

Type 3310/AT and Type 3310/3278 Pneumatic Control Valves



Type 3310 Segmented Ball Valve



Fig. 1 · Type 3310/3278 with positioner



Fig. 2 · Type 3310/AT

Mounting and Operating Instructions

EB 8222 EN



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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 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 that includes information about the applied conformity assessment procedure. The declaration of conformity is available on request.*
- ▶ *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 taking appropriate precautions.*
- ▶ *Proper shipping and appropriate storage are assumed.*

NOTICE

- ▶ *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 supply air and control signal are disconnected or blocked to prevent any hazards that could be caused by moving parts.*

1 Design and principle of operation

The pneumatic control valve consists of the Type 3310 Segmented Ball Valve and either the Pfeiffer Type AT or the SAMSON Type 3278 Pneumatic Rotary Actuator.

The control valve is used for both throttling and on/off services in process engineering and plants with industrial requirements.

It is suitable for liquids, vapors and gases within a temperature range of -29 to 220 °C and for pressure rating Class 150 and 300.

The segmented ball valve in valve sizes NPS 1 to 12 is available with a soft-seated or metal-seated ball. A code number on the nameplate located on the valve body indicates which type of seal is used.

The process medium flows through the valve. The signal pressure acting on the rotary actuator determines the position (opening angle) of the segmented ball (8) and therefore the flow rate across the open area between the segmented ball and valve body (1).

The actuator motion is transmitted to the segmented ball valve by a shaft with square or key drive.

The valve shaft (4) is sealed by a self-adjusting PTFE V-ring packing (2.3).

Fail-safe action:

The fail-safe action of the control valve, which becomes effective when the supply air (signal pressure) fails, is determined in Type 3310/AT (Type SRP single-acting version) by the version used and in Type 3310/3278 by how the pneumatic actuator is mounted to the valve.

Fail-close

The actuator springs close the valve when the signal pressure is reduced or the supply air fails.

When the signal pressure increases, the valve is opened, acting against the spring force.

Fail-open

The actuator springs open the valve when the signal pressure is reduced or the supply air fails.

When the signal pressure increases, the valve is closed, acting against the spring force.

The double-acting Type DAP Rotary Actuator has no springs. A defined final position is not reached when the supply air fails.

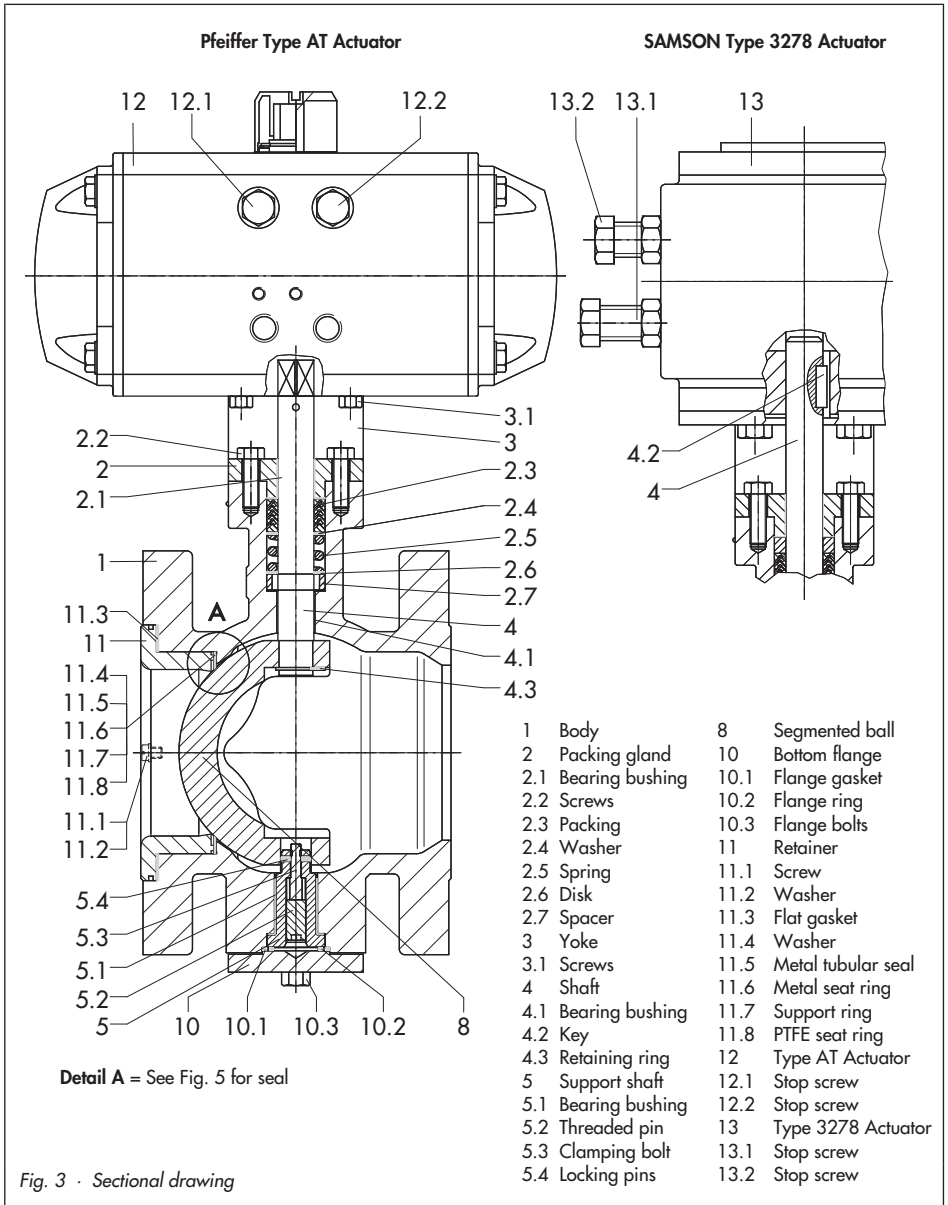


Fig. 3 · Sectional drawing

2 Installation

2.1 Assembling valve and actuator

2.1.1 Type 3310-SRP

If the valve and actuator have not been assembled by the manufacturer, proceed as follows:

Note: *In the standard actuator version (SRP = single-acting with spring-return), the spring-return mechanism is designed to close clockwise when there is no signal pressure.*

Should another direction of rotation or a double-acting actuator (DAP = double-acting without spring-return) be required, this must be specified on ordering the actuator.

Fail-safe action	Springs	Characteristic
Fail-close	Clockwise	Equal percentage
Fail-close	Counterclockwise	Linear
Fail-open	Clockwise	Linear
Fail-open	Counterclockwise	Equal percentage

The rotary actuator with a square drive can be placed either vertically or horizontally at a 90° angle to the segmented ball valve.

Fail-close valve

1. Place the segmented ball (8) of the valve in the closed position (0° angle of rotation).

2. Fasten the yoke (3) to the flange of the valve shaft using two or four screws (depending on the valve size).
3. If necessary, place the shaft adapter on the valve shaft, then slide the actuator over the adapter or valve shaft (4) and fasten it onto the yoke with four screws.
4. Adjust the stop screws (12.1 or 12.2 depending on the direction of rotation) to close the valve completely. Additionally, align the markings on the shaft and packing flange.
5. Secure the position of the stop screw with its lock nut.
6. Apply a signal pressure to the loading pressure connection which corresponds to the number of springs in the actuator (see actuator nameplate).
7. Adjust the other stop screw so that the segmented ball stops at 90° angle of rotation.
8. Secure the position of the stop screw with its lock nut.

Fail-open valve

1. Place the segmented ball (8) of the valve in the open position (90° angle of rotation).
2. Fasten the yoke (3) to the flange of the valve shaft using two or four screws (depending on the nominal size).
3. If necessary, place the shaft adapter on the valve shaft, then slide the actuator over the adapter or valve shaft (4) and fasten it onto the yoke with four screws (3.1).
4. Adjust the stop screw (12.1 or 12.2 depending on the direction of rotation) so

that the valve is fully open at 90°.

Additionally, align the markings on the shaft and packing flange.

5. Secure the position of the stop screw with its lock nut.
6. Apply a signal pressure to the loading pressure connection which corresponds to the number of springs in the actuator (see actuator nameplate).
7. Adjust the other stop screw so that the segmented ball is fully closed. To do this, align the markings on the shaft and packing flange.
8. Secure the position of the stop screw with its lock nut.

2.1.2 Type 3310/3278

If the valve and actuator have not been assembled by the manufacturer, proceed as follows to mount the actuator onto the body flange **1** or **2** depending on the characteristic and fail-safe position:

'1' or '2' is cast onto the corresponding side of the valve body.

Fail-safe action	Characteristic	Body flange
Fail-close	Equal percentage	2
Fail-close	Linear	1
Fail-open	Equal percentage	1
Fail-open	Linear	2

The rotary actuator can be placed as required to suit the on-site conditions either vertically or horizontally at a 90° angle to the segmented ball valve.

Fail-close valve

1. Unscrew both stop screws (13.1 and 13.2) at the rotary actuator, then screw back in the stop screw (13.2) until the actuator shaft's grooves are aligned horizontally or vertically to the actuator axis.
2. Place the segmented ball (8) of the valve in the closed position (0° angle of rotation).
3. Fasten the yoke (3) to the flange of the valve shaft with two or four screws depending on the nominal size.
4. Slide the actuator with the actuator shaft over the valve shaft (4) and screw down to the yoke (3) with four screws.
5. Unscrew the stop screw (13.2) again.
6. Adjust the stop screw (13.2) so that the valve is fully closed. Additionally, align the markings on the shaft and packing flange.
7. Apply a supply pressure required for the spring range (see actuator nameplate) to the loading pressure connection to open the valve.
8. Screw back in the stop screw (13.1) until the valve reaches its open position (90° angle of rotation).
9. Secure both stop screws with their lock nuts.

Fail-open valve

1. Unscrew both stop screws (13.1 and 13.2) at the rotary actuator, then screw back in the stop screw (13.2) until the actuator shaft's grooves are aligned hor-

izontally or vertically to the actuator axis.

2. Place the segmented ball (8) of the valve in its open position (90° angle of rotation).
3. Fasten the yoke (3) to the flange of the valve shaft with two or four screws depending on the nominal size.
4. Slide the actuator over the valve shaft (4) and screw tight to the yoke (3) with four screws.
5. Unscrew the stop screw (13.1) again.
6. Apply a supply pressure required for the spring range (see actuator nameplate) to the loading pressure connection to close the valve.
7. Adjust the stop screw (13.1) until the valve is fully closed by the segmented ball. In addition, align the markings on shaft and packing flange
8. Disconnect supply pressure.
9. Screw back in the stop screw (13.2) until the segmented ball stops at 90° angle of rotation in the open position.
10. Secure both stop screws with their lock nuts.

2.2 Mounting position

Note: Prior to installing the valve into the pipeline, place it in the CLOSED position to allow the seat to be centered properly with the segmented ball.

The control valve can be installed into a pipeline either vertically or horizontally,

however, the following points regarding the direction of flow must be observed:

Install the valve in the pipeline so that the lower half of the segmented ball opens into the flow. This helps avoid dirt deposits from accumulating which could prevent the valve from opening. The direction of medium flow into the convex of the ball also prevents the medium from collecting unnecessarily in the shaft bearings.

The standard direction of flow (into the convex face) is indicated by the manufacturer by an arrow on the valve body.

Should the direction of flow be reversed, e.g. required for abrasive media, it is necessary to indicate the reversed direction by using the arrow plate and the two slotted pins included in the scope of delivery. Using this direction of flow causes the pressure of the process medium to constantly act on the packing. On tightening the flange bolts, make sure that an even pressure is exerted on the flat gaskets.

2.3 Loading pressure connection

The loading pressure connection of rotary actuators is a G $\frac{1}{8}$ female thread port for small actuators and a G $\frac{1}{4}$ port for larger actuators.

The connection allows in compliance with VDE/VDE 3845 guidelines the connection of a solenoid valve, e.g. Type 3963, or a limit switch with or without a solenoid valve (Type 3776/3777).

Accessories are available for the connection of SAMSON positioners.

3 Operation

3.1 Changing the fail-safe action

The fail-safe action can be changed in the Type 3278 Actuator after delivery from fail-close to fail-open and vice versa.

To do this, the attachment side of the rotary actuator must be changed (see the table on page 7).

The position of pistons in the Type SRP Actuator must be reversed.

Note: Refer to the mounting and operating instructions of the rotary actuator used for further details about, for example, changing the spring range to obtain other actuator torques.

4 Maintenance – Replacing parts

The control valve is subject to natural wear especially at the seat, segmented ball and packing. Depending of 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 shut-off properly, this may be because tight shut-off is prevented by dirt or other impurities between the seat ring and segmented ball or because the seating surfaces have been damaged.

If you intend to remove parts to clean them, first mark the position of the seat ring (11.8) in the body for a valve with soft-seated ball. This will help you to replace the seat ring in its correct position on reassembling the valve.

Proceed as described in section 4.2 to replace the seat ring (11.6 or 11.8) with new ones.



CAUTION!

Before removing parts from the valve, remove the valve from the pipeline. To proceed, first relieve the corresponding plant section of pressure and drain it. Let the plant section cool down, if necessary.

Note: Prior to performing any work on the valve body, remove the actuator.

Removing the actuator:

1. Unscrew the two or four screws on the flange of the valve shaft and pull off the actuator together with the yoke (3).

4.1 Replacing the packing

The valves in NPS 1 to 12 are fitted with a V-ring packing.

1. Unscrew the screws (2.2) and take off packing flange (2) with the bearing bushing (2.1).
2. Remove all packing parts from the packing chamber using a suitable tool. Clean them thoroughly.

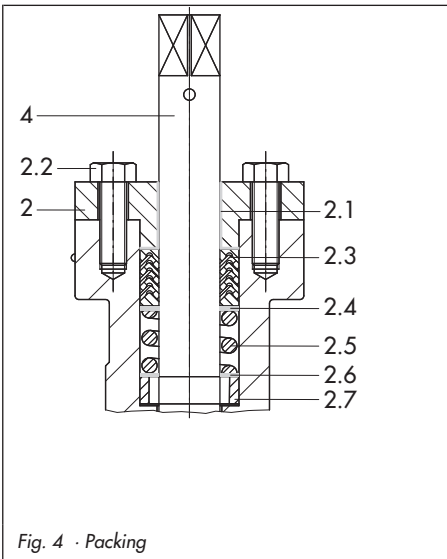


Fig. 4 · Packing

3. Renew packing (2.3), then push new packing parts over the shaft (4) into the packing chamber.
4. Push the packing flange (2) together with bearing bushing (2.1) onto the shaft (4). Fasten the packing flange using the screws (2.2).

4.2 Replacing the seat ring

1. Remove both anchoring screws (11.1) with washers (11.2).
2. Take out the retainer (11) together with the flat gasket (11.3).
If you are unable to remove the retainer, use the special tool listed in Table 3.

Soft-seated version:

3. Remove the support ring (11.7) and the seat ring (11.8).

Metal-seated version:

3. Remove in sequence any washer(s) (11.4), the metal tubular seal (11.5), seat ring (11.6) and the washers (11.4).

Reassembly

To reassemble, proceed in the reverse order. Special tools are not necessary.

The retainer (11) can be pressed into the body using, for example, a blank flange, by tightening the flange bolts accordingly. Prior to this, it is absolutely necessary to place the valve in the closed position to center the seat ring and segmented ball.

Note: Check the friction torque (breakaway torque) needed to open the valve according to the table on page 15.

Metal-seated version:

Change the number of washers (11.4) used. If necessary, omit the bottom washer on the valve body side.

If the friction torque is different from the torque specified in the table, proceed as follows:

Soft-seated version:

Turn the segmented ball clockwise by 360° in the valve body two or three times to let the seal adapt itself.

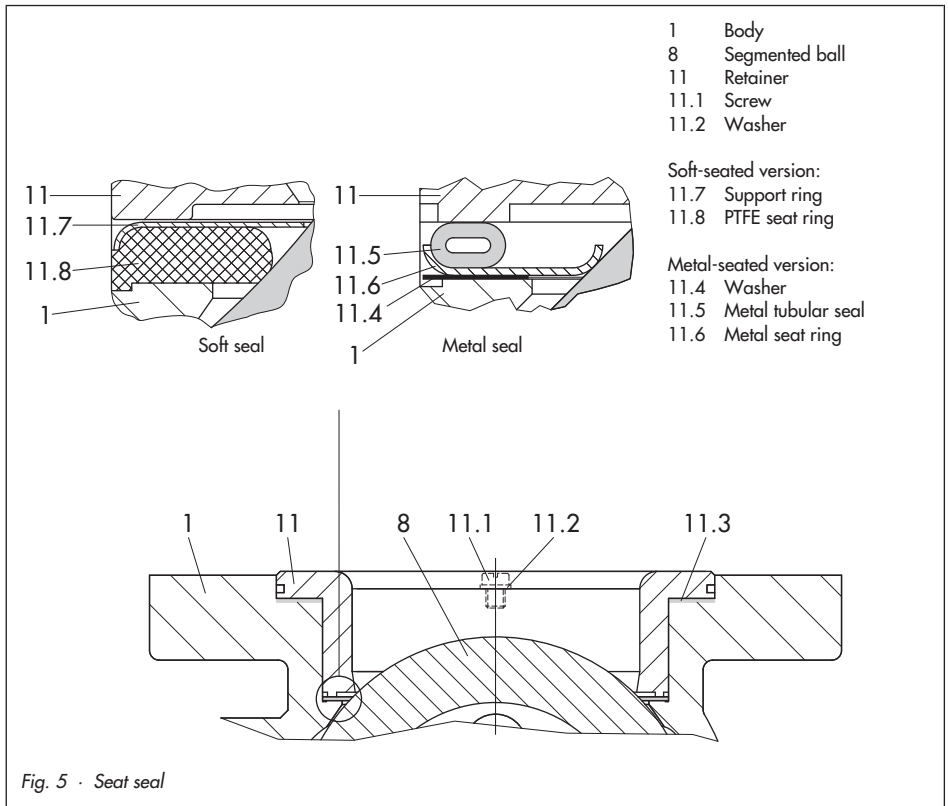


Fig. 5 · Seat seal

4.3 Replacing the segmented ball, shafts and bearings

Note: *No clearance may exist between the segmented ball and shafts. Therefore, the shafts need to be replaced as well when the segmented ball is replaced with a new one. Furthermore, the bearing bushings and seat rings as well as the ring and gasket on the bottom flange need to be renewed as well.*

1. Unscrew both bolts (10.3) and lift off bottom flange (10) together with the ring (10.2). Remove the flange gasket (10.1).
2. Unscrew the threaded pin (5.2) out of the shaft and remove the clamping bolt (5.3). Make sure that the locking pins (5.4) do not get lost.
Press out the support shaft. If this is not possible, screw in a screw with a washer (see table listing special tools) in place of the threaded pin. Turning the screw against the washer loosens the support shaft.
3. Pull the bearing bushing (5.1) out of the body.
4. Unthread screws (2.2) and lift off the packing flange (2) together with the bearing bushing (2.1).
5. Use snap ring pliers to pull the retaining ring (4.3) off the shaft and pull the shaft out of the body using disassembling tool.
6. Remove all packing parts with the appropriate tool from the packing space, and clean packing space thoroughly.
7. Remove the lower bearing bushing (4.1).

8. Take the segmented ball out of the body. For valves in NPS 1, 1 ½ and 2, the segmented ball must be removed from the retainer side. Proceed as described in section 4.2, dismantling first the retainer and the seat ring parts.

Reassembly

We recommend purchasing the assembly tools listed in Table 3 for reassembling the valve.

To assemble the valve, proceed in the reverse order as described in disassembly. Observe the tightening torques of the bolts for the packing flange and bottom flange listed in Table 3.

On inserting the shaft (4) into the body and the segmented ball, make sure that the shaft is aligned correctly with the segmented ball (the red marking on the shaft must be positioned at a right angle to the pipeline when the valve is closed).

1. Insert the segmented ball (8) into the valve body.
2. Push first the bearing bushing (4.1) into the body, then align the shaft (4) and use an assembling tool to press the bearing bushing into the segmented ball.
3. Use the part of the tool that is in the bearing of the support shaft to slide the segmented ball (8) onto the shaft (4) and attach the retaining ring (4.3).
4. Insert the locking pins (5.4) into the holes of the support shaft (5), then position the complete support shaft (parts 5, 5.2, 5.3 and 5.4) on the bearing bushing (5.1)

- and use the packing flange (2) to press them in.
5. Align the segmented ball (8) centrally.
 6. Screw the threaded pin (5.2) against the clamping bolt (5.3) to obtain a force-locking connection between the support flange and segmented ball.
 7. Mount the packing with spacer (2.7), washer (1.6), spring (2.5), thrust washer (2.4), packing (2.3) and flange (2).

Note: Check the friction torque (breakaway torque) needed to open the valve according to Table 3.

Proceed as described in section 4.2 if the torque is different than specified.

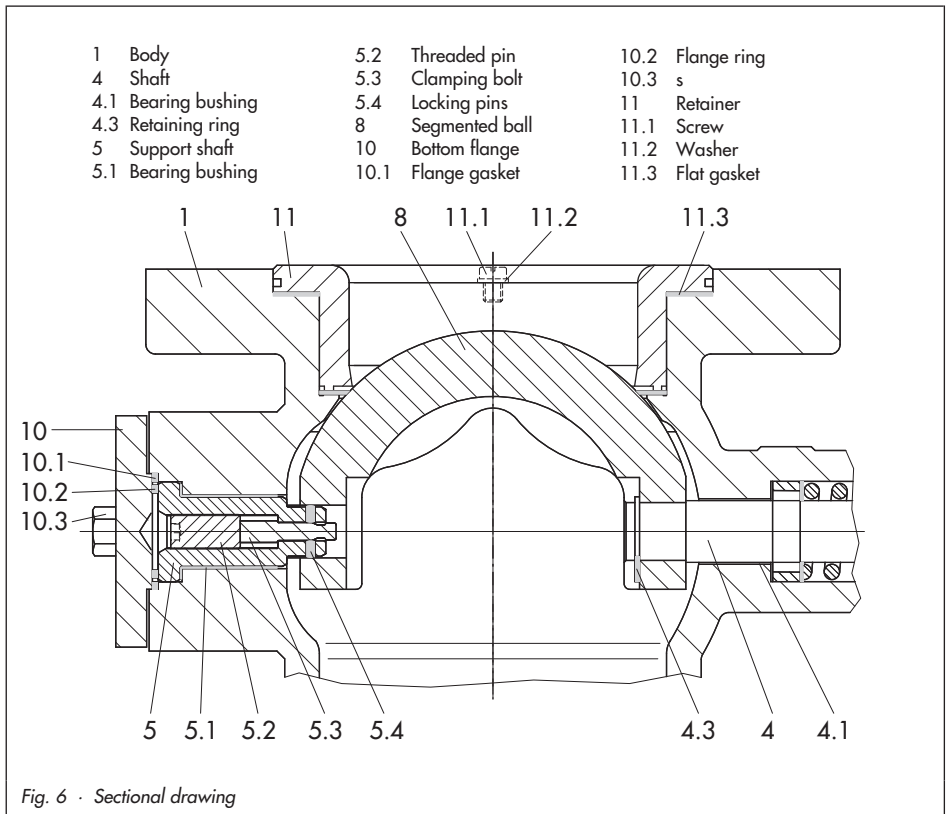


Fig. 6 · Sectional drawing

5 Changing the characteristic

Changing the characteristic from equal percentage to linear and vice versa can be carried out by changing the actuator's direction of rotation.

See Table 1 and 2.

6 Tools and torques

6.1 Special tools

Table 3 · Special tools					
NPS	Extracting tool for retainer (11)		Extracting tool for support shaft (5)	Tool to mount and remove the shaft	
	Crossbeam	Flange		Press tool for support shaft	Press tool for actuator shaft
	Order no.				
1	1281-0011	1281-0007	1281-0026	1281-0019	1281-0023
1 ½	1281-0012			1281-0020	
2	1281-0013	1281-0008			
3	1281-0014				
4	1281-0015	1281-0009	1281-0027	1281-0021	1281-0024
6	1281-0016				
8	1281-0017	1281-0010	1281-0028	1281-0022	1281-0025
10	1281-0018				
12					
Adapter for torque wrench		Shaft with square drive		Shaft with key drive	
NPS	1, 1 ½, 2, 3	1281-0029		1281-0032	
	4, 6	1281-0030		1281-0033	
	8, 10	1281-0031			
	12				

6.2 Tightening torques

Valve size NPS	1	1 ½	2	3	4	6	8	10	12
Tightening torque in Nm Screws (2.2) on packing flange Bolts (10.3) on bottom flange	35	35	35	35	35	35	60	60	60
Friction torques									
Valve size NPS	1	1 ½	2	3	4	6	8	10	12
Friction torque to open the valve [Nm]									
Metal seal	8	10	11	19	40	70	100	155	155
Soft seal	9	12	14	24	50	100	170	260	260

6.2.1 s

Table 5 · ANSI version

NPS	Class	s (quality 8.8)	Min. tightening torque in Nm
1	150	4 x ½"	35
	300	4 x ⅝"	45
1½	150	4 x ½"	45
	300	4 x ¾"	65
2	150	4 x ⅝"	90
	300	8 x ⅝"	45
3	150	4 x ⅝"	125
	300	8 x ¾"	65
4	150	8 x ⅝"	80
	300	8 x ¾"	80
6	150	8 x ¾"	125
	300	12 x ¾"	80
8	150	8 x ¾"	165
	300	12 x ⅞"	125

NPS	Class	s (quality 8.8)	Min. tightening torque in Nm
10	150	12 x 7/8"	155
	300	16 x 1"	135
12	150	12 x 7/8"	155
	300	16 x 9/8"	125

Table 6 · DIN version

DN	PN	Flange bolts (quality 8.8)	Min. tightening torque in Nm
25	10/40	4 x M12	40
40	10/40	4 x M16	55
50	10/40	4 x M16	75
80	10/16	8 x M16	55
	25/40	8 x M16	55
100	10/16	8 x M16	70
	25/40	8 x M20	85
150	10/16	8 x M20	125
	25/40	8 x M24	150
200	10	8 x M20	165
	16	12 x M20	110
	25	12 x M24	135
	40	12 x M27	150
250	10	12 x M20	140
	16	12 x M24	165
	25	12 x M27	185
	40	12 x M30	205
300	10	12 x M20	140
	16	12 x M24	165
	25	16 x M27	140
	40	16 x M30	165

7 Description of nameplate

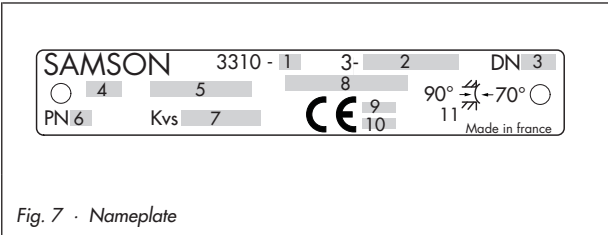


Fig. 7 · Nameplate

The nameplate contains all details to identify the valve:

- 1 Type designation
- 2 Serial number
- 3 Valve size NPS/DN ...
- 4 Seat/ball seal
 - ME Metal seal
 - PT PTFE
 - PK PEEK 450G Victrex®
 - PK1 PEEK 450FC30 Victrex®
- 5 Body material
- 6 Pressure rating Class/PN ...
- 7 Flow coefficient Kvs .../Cv ...
 - Characteristic
 - % Equal percentage
 - LIN Linear
- 8 PED text
- 9 Notified body
- 10 Year of manufacture
- 11 Direction of flow and maximum opening angle

8 Accessories

NPS	Type AT Actuator SRP/DAP	Connecting flange DIN 3337	Mounting kit Order no.	Actuator cm ² Type 3278	Mounting kit Order no.
1	30 60	F05	1400-7316	160 (F07)	1400-7251
1½	60 100	F05 F07	1400-7316 1400-7317		
2	60 100 150	F05 F07 F07	1400-7348 1400-7239 1400-7239		1400-7252
3	100 150 220	F07 F07 F10	1400-7239 1400-7239 1400-7732		
4	220 300 450	F10 F10 F12	1400-7240 1400-7240 1400-7241	320 (F12)	1400-7255
6	300 450 600	F10 F12 F12	1400-7240 1400-7241 1400-7241		
8	600 900 1200	F12 F14 F14	1400-7755 1400-7243 1400-7243		
10	900 1200	F14 F14	1400-7243		
12	900 1200	F14 F14	1400-7243		

9 Customer inquiries

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

- ▶ Order number
(mentioned on the nameplate)
- ▶ Type, model number, valve size and valve version
- ▶ Pressure and temperature of the process medium
- ▶ Flow rate in m³/h
- ▶ Bench range (spring range of the actuator)
- ▶ Installation drawing

Dimensions

Refer to the Data Sheet T 8222 EN for details about dimensions and weights.



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