

Technical data (positioner):

	Digital positioner	i/p-positioner	p/p-positioner
Input signal range	0/4 - 20 mA, 0/2 - 10 V	0/4 - 20 mA	0,2 - 1 bar
Input resistance	100 Ohm	220 Ohm (EEx: 420 Ohm)	
Supply voltage, electrical	24 V DC, maximal 10 W	none	none
Supply air pressure	max. 6 bar (87 psi)	max. 6 bar (87 psi)	max. 6 bar (87 psi)
Hysteresis	< 0,5 %	< 1 %	< 1 %
Rangeability	20 :1	20 : 1	20 : 1
Characteristics	linear, equal percentage, user-defined	linear, equal percentage	linear, equal percentage
Adjustment (stroke, zero point)	self-adapting	mechanical	mechanical
Ambient temperature	-20°C - + 75°C (-4°F - + 167°F)	-20°C - + 60°C (-4°F - + 140°F)	-20°C - + 80°C (-4°F - + 176°F)
Protection class acc.DIN40050	IP65	IP 54	IP 54
Intrinsic safety (optional)	-	II 2 G EEx ib IIC T6 + 45°C II 2 G EEx ib IIC T5 + 60°C	-

4 Mounting

Remove all packing materials from the valve.

Check the piping for contaminations and other undesired particles and clean piping in case before mounting the valve.

The control valve has to be mounted to the pipeline according its direction of flow. The flow direction is indicated by an arrow on the body.

Use flange sealings acc. DIN EN 1514-1 or ANSI B16.21 in the respective nominal pressure.

We recommend flange sealings made from pure graphite with a stainless steel backup.

Before starting the complete installation check the function of the valve.

Mounting position:

The mounting position of valves with pneumatic or digital positioner is arbitrary.



Factory adjustment of the electro-pneumatic positioner is carried through for a horizontal mounting position of the valve (positioner on top). When changing the mounting position (especially overhead position) the positioner zero and span have to be readjusted.

5 Connection and Start-Up



The electrical connection must only be carried through by qualified personnel.
Consider absolutely all applicable national safety regulations for mounting, start-up and operation of the devices (e. g. VDE 0100).
All works have to be carried through only without voltage supply connected.
Disregarding the relevant safety regulations might cause heavy injuries and/or property damage.

5.1 Valves With Pneumatic Positioner

Connect supply air to port "P" (G1/8").

We recommend oil-, water- and dust-free supply air, filtered to 100µm approx. The admissible supply pressure range is stated on the type label (6 bar max.).

Connect set point signal to port "w" (G1/8").
The set point signal connection accepts 6 bar excess-pressure.

Factory adjustment of the positioner is carried through for 4 bar supply pressure.

Changes in supply pressure might eventually require a readjustment.

Factory setting:	set point signal	control function
	0,2 bar (4 PSI)	valve is completely closed (with overlapping)
	0,4 bar (4 PSI)	valve starts to open
	1,0 bar (15 PSI)	valve completely open

5.2 Valves With Electro-pneumatic Positioner

Connect supply air to port "P" (G1/8").

We recommend oil-, water- and dust-free supply air (instrument air).
The admissible supply pressure range is stated on the type label (6 bar max.).

Factory adjustment of the positioner is carried through for 4 bar supply pressure.
Changes in supply pressure might require a readjustment of zero and span settings.
This is also true if the valve is mounted in an overhead position (positioner downwards).

The set point connection is carried through with a two-wire cable or a two port terminal located in a side-mounted casing use (clamp adapter).
Clamp adapter with cable gland are closed by a screwed cap.
The intrinsically safe Ex-version is supplied only with clamp adaptor.

Polarity depends on the valve operation mode as follows:

Rising signal opens valve: brown: positive pole (+)
white resp. black: negative pole (-)

Rising signal closes valve: brown: negative pole (-)
white resp. black: positive pole (+)

Reversing the input terminals causes the inversion subsequently (**NOT** valid for Ex-version).

5.3 Valves With Digital Positioner Type 8048

Connect supply air to port "P" (G1/8").

The supply pressure value should at least correspond to the stated value on the type label. We recommend oil-, water- and dust-free supply air, filtered to 40µm approx.

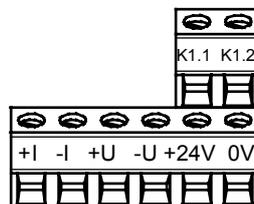
The supply pressure must not exceed 6 bar to avoid malfunctions.

We recommend a shielded cable for connecting the set point signal.
The electrical power supply should be carried through via a second separate cable.
Two separate cable glands are provided for that purpose.



Cable glands which are not in use have to be closed by a suitable screw cap to maintain the protection class (IP65).

Connection of voltage supply



terminals positioner 8048

The positioner requires an external voltage supply (24 V/DC, ripple 10% max.).

Connection:

Supply-positive pole (+): terminal: + 24V
Supply-negative pole (-): terminal: 0V

Max. current consumption is 400 mA approx.

Connection of set point signal

The set point signal can be provided either as a current or a voltage signal.

Connection as current signal 0/4-20 mA:

Signal-positive pole (+):	terminal:	+ I
Signal-negative pole (-):	terminal:	- I

The input resistance is 100 Ω +/- 1%

Connection as voltage signal 0/2-10 V:

Signal-positive pole (+):	terminal:	+ U
Signal-negative pole (-):	terminal:	- U

The input resistance is 20.12 k Ω +/- 1%



An offset voltage of $\pm 15V$ max. is admissible between supply voltage GND and the negative pole of the set point signal input (-I or -U).
If necessary the set point signal current or voltage source has to be grounded against the negative pole of the supply voltage source.
Take care if in your system the voltage sources can be grounded anyhow.
Otherwise a separate supply has to be provided for the positioner!

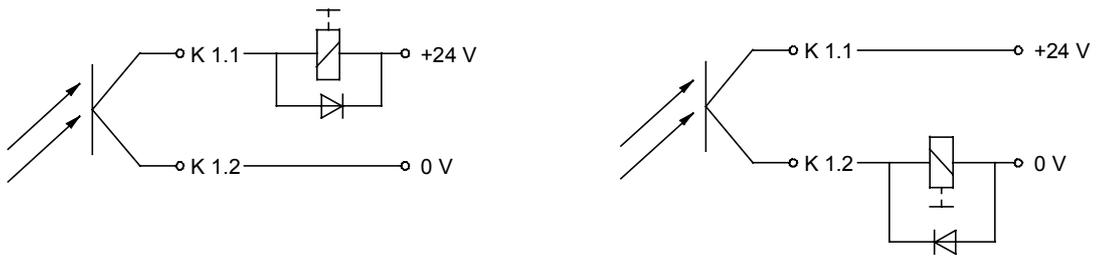
Alarm output

If required an alarm output (terminals K1.1 and K1.2) can be evaluated to check the correct valve function.

The output gets active if the positioner cannot track the stroke to the corresponding set point signal (e.g. for failing or low supply pressure).

In this case the alarm output switches a connected voltage (max. 48 VDC) with 0,5 Hz pulses. Admissible load is 100mA, e.g. allowing a relay to be operated directly (provide a recovery diode for inductive loads!).

Example for a relay connection:



In case of an active alarm output the LED is flashing permanently.

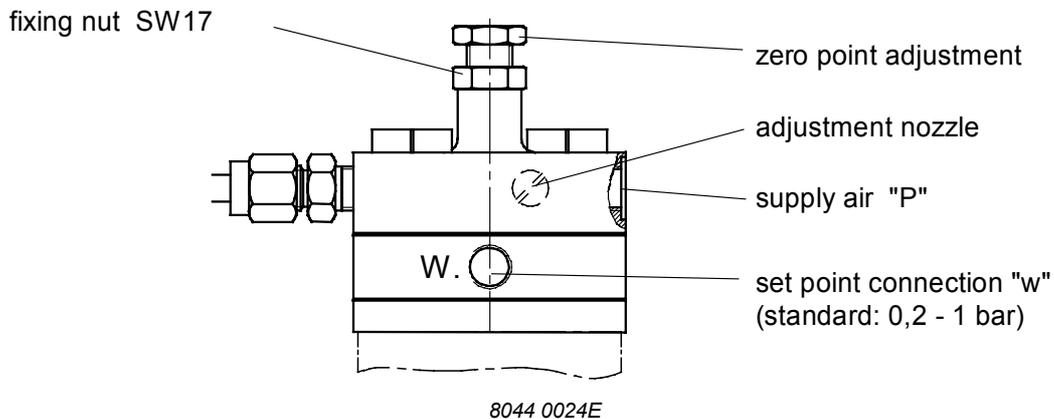
After connection of all supply and signal lines the positioner is ready for operation. All positioners mounted to valves are factory-set and tested with the valve.

Adaption or adjustment is not required for the initial operation.

For repaired or replaced positioners the adjustment has to be checked and a new adjustment has to be carried through in case.

6 Adjusting The Positioner

6.1 Pneumatic Positioner



6.1.1 Readjusting Zero Point

- Loosen lock nut.
- Apply set point "w" for starting valve opening (standard: 0,3 bar, 4,4 PSI).
- Adjust new ZERO by turning the adjustment screw.
 - Turning clockwise: the valve opens further
 - Turning counter-clockwise: the valve closes further
- Lock Zero-screw with lock nut.

6.1.2 Adjusting Stroke

The stroke is adjusted by the resilient windings of the range spring (adjustment by the customer is normally not required).

6.1.3 Adjusting Supply Air Flow

Supply air flow and corresponding control velocity are adjusted by the adjustment nozzle:

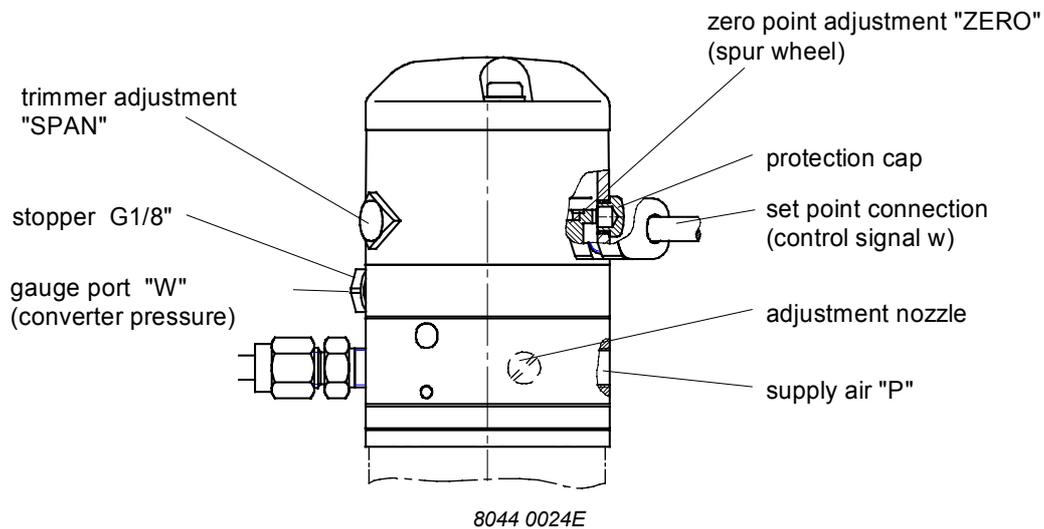
Turning the nozzle clockwise reduces the air consumption. Opening speed of the valve slows down. Heavy throttling has to be avoided as the control valve will not open anymore.

Turning the nozzle counter-clockwise increases the air consumption. Opening speed of the valve is increasing and closing slows down. Opening the nozzle too far should be avoided, as the control valve will not close anymore.

6.2 Electro-Pneumatic Positioner Type 8047

Factory setting of the i/p-positioner is stated on the type label.

The electrical set point signal is converted to a signal pressure by an i/p-converter. This converted pressure has to be controlled with a pressure gauge screwed to the G1/8"-gauge connection. This eases adjustment and trouble shooting.



6.2.1 Adjusting ZERO

- Remove cap at zero adjustment.
- Turn spur-wheel with screw driver:
- ("+" converter pressure rises, "-" converter pressure drops)

6.2.2 Adjusting SPAN

- Remove bleeder screw.
- Turn trimmer with small screw driver
- ("left" converter pressure rises, "right" converter pressure drops)

Adjustments of „ZERO“ and „SPAN“ have to be carried through alternately for several times as they interfere with each other.

6.2.3 Adjustment Versions

Signal range 4-20 mA, spring closes, rising signal opens

Polarity:	Positive pole (+): brown	Negative pole (-): white resp. black
Set point signal	Function	Converter pressure
4 mA	Valve is fully closed	
8 mA	Valve starts to open	0,4±0,03 bar (5,8±0,44 PSI) (adjustment „ZERO“)
20 mA	Valve is fully opened	1,0±0,03 bar (14,5±0,44 PSI) (adjustment „SPAN“)

Signal range 0-20 mA, spring closes, rising signal opens

Polarity:	Positive pole (+): brown	Negative pole (-): white resp. black
Set point signal	Function	Converter pressure
0 mA	Valve is fully closed	
4 mA	Valve starts to open	0,4±0,03 bar (5,8±0,44 PSI) (adjustment „ZERO“)
20 mA	Valve is fully opened	1,0±0,03 bar (14,5±0,44 PSI) (adjustment „SPAN“)

Signal range 4-20 mA, spring closes, rising signal closes

Polarity:	Negative pole (-): brown	Positive pole (+): white resp. black
Set point signal	Function	Converter pressure
4 mA	Valve is fully opened	1,0±0,03 bar (14,5±0,44 PSI) (adjustment „SPAN“)
16 mA	Valve starts to close	0,4±0,03 bar (5,8±0,44 PSI) (adjustment „ZERO“)
20 mA	Valve is fully closed	

For positioners in Ex-version this adjustment can only be carried through in the factory.

Signal range 0-20 mA, spring closes, rising signal opens

Polarity:	Negative pole (-): brown	Positive pole (+): white resp. black
Set point signal	Function	Converter pressure
0 mA	Valve is fully opened	1,0±0,03 bar (14,5±0,44 PSI) (adjustment „SPAN“)
16 mA	Valve starts to close	0,4 ±0,03 bar (5,8±0,44 PSI) (adjustment „ZERO“)
20 mA	Valve is fully closed	

For positioners in Ex-version this adjustment can only be carried through in the factory.

After all adjustments have been carried through all caps and sealings have to be put into place again.

6.2.4 Adjusting Supply Air Flow

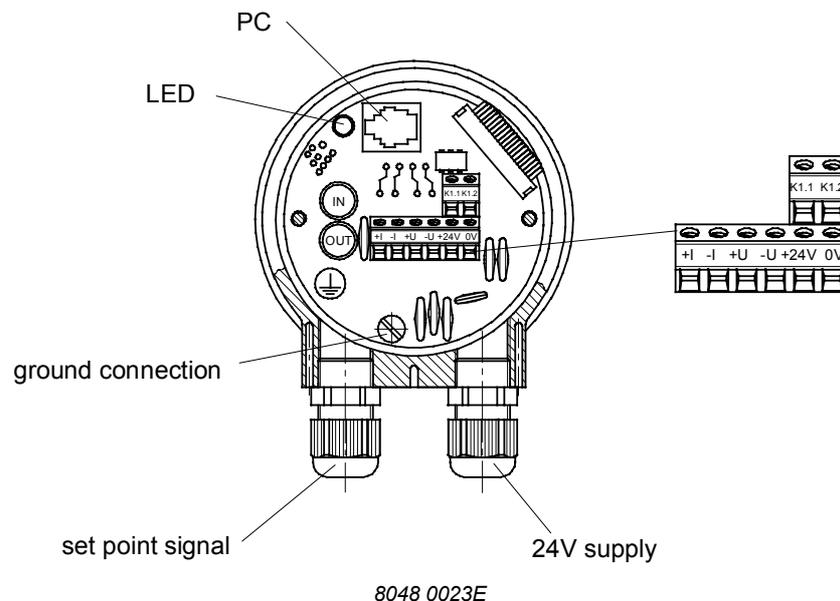
Supply air flow and corresponding control velocity are adjusted by the adjustment nozzle:

Turning the nozzle clockwise reduces the air consumption. Opening speed of the valve slows down. Heavy throttling has to be avoided as the control valve will not open anymore.

Turning the nozzle counter-clockwise increases the air consumption. Opening speed of the valve is increasing and closing slows down. Opening the nozzle too far should be avoided, as the control valve will not close anymore.

Standard adjustment: Screw in the nozzle completely
 Open nozzle by 1.5 turns approx.

6.3 Digital Positioner Type 8048



6.3.1 Self Adjustment

The adjustment (self configuration) of the mounted positioner has been carried through in the factory. It is only required after having replaced the positioner or if the valve has been repaired.

- Open positioner cap.
- Press both buttons "IN" and "OUT" simultaneously for ca. **2-3 seconds** until the LED flashes.
- Wait until the valve has performed several stroke movements (on/off) and the LED starts to light permanently.
- If the LED flashes further on, an error has occurred (e.g. insufficient supply pressure).
- Adjustment is completed by pressing both buttons "IN" and "OUT" (**1 sec. approx.**) simultaneously (LED flashes and turns off).

6.3.2 Manual Operation

The valve has to be connected to supply voltage and supply pressure. A set point signal must not be necessarily connected.

- Press button "IN" or "OUT" for **2-3 seconds** approx.
The LED on the plate is lit.
- By pressing button "IN" (supply air to actuator) or "OUT" (actuator is vented) the valve moves open or close.
- The manual operation is switched off by pressing **both** buttons simultaneously (**1 sec. approx.**).
The valve moves back to its initial position corresponding to the applied set point signal



If both buttons are pressed for too long (> 2-3 sec.), the positioner switches over to adjustment mode.

6.3.3 Configuration

Adjusting the operation parameters of the positioner can be carried through via PC-interface and configuration software.

It is required if the factory-set positioner configuration shall be modified (e.g. setting up Split-Range-operation, configuring special flow characteristics).

It is **not** required for initial start-up and operation of the positioner 8048 and also after the positioner has been replaced, as long as no local settings had been stored.

Connecting the positioner to a Personal Computer for configuration or diagnosis is carried through by a special interface cable via the plug connection "PC".

The configuration software, a special interface cable and the operating manual are available on request.

7 Replacing The Positioner

7.1 Pneumatic Positioner

- Unscrew supply air from port “P” (G1/8")
- Loosen pipe fitting at tube to actuator
- Loosen 3 threaded pins (131)
- Take off positioner

Carry through mounting the same way and in reverse order.



Do **not** open the positioner but send it back to the factory for repair.

7.2 Electro-Pneumatic Positioner Type 8047

- Remove signal cable
- Unscrew supply air from port “P” (G1/8")
- Loosen 3 threaded pins (131)
- Loosen pipe fitting at tube to actuator
- Take off positioner

Carry through mounting the same way and in reverse order.



Do **not** open the positioner but send it back to the factory for repair.

7.3 Digital Positioner Type 8048

- Unscrew supply air from port “P”
- Remove positioner cap and disconnect electrical connections
- Loosen pipe fitting at tube to actuator
- Loosen 3 threaded pins (131)
- Take off positioner and sensing pin

Carry through mounting the same way and in reverse order. Adjust positioner afterwards.



When replacing the positioner always remove positioner and sensing pin and replace it by the new positioner and the enclosed new sensing pin!

Take care for sealing the connection between actuator and positioner properly!

7.4 Replacing p/p- or i/p- to Digital Positioners

If the valve has been equipped with an analogue positioner type 8047 a digital positioner type 8048 can be mounted using a special conversion kit:

- Dismount positioner (see: replacing the positioners)
- Remove feedback spring unit from actuator
- Push sensing pin (152) with spring (153) into the digital positioner
- Place the positioner on the diaphragm housing (35), turn it to the proper position and tighten the three threaded pins (131) on the side.
- Set up the connection between actuator and positioner using a new tube and angled fitting (plastic tubes can be shortened slightly)



- Take care for sealing the connection between actuator and positioner properly!

Carry through connections and adjustment according to the chapters above.

8 Replacing the Functional Unit

8.1 Series GS1

8.1.1 Dismounting

1. Remove fixing screw (7).
2. Push valve stem (13) downwards.
3. Press functional unit out from valve body.
4.  **ATTENTION:** Do not sliding disc (3) with a hammer or any other hard tool!
5. Remove sealing (7a).

8.1.2 Mounting



Note lubrication and bonding plan!
Use original Schubert & Salzer Control Systems spare parts only!

1.  Clean support surface on valve plate (2) and body (1) and remove particles and sealing remnants.
2. Insert functional unit into valve body. Check whether the disc orifices are closing in a parallel way. In case turn the valve plate (2) a little bit.
3. Insert sealing (7a) into valve body.
4. Screw in fixing screw (7).

8.2 Series GS2 and GS3

8.2.1 Dismounting

1. Push valve stem (13) downwards.
2. Remove screws (202), body cover (201) and sealing (200).
3. Press functional unit out from valve body.
4.  **ATTENTION:** Do not sliding disc (3) with a hammer or any other hard tool!

8.2.2 Mounting



Note lubrication and bonding plan!
Use original Schubert & Salzer Control Systems spare parts only!

1. Clean support surface on valve plate (2) and body (1) and remove particles and sealing remnants.
2. Insert functional unit into valve body (1).
3. Insert sealing (200) and body cap (201). Insert functional unit into valve body. Check whether the disc orifices are closing in a parallel way. In case turn the valve plate (2) a little bit.
4. Screw together body and screws (202) firmly.

9 Dismounting and Mounting Of Valve

9.1 Dismounting the Lower Valve Part

1. Remove positioner (see chapter 7).
2. Remove coupling (22) and nuts (9).
3. Remove actuator.
4. Removing the functional unit see chapter 8.
5. Unscrew tube for packing (16), pull it out from the valve body together with valve stem (13).
6. Loose regulating nut (18) from valve stem (13) and pull off tube fir packing from valve stem.
7. Push out guide sleeve (19) and packing with mounting pin 4010410.

9.2 Dismounting the Actuator

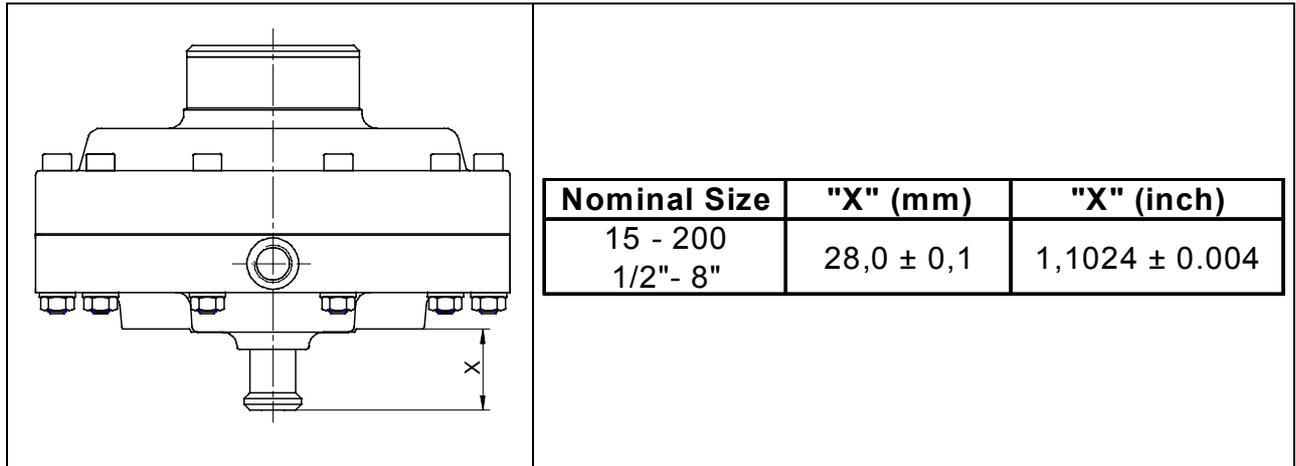
1. Loose screw pin (20).
2. Unscrew regulating nut (21) from screw (39)
3. Remove two screws (37) being opposite and replace them by two screws which are 15 mm longer at least.
4. Remove all remaining screws (37).
5. Release the actuator springs (26) carefully by unscrewing the two longer screws.
6. Unscrew nut (38) and take off diaphragm (30).
7. Dichtung (42) entfernen.

9.3 Mounting the Actuator



Note lubrication and bonding plan!
Use original Schubert & Salzer Control Systems spare parts only!

1. Clean all actuator parts with white spirit or any other suitable solvent.
2. Press in DU-bush (43).
3. Screw together screws (39), diaphragm plate (41), diaphragm (30) and diaphragm disc (33) and nut (38) tightly.
4. Insert sealing (42).
5. Screw two screws which are min. 15 mm longer as screws (37) to opposite holes in the diaphragm housings (35) and (27). Tighten the diaphragm housings until they can be screwed together completely.
6. Replace the two longer screws by screws (37).
7. Screw in regulating nut (21).
8. Adjust regulating nut to mounting dimension "X" (see table).
9. Lock with screw pin (20).

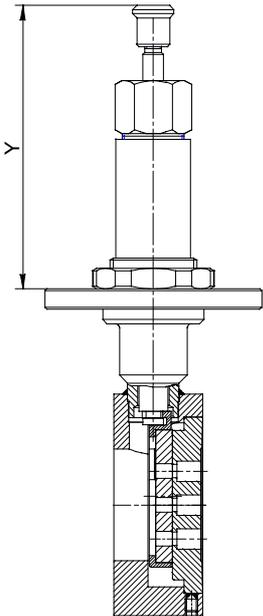
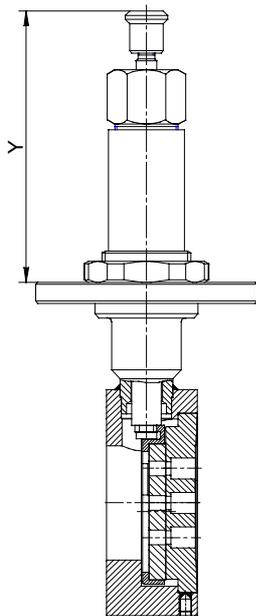
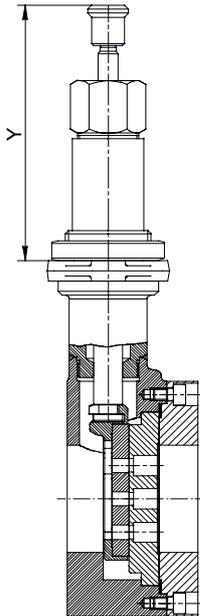
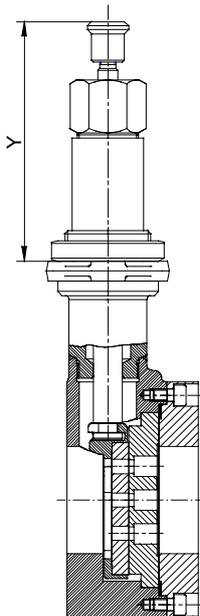


9.4 Mounting the Lower Valve Part and the Complete Valve

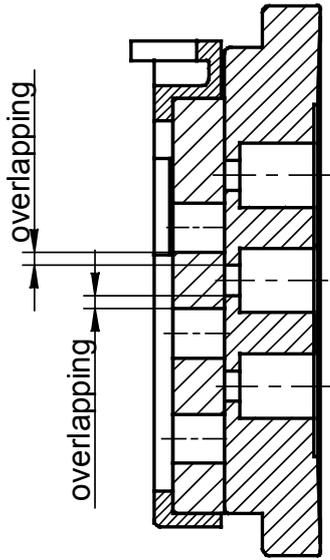


Note lubrication and bonding plan!
Use original Schubert & Salzer Control Systems spare parts only!

1. Clean all lower valve parts with white spirit or any other suitable solvent.
2. Insert complete packing into tube (16) using a suitable tool. Take care for the right order.
3. Push valve stem into body (1).
4. Screw tube for packing (16) to valve body.
5. Insert functional unit into body (1). Mount acc. chapters 7.1 or 7.2.
6. Adjust mounting dimension "Y" (see following table). To do this shift the functional unit to position "valve opened".
7. Lock with screw pin (20).
8. Mount the actuator to the lower valve part.
9. Screw tight actuator with nut (9).
10. Mount coupling (22).
11. See mounting dimension "Y", disc overlapping and valve strokes in both following tables.

Series GS1- Spring closes		Series GS1- Spring opens		Series GS2/GS3 Spring closes		Series GS2/GS3 Spring opens	
							
DN	"Y" (mm)	DN	"Y" (mm)	DN	"Y" (mm)	DN	"Y" (mm)
15	136,25 ± 0,2	15	130 ± 0,2	15	124,25 ± 0,2	15	118 ± 0,2
20	136,25 ± 0,2	20	130 ± 0,2	20	124,25 ± 0,2	20	118 ± 0,2
25	136,25 ± 0,2	25	130 ± 0,2	25	124,25 ± 0,2	25	118 ± 0,2
32	136,25 ± 0,2	32	130 ± 0,2	32	124,25 ± 0,2	32	118 ± 0,2
40	136,25 ± 0,2	40	130 ± 0,2	40	124,25 ± 0,2	40	118 ± 0,2
50	138,25 ± 0,2	50	130 ± 0,2	50	126,25 ± 0,2	50	118 ± 0,2
65	138,25 ± 0,2	65	130 ± 0,2	65	126,25 ± 0,2	65	118 ± 0,2
80	138,25 ± 0,2	80	130 ± 0,2	80	126,25 ± 0,2	80	118 ± 0,2
100	138,75 ± 0,2	100	130 ± 0,2	100	126,75 ± 0,2	100	118 ± 0,2
125	138,75 ± 0,2	125	130 ± 0,2	125	126,75 ± 0,2	125	118 ± 0,2
150	138,75 ± 0,2	150	130 ± 0,2	150	126,75 ± 0,2	150	118 ± 0,2
200	138,75 ± 0,2	200	130 ± 0,2	200	126,75 ± 0,2	200	118 ± 0,2

Attention: table not in inch!



DN	Overlapping		Valve stroke	
	mm	inch	mm	inch
15 - 1/2"	1,0	0.059	6,25	0.246
20 - 3/4"	1,5	0.059	6,25	0.246
25 - 1"	1,5	0.059	6,25	0.246
32 - 1 1/4"	1,5	0.059	6,25	0.246
40 - 1 1/2"	1,5	0.059	6,25	0.246
50 - 2"	1,5	0.059	8,25	0.325
65 - 2 1/2"	1,5	0.059	8,25	0.325
80 - 3"	1,5	0.059	8,25	0.325
100 - 4"	1,5	0.059	8,75	0.325
125 - 5"	1,5	0.059	8,75	0.325
150 - 6"	2,0	0.787	8,75	0.344
200 - 8"	2,0	0.787	8,75	0.344

