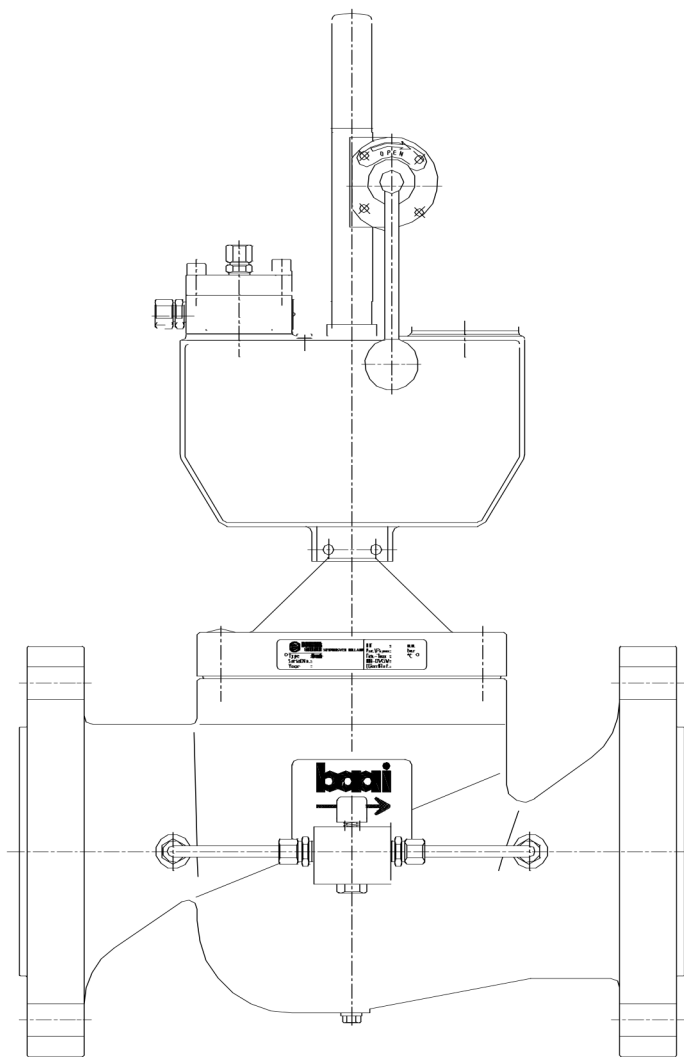




CONTROLS SUPPLY CHAIN
VALVES ACTUATORS INSTRUMENTATIONS

Safety shut-off valve BAAI-HSV086 / HSVS086

Operation and maintenance manual





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While great care has been taken in composing the text and illustrations, Gorter Controls B.V. does not accept liability for any inaccuracies.



- 1 Technical Specifications**
- 1 Technical Specifications**
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1.1 General

Type	:	HSV086 / HSVS086
Nominal diameter	:	1" – 24"
• Pressure categories	:	ANSI 300 and 600 ¹⁾
Design	:	DIN 3381, BS 1873, ANSI B16.10
Operating pressure	:	up to 100 bar
Threshold value:		
• against high pressure	:	3-49.5 bar ANSI 300 / 3 up to 90 bar ANSI 600 ¹⁾
• against low pressure	:	0.7 up to 10 bar
Reproducibility		
• high pressure	:	AG 1 between 20 - 95 bar AG2.5 between 3 - 20 bar
• low pressure	:	AG 5 between 0.7 - 10 bar
Temperature range	:	-30 up to +60° C
Closing time	:	< 1 sec.
Building-in position	:	horizontally with switch and reset mechanism up
DIN-DVGW No. HSV	:	NG-4395AO0715
DIN-DVGW No. HSVS	:	NG-4395AP1052

1.2 Materials

Valve body	:	A216-WCB or GS-C25N or St52-3N or equivalent
Valve rod	:	St52-3N or equivalent
Cover	:	St52-3N or equivalent
Guides	:	Bronze Rg7 acc. DIN 1705
Valve stem	:	C35 or equivalent
O-rings	:	Viton and NBR or equivalent
Diaphragm	:	NBR with nylon
SVC086 (operational parts)	:	stainless steel
Dual tripping device	:	brass and steel

When corrosive gasses are used, other materials may be necessary. We would advise always to describe the composition of the gas exactly when placing the order.

¹⁾ Higher pressure ratings are also available

1.3 Dimensions and weights 1"- 12"

DN	ANSI 300			ANSI 600		
	L	H	W	L	H	W
1"	203	555	30	216	555	33
2"	267	615	45	292	615	45
3"	318	655	65	356	655	70
4"	356	665	105	432	665	115
6"	445	715	195	559	715	210
8"	559	867	295	660	867	320
10"	622	1000	455	787	1000	550
12"	711	960	600	838	960	660

Table I: Dimensions L and H (mm) and weight W (kg)
 For dimensional drawing see figure 1a (barring alterations)

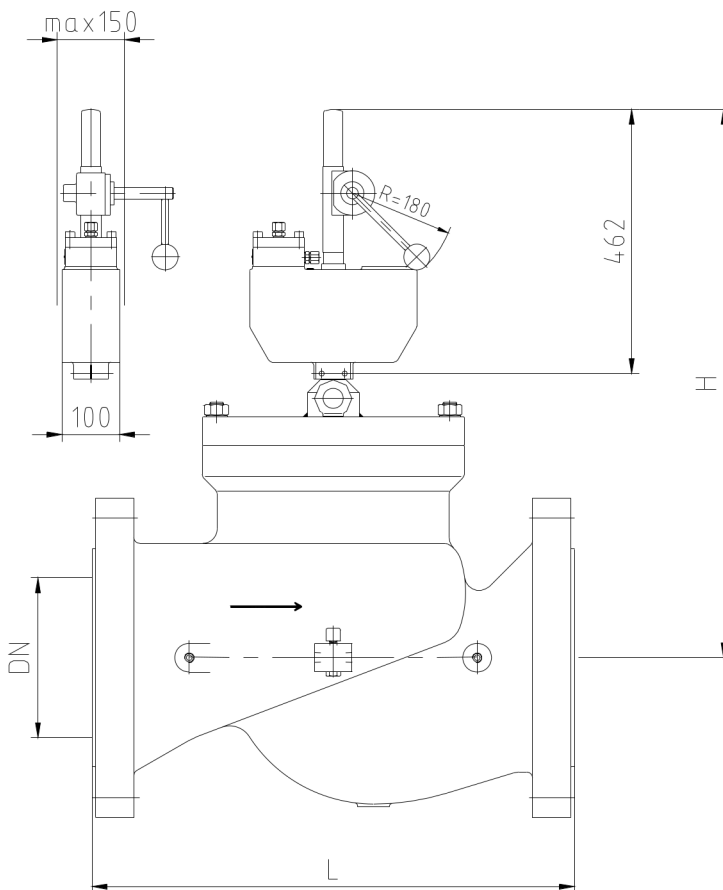


Figure 1a: Dimensional drawing

1.4 Dimensions and weights 16"- 24"

DN	ANSI 300			ANSI 600		
Size	L	H	W	L	H	W
16"	864	1327	1240	991	1327	1290
20"	1016	1410	1500	1194	1410	1540
24"	1346	1500	1780	1397	1500	1820

Table II: Dimensions L and H (mm) and weight W (kg)
 For dimensional drawing see figure 1b (barring alterations)

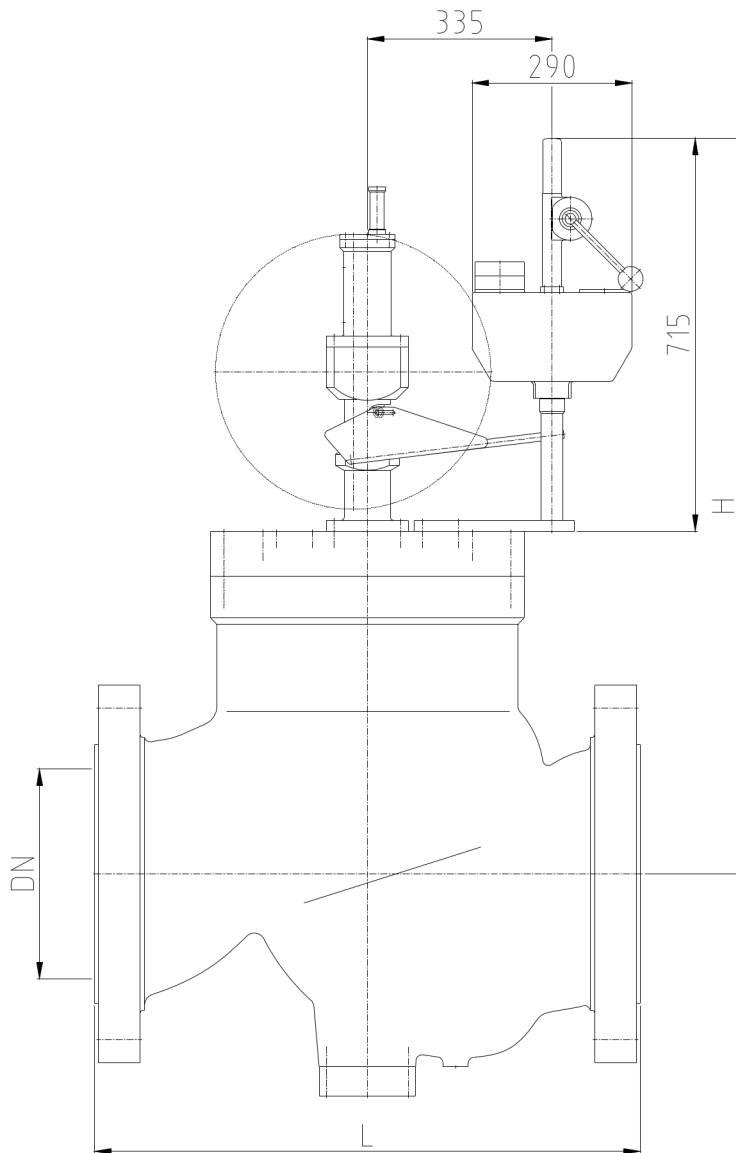


Figure 1b: Dimensional drawing.

1.5 Determination of the capacity

To determine the pressure loss of a safety device with fully open valve, you may use this formula:

$$\Delta P = \frac{\{Q_n \cdot \sqrt{d \cdot (T_e + 273)}\}^2}{(13,57 \cdot C_g)^2 \cdot p_i}$$

For natural gas with $\rho_n = 0.831 \text{ kg/m}^3$
 $d = 0.643$

When using other gasses
 $d = \rho_n \text{ gas} / 1.29$

with Q_n = flow rate in m_n^3/h
 p_i = inlet pressure in bar (abs)
 C_g = capacity rate
 d = relative density (air = 1)
 T_e = inlet temperature of the gas
 ρ_n = gas density ($T_e = 273 \text{ K}$)

DN	1"	2"	3"	4"	6"	8"	10"	12"	16"	20"	24"
C_G	480	1950	4300	7050	15100	26060	40800	60050	104150	166640	287953

Table II: Capacity rates C_G

To limit the flow forces we would advise not to exceed the following flow rate. You have to use the formula below for this purpose.

$$Q_{\max} \leq K D_1 \sqrt{p_{i \min}}$$

in which D_1 = nominal diameter in mm
 $p_{i \min}$ = minimum inlet pressure in bar (abs)
 Q_{\max} = maximum flow in m_n^3/h

$K = 100$ for DN = 1" up to 6"

$K = 200$ for DN = 8" up to 12"

$K = 300$ for DN = 16" up to 24"

1.6 Pressure converter and setpoint springs

1.6.1 Pressure converter: setpoint range

SETPOINT RANGE IN BAR				
pressure converter	W _{hu}	AG	W _{ho}	AG
SM1.2-A	2.0 - 10.0	5	40.0 - 95.0	1
SM1.4-A	1.0 - 5.0	5	20.0 - 48.0	1
SM1.9-A	0.7 - 2.5	5	3.0 - 21.0	2.5

Table III: Setpoint range of the pressure converters

1.6.2 Pressure converter: setpoint springs

SM1.9a				
min-setpoint	0.7	STD	colorcode	green
max	springrange [barg]		setpointrange [barg]	
colorcode	min	max	min	max
green	0.2	0.8	0.7	1.3
yellow	0.6	1.5	1.1	2
*) black	1.4	3.8	1.9	4.3
*) white	3.7	7.1	4.2	7.6
*) orange	6.2	9.6	6.7	10.1
*) grey	7.9	11.3	8.4	11.8
*) purple	10.5	16.5	11.0	17.0
*) brown	15.6	21.7	16.1	22.2

SM1.4a				
min-setpoint	1	STD	colorcode	green
max	springrange [barg]		setpointrange [barg]	
colorcode	min	max	min	max
green	0.5	1.8	1.5	2.8
yellow	1.3	3.2	2.3	4.2
black	3	8.2	4	9.2
with	8	15	9	16
orange	13	21	14	22
*) grey	17	24	18	25
*) purple	23	35	24	36
*) brown	33	46	34	47

SM1.2a				
min-setpoint	2	STD	colorcode	green
max	springrange [barg]		setpointrange [barg]	
colorcode	min	max	min	max
green	0.9	3	2.9	5
yellow	2	5	4.2	7.4
black	5	14	7	16
white	13	26	15	28
orange	22	35	24	37
grey	29	41	31	43
*) purple	38	60	40	62
*) brown	56	78	58	80

*) are tested by DVGW
 if min.setpoint=0, the red spring will be mounted

Table IV: setpoint springs

1.6.3 Choice of pressure converter and setpoint springs

In order to choose the correct pressure converter and setpoint springs for a required threshold value, proceed as follows:

- The lower threshold value is only determined by the force of the minimum spring;
- Choose the pressure converter for the required threshold value from table III;
- When you have a choice of 2 pressure converters, choose the pressure converter with the largest diaphragm surface (SM1.2-A is the smallest, SM1.9-A is the largest);
- Now select from table IV the relevant setpoint spring for the minimum threshold value of the pressure converter you have just decided on;
- The maximum threshold value is determined by means of the force of the minimum and maximum spring. In order to determine the maximum threshold value, the minimum threshold value should be deducted from the maximum. The pressure difference determines the selection of the maximum spring;
- Using the calculated pressure difference, you select from table IV the setpoint spring of the maximum threshold value.

Example of selection of the setpoint springs for the minimum and maximum threshold value

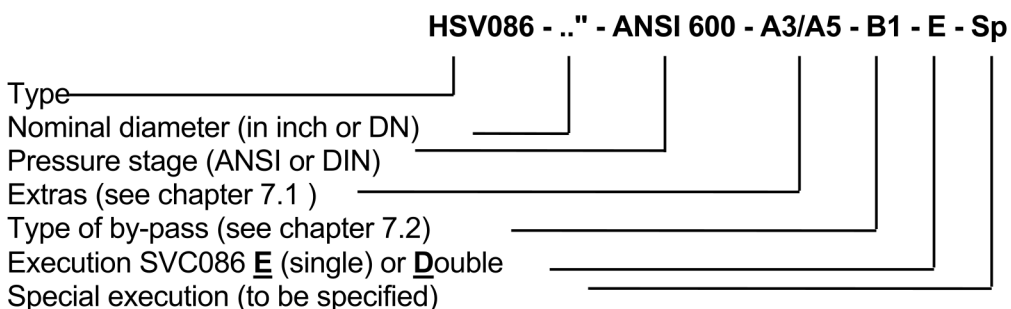
Given: Minimum threshold value 2 bar
 Maximum threshold value 22 bar

Calculate the pressure difference between maximum and minimum threshold value:
 Result: 22 bar - 2 bar = 20 bar.

Choosing the pressure converter and setpoint springs:

- acc. table III, pressure converters SM1.4-A and SM1.9-A are suitable. The SM1.9-A has the larger diaphragm surface;
- in table IV we find for a lower threshold value of 2 bar the yellow setpoint spring with a pressure range of 1.5 to 2.5 bar;
- for the maximum threshold value of 20 bar we find the brown setpoint spring with a pressure range of 15.0 to 21.0 bar.

1.7 Type indication





	2	Working
	2	Working
	2	Working
	2	Working
	2	Working



2.1 General

The HSV086 is a mechanical safety shut-off device of the slam shut type and has evolved from type Baai SV086.

The safety shut-off device is not self-acting. Having solved the failure, the valve has to be opened by someone locally (i.e. at the device). The valve can only be opened when the failure has been solved and the switch mechanism (the SVC086) has already been released.

The safety shut-off device functions very precisely and has a limited switching trajectory, so that the threshold value may be relatively close to the set pressure of the regulator.

At an undesired failure in the pressure converter or an impulse line the valve shuts automatically.

Owing to the application of two pressure converters and two minimum/maximum springs, a "one of the two" redundancy is possible for each shut-off valve. Standard, the safety shut-off device has been equipped with an emergency button. In addition, several accessories are available.

The working of the shut-off valve rests on three main elements:

- The switch and reset mechanism SVC086 functions as a sensor and forces a switching-on;
- Subsequently the locking of the valve is released;
- The valve then blocks the flow to be protected.

2.2 The switch and reset mechanism

The switch and reset mechanism SVC086 is used standard on all Baai safety shut-off devices. When the stroke of the HSV is smaller than 110 mm, the SVC086 may be mounted directly onto the body.

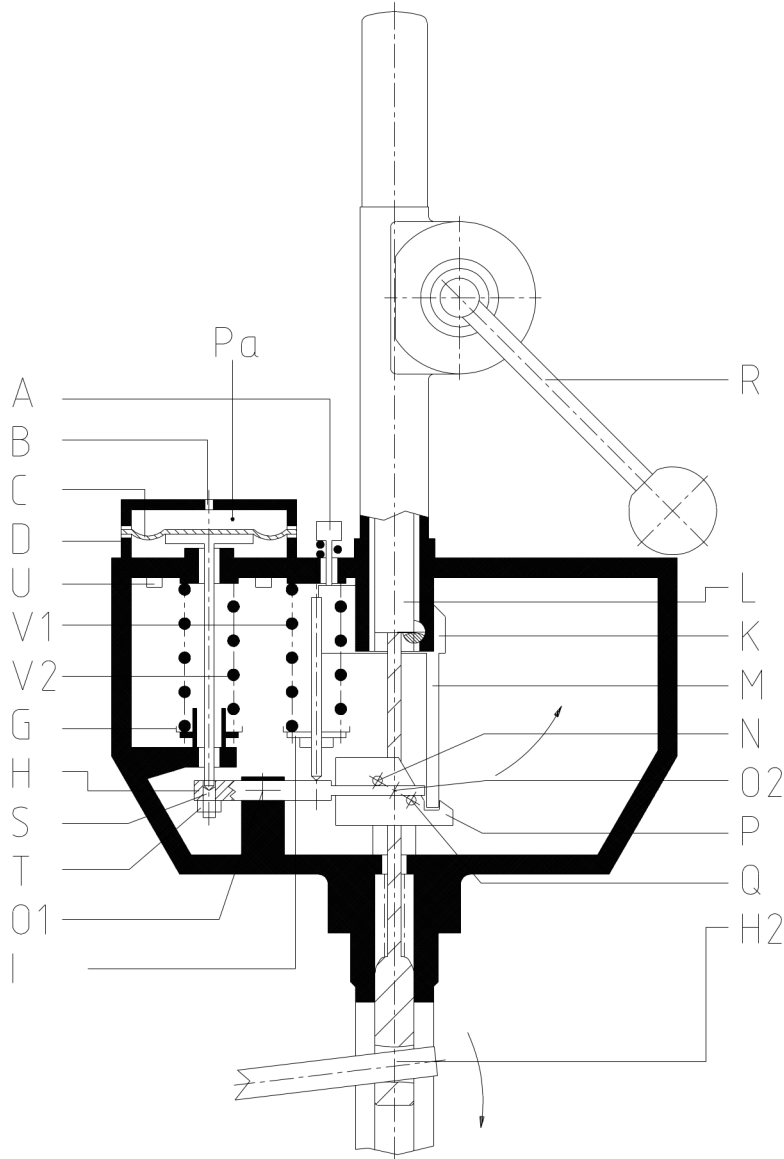


Figure 2: Working principle of the switch and reset mechanism SVC086

2.2.1 Overpressure protection

(see figure 2 / figure 3)

When the pressure P_a in pressure converter D is higher than the threshold value set by compression springs V1 and V2, diaphragm C is pressed down and handle H turns around pivoting point O1. Pin N is pushed upwards, so that balance jaw P turns to the right past pivoting point O2. Because of this, the balance jaw will no longer support the downward pointing switch rod M of the switch handle, so that it rotates around its axle. This axle partly has a crescent-shaped section. This is the point of support of the valve, and for HSVS the point of support of rod L, which releases the "second-stage handle" H2. When the switch handle (K) has made a quarter-turn, valve (S) closes by means of handle arm (R) fitted in the valve body. Because of the pressure exchange at the outlet side of the installation, a pressure difference usually occurs at valve (S), so that it is pushed further into the valve seat.

Continued for 16" and larger.

When switch handle K has made a quarter-turn, handle H2 can move downwards (due to the force executed by the valve). This will switch on the valve or the second stage. Switching on the second stage: see chapter 4.1.

The safety device is now locked. Even when pressure P_a drops below the threshold value, valve (S) remains shut.

2.2.2 Underpressure protection

When pressure P_a of pressure converter D is lower than the set threshold value of spring V1, diaphragm C moves upwards. The top of V2, by means of the spring seat, now presses against the housing of the control and switch mechanism and no longer against the diaphragm disc of the pressure converter. Because of this, the threshold value is determined by spring V1 only. Handle H is now going to push down pin Q, so that balance jaw P (just as with overpressure) turns to the right.

The working principle of switch handle K, valve (S) and valve shaft L, which releases the valve or the "second-stage handle" H2, is identical to the one of overpressure.

2.2.3 Operation of the emergency button

When the emergency button (red button) is pressed (not indicated in figure 2), balance jaw P turns to the right. This will make switch handle K turn at least a quarter.

For 16" and larger, shaft L of the "second-stage handle" H2 touches on the crescent-shaped point of support and the second stage is switched on. The position of handle H, diaphragm C and the minimum and maximum springs is not changed. The valve shaft passes the crescent-shaped point of support and the valve is shut.

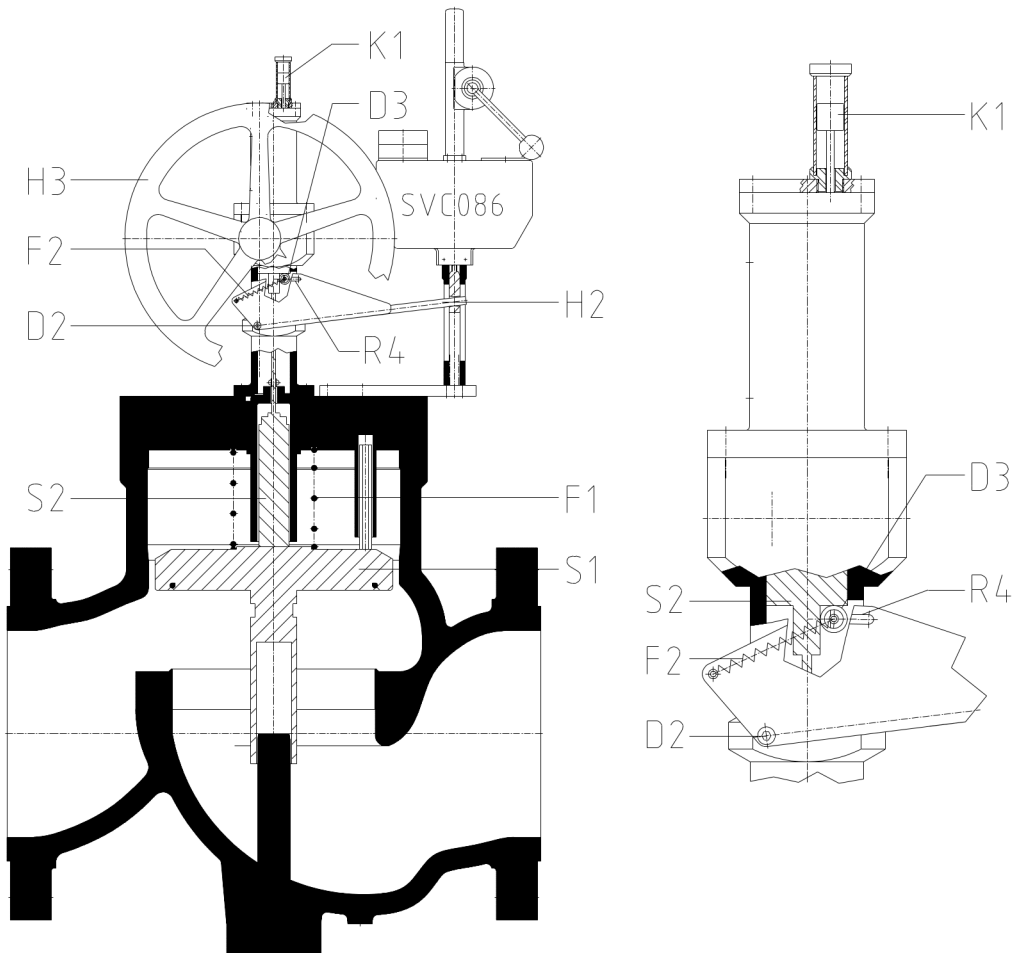


Figure 3: Working principle second stage HSVS

2.3 Releasing and opening HSV / HSVS

(see figures 2 and 3)

After having solved the failure, the pressure to be protected returns to a value between the lower and higher threshold value. Handle H returns to its initial position. Due to gravity, balance jaw P follows this movement.

In order to make the HSV ready-for-operation again, the switch and reset mechanism must first be reset and then the second stage (if 16" and larger).

Here follows a short description of the actions for releasing and opening the HSV.

- Solve the failure;
- Bring the pressure to be protected to a normal value between the higher and lower threshold values;
- Ensure that no gas is taken off at the outlet side and that the pressure above and below the valve is in equilibrium, using a bypass;
- First press and then turn clockwise handle arm R of the lifting component of the SVC086;

- Press reset button A when valve shaft L is kept in its highest position. This makes that switch rod M falls into balance jaw P;
- Again slightly turn handle arm R back. Switch rod M is now locked by the balance jaw. Let go of handle arm R. This can turn freely again;

The following steps for an HSVS

- Handle arm H2 has now moved upwards. This moved support D3 against the force of the two draw springs F2 into groove R4;
- Push in hand wheel H3 and turn anti-clockwise;
- When hand wheel H3 has been turned sufficiently a notch in valve rod S2 automatically snaps shut into support D3 (clearly audible);
- Let go of hand wheel H3, so that it is disconnected from valve rod S2;
- Check the open position of the valve (valve position indication K1), the closed position of the bypass valve and the free turning of hand wheel H3, handle arm R of the lifting component.

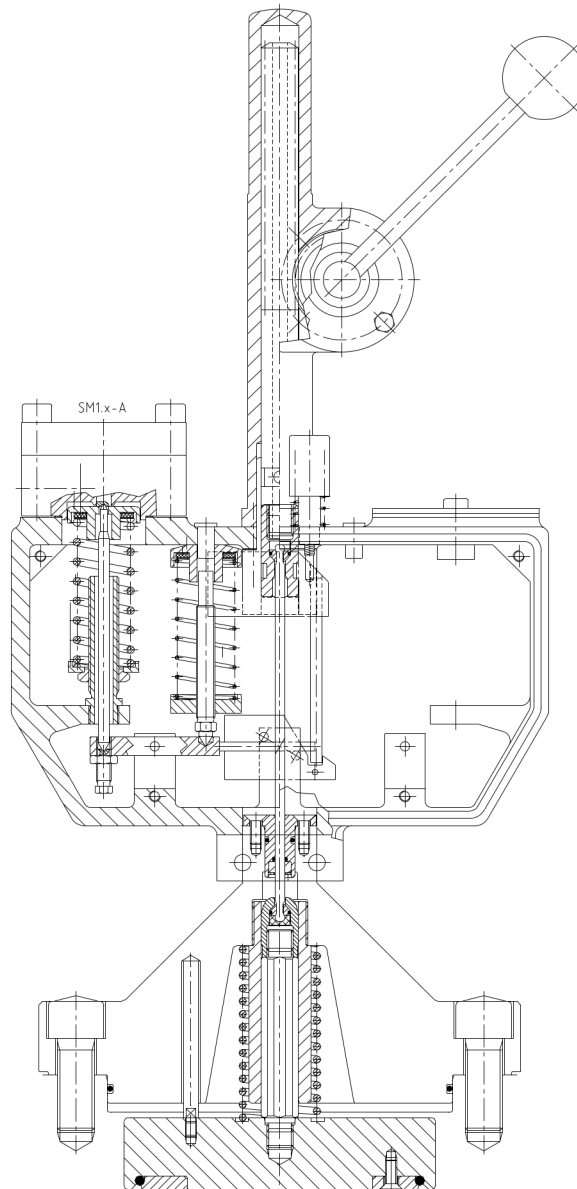


Figure 4: SVC 086 (HSV)



3 Installation Instructions
3 Installation Instructions
3 Installation Instructions
3 Installation Instructions
3 Installation Instructions

3.1 Connection of signal lines

Connect the signal lines of the pressure converters of the safety shut-off valve as shown in figure 5.

See figure 2 (chapter 2.2), connection B, for connection to the pressure converter.

The signal lines of the pressure converters should have a minimum diameter of 10 mm. Sometimes it is desirable (and in certain countries obligatory) that the vent opening (see figure 2 (chapter 2.2), connection D) of the diaphragm of the pressure converter is installed to outside. In this way no gas can get into the installation space when a diaphragm fractures. The vent pipeline should be no longer than 40 m.

3.2 Some remarks

Mind the following when mounting the HSV:

- When there is a possibility that fins detach from the pipeline between dust filter and safety valve, it is advisable to fit a simple wire-mesh filter right before the HSV during the first operational period. This filter may be removed later;
- Mount the safety shut-off device in such a way that the arrow on the valve body points into the flow direction.

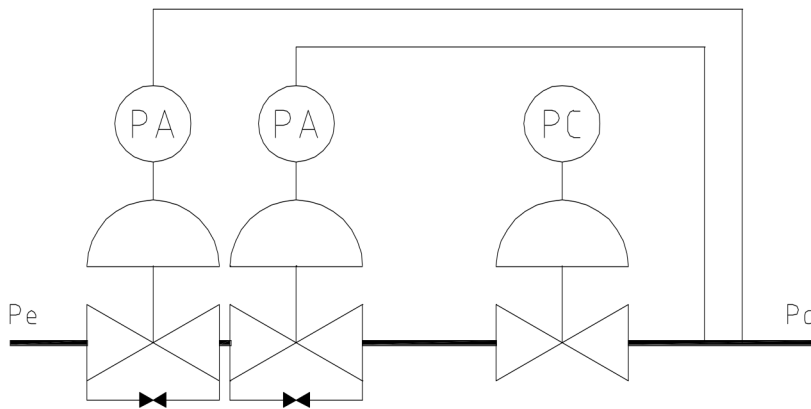


Figure 5: Example with two safety shut-off valves

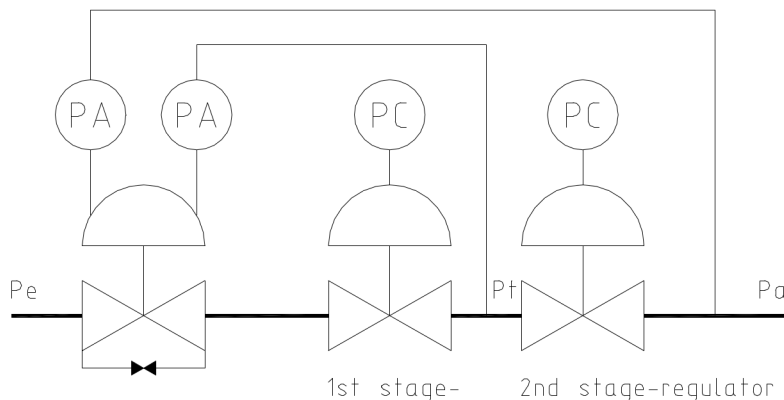


Figure 6: Example of a safety shut-off valve in dual execution ("one-of-the-two" redundancy).

3.1 Connection of signal lines

Connect the signal lines of the pressure converters of the safety shut-off valve as shown in figure 5.

See figure 2 (chapter 2.2), connection B, for connection to the pressure converter.

The signal lines of the pressure converters should have a minimum diameter of 10 mm. Sometimes it is desirable (and in certain countries obligatory) that the vent opening (see figure 2 (chapter 2.2), connection D) of the diaphragm of the pressure converter is installed to outside. In this way no gas can get into the installation space when a diaphragm fractures. The vent pipeline should be no longer than 40 m.

3.2 Some remarks

Mind the following when mounting the HSV:

- When there is a possibility that fins detach from the pipeline between dust filter and safety valve, it is advisable to fit a simple wire-mesh filter right before the HSV during the first operational period. This filter may be removed later;
- Mount the safety shut-off device in such a way that the arrow on the valve body points into the flow direction.

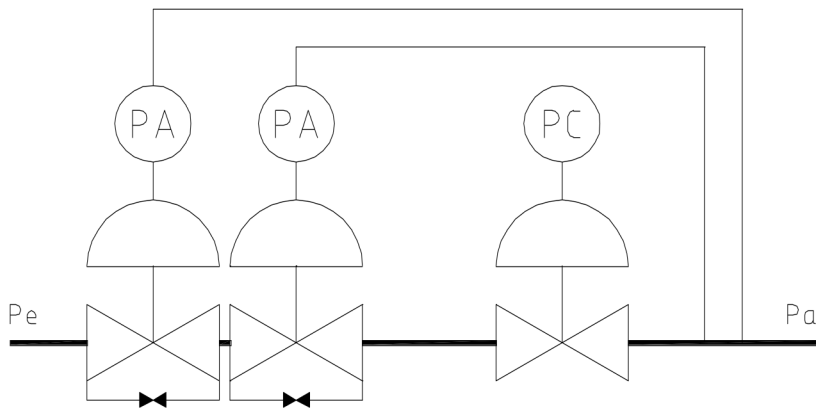


Figure 5: Example with two safety shut-off valves

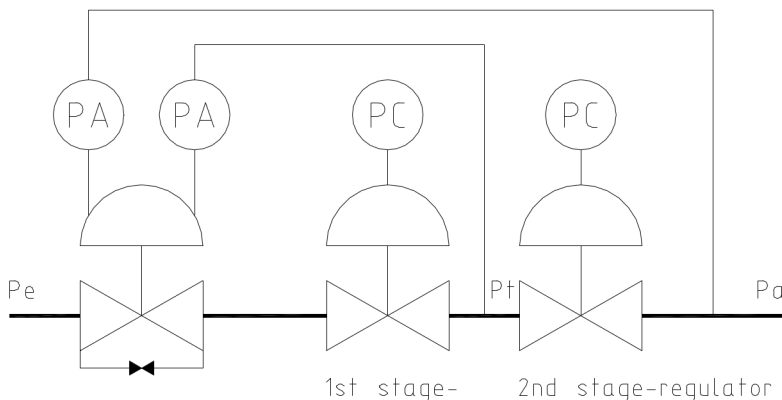


Figure 6: Example of a safety shut-off valve in dual execution ("one-of-the-two" redundancy).



	4	Operation
	4	Operation
	4	Operation
	4	Operation
	4	Operation

4.1 Replacing the setpoint springs

(see figure 2 chapter 2.2)

- a) Completely release the maximum and minimum springs (V2 and V1) by turning the spring seats (G and I) of the springs all the way down.
- b) Remove pressure converter after loosening the corresponding screw connection U (top and bottom of the pressure converter need not be disconnected).
- c) Replace setpoint springs.
- d) Re-mount pressure converter.
- e) Set the pressure as described in chapters 4.4 and 4.5.

4.2 Setting the lower threshold value

- a) Screw the minimum spring seat I all the way down (minimum spring is fully released).
- b) Screw maximum spring seat G all the way up (maximum spring is fully compressed, don't block).
- c) Set the pressure in the pressure converter between lower and higher threshold value, at approx. half the value of the higher threshold value.
- d) Screw in set screw S until the balance handle H is horizontal. The balance handle should not have any play now at the points of support N and Q and at the balance jaw P. Fix the set screw with lock nut T.
- e) Lift valve shaft L with handle arm R and lock switch pin M with balance jaw P.
- f) Lift the valve by pushing in hand wheel H3 and turning it anti-clockwise.
- g) If necessary, fit accessory A9 in SVC086 to prevent complete disconnection.
- h) Now set the lower threshold value of the pressure converter.
- i) Turn the minimum spring seat I up until the SVC086 disconnects.
- j) Place balance handle H horizontally again by adjusting the pressure in the pressure converter as described in point c).
- k) Repeat steps e) to j), resp. steps e), h), i), and j) when accessory A9 is used, a number of times and adjust minimum spring seat I if necessary. Check that the SVC086 disconnects at the right threshold value.

4.3 Setting the higher threshold value

- a) The lower threshold value has already been set.
- b) If not, turn maximum spring seat G all the way up (maximum spring is completely compressed, don't block).
- c) Set the pressure in pressure converter D between the lower and higher threshold value, at approx. half the value of the higher threshold value.
- d) Screw in set screw S until the balance handle H is horizontal. The balance handle should not have any play now at the points of support N and Q and at the balance jaw P. Fix the set screw with lock nut T.
- e) Lift the valve shaft L with handle arm R and lock switch pin M with balance jaw P.

The following steps for an HSVS

- f) Lift the valve by pushing in hand wheel H3 and turning it anti-clockwise (this may already have been done when setting the lower threshold value).
- g) If necessary, fit accessory A9 in SVC086 to prevent complete disconnection.
- h) Set the higher threshold value of the pressure converter.
- i) Turn maximum spring seat G down until SVC086 disconnects.
- j) Place balance handle H horizontally again by adjusting the pressure in the pressure converter as described in point c).
- k) Repeat steps e) to j), resp. steps e), h), i), and j) when accessory A9 is used, a number of times and adjust maximum spring seat G if necessary.
Check that the SVC086 disconnects at the right higher threshold value.

Remark

When the lower threshold value is altered, the higher threshold value also has to be reset (because of the lever action in the SVC086).

4.4 Operational test

At the works, the device was equipped with the correct springs for the threshold value as specified in the order. In principle, a normal operational test should therefore suffice.

However, when this test shows that the set pressure is not set correctly, you'll have to alter it. Consult chapters 4.4 and 4.5 for this.

As a safety valve is seldom activated in normal operation, it is advisable to carry out an operational test regularly. Don't forget to test the emergency button, either. This operational test should be carried out with a complete system. Because of the forces exercised and carried over at the current pressure, it is advisable and useful for the system to be pressurised during the operational test.

Checking the lower threshold value

The setting for underpressure, resp. diaphragm fracture protection, has to be checked as follows.

- Pressurise the pressure converter. Choose a pressure value between the lower and higher threshold values.
- Let the pressure in the pressure converter decrease slowly.
- When the lower threshold value has been reached, the system has to switch.
- Bring the pressure in the pressure converter back to a value between the lower and the higher threshold values.
- Bring the pressure above and below the valve in equilibrium, by means of the bypass.
- Lock the HSV (see chapter 4.4).
- Run this check several times.

Checking the higher threshold value

- Bring the pressure in the pressure converter to a value between the lower and higher threshold values.
- Let the pressure in the pressure converter increase slowly.
- When the higher threshold value has been reached, the system has to switch.
- Bring the pressure in the pressure converter back to a value between the lower and the higher threshold values.
- Bring the pressure above and below the valve in equilibrium, by means of the bypass.
- Lock the HSV (see chapter 4.4).
- Run this check several times.

Checking the emergency button

- Build up the normal initial pressure in the pressure converter.
- Press the emergency button of the SVC086 (red button at the top of the SVC086)
- The system should now switch.
- Bring the pressure above and below the valve in equilibrium, by means of the bypass.
- Release the HSV (see chapter 4.4).
- Run this check several times.

Remark

To prevent the second stage and thus also the valve from responding whenever the SVC086 is activated, the release of the second stage can be prevented by means of a special tool in the SVC086. See chapter 7 of the operating instructions, Accessories 7.1 (A9).

However, it is advisable to have the second stage and valve respond at least once.

4.5 Commissioning

- Before commissioning the HSV is unpressurised. The valve is closed.
- The threshold values should be correctly set and checked.
- Slowly open the inlet valve of the installation.
- When the full inlet pressure has built up before the still closed safety shut-off device, the bypass valve may be opened. This enables equilibration of the pressure above and below the valve.
- The pressure has now also built up before the gas pressure regulator, so that it can be taken into operation.
- When the gas pressure regulator produces an outlet pressure higher than the set minimum threshold value of the HSV, the control and switch mechanism can be locked and the safety shut-off device can be opened using the lifting component. Close the bypass valve if it doesn't close automatically. We would advise to use a self-closing bypass valve, so that you can't fail to close the valve (an automatic bypass valve is supplied standard).
- When the required outlet pressure has been reached, the outlet valve can slowly be opened
- The installation is now operational.

When commissioning the installation, the bypass valve of the HSV bypass must be closed.

Remark

Before first commissioning an installation, the threshold values of the HSVs should be checked.

4.6 Taking out of operation

- Slowly close the inlet valve of the regulating line.
- Then slowly close the outlet valve. When gas still has to be transported, the stand-by line or a second installation takes over regulating.
- Unpressurise the line at the outlet side using the manual blow-off.
- Close the HSV when the minimum threshold value has been reached.
- In order to unpressurise the chamber before the HSV also, the bypass valve of the bypass has to be opened. The gas now flows via the bypass to the outlet of the regulating line and can be blown off there.
- After the line has been completely unpressurised, you can (if required) carry out maintenance work.

Consult chapter 4.1 when you wish to take the installation back in operation.



	5 Maintenance
	5 Maintenance
	5 Maintenance
	5 Maintenance
	5 Maintenance

5.1.1 General

Maintenance work is limited to replacing the O-rings and diaphragms. To all dynamic O-rings (seals between the moving parts) and the diaphragms applies, for optimal working, a recommended maximum life of 4 years. For static O-rings (seals between fixed, non-moving parts) Gorter Controls advises a useful life of 6 to 7 years.

You can find all required parts for maintenance work in the parts list added.

5.1.2 Lubricants

Mind the following during all maintenance work:

- Unless otherwise indicated, all screw connections < M10 are to be greased with a suitable grease (Gorter Controls advises MOLYKOTE BR2 PLUS). Screw connections > M10 are to be greased with copper grease (Gorter Controls advises APPLIED 1-280 COPPER GREASE or MOLYKOTE KOPER PASTA).
- All O-rings are to be greased with a suitable grease (Gorter Controls advises MOLYKOTE BR2 PLUS).
- All guiding surfaces are to be greased with a suitable grease (Gorter Controls advises MOLYKOTE BR2 PLUS).

CAUTION !!!

**Unpressurise the line before starting
maintenance work!**

5.1.3 Pressure converter SM 1.x-A

(see figure 6)

The following parts have to be replaced in this component.

- Diaphragm 02
- O-ring 16
- O-ring 18

To replace these parts, the following steps are to be taken.

- Disconnect impulse line 21
- Unscrew screw connection 15
- Remove cover 01
- Remove diaphragm 02
- Remove bottom seat 05 to replace O-ring 18
- Replace O-ring 18
- Replace O-ring 16
- Fit bottom seat 05, new diaphragm 02 and cover 01 with O-ring 16
- Tighten screw connection 15 (even and diagonally)
- Connect impulse line.

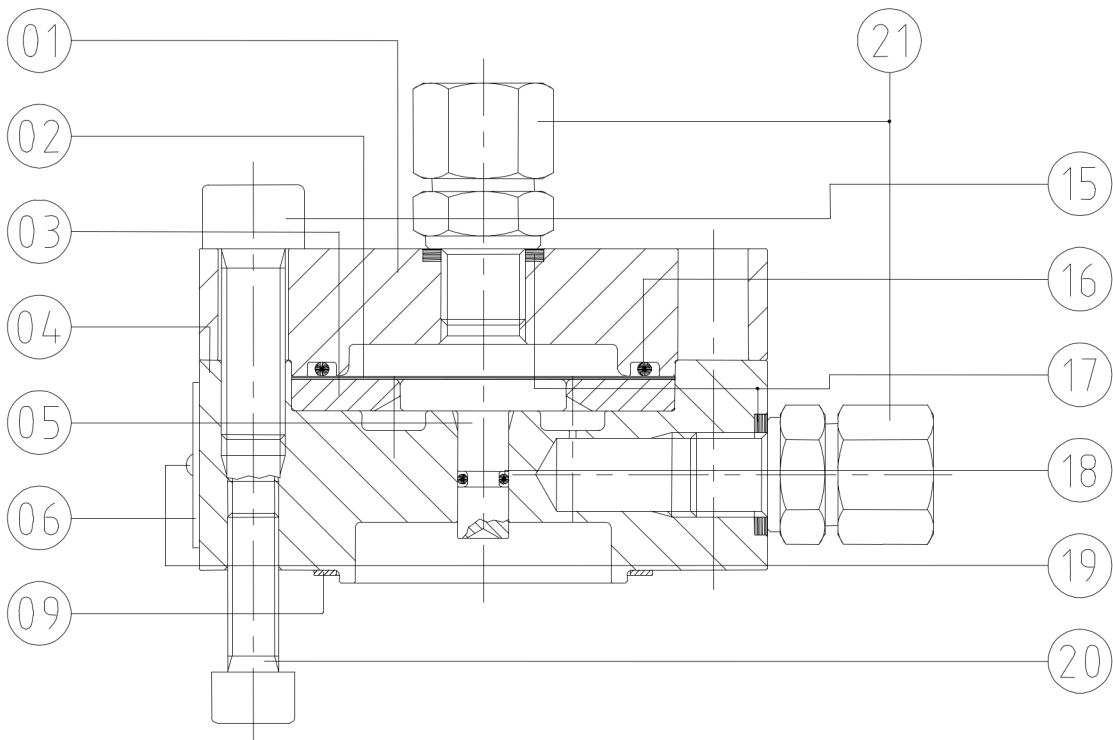


Figure 6: Pressure converter SM1.x-A

5.1.4 Valve and body HSV

(see figures 7a, 8)

The following parts should be replaced in this component during maintenance:

- 2x O-ring retainer set 21 (no seal, must be replaced during assembly, however)
- O-ring rod 22
- O-ring guide 23
- O-ring cover 26
- O-ring valve 30
- O-ring valve seat 32
- O-ring 40

Work as follows to replace these parts:

- The valve should be closed.
- Disconnect impulse line (pos. 21 in fig. 6).
- Unscrew screw connection 47 and dismount the complete SVC086.
- Unscrew screw connection 27.
- Lift cover 09 from body 16 by load frame 37 provided for this purpose (not shown in figure 7a). For easier removal of cover 09 from body 16 you may use lock screws 55 (after loosening plug 56 (only for 12")).
- When you have used lock screws 55, you should tighten them again and fit plug 56 (only for 12").
- Valve 12 is now underneath cover 09.
- Place cover 09 with valve 12 on a surface which guarantees that valve 12 with cover 09 lies horizontally.
- Remove retainer set 02 from connection rod 04.
- Replace O-ring of retainer set 21.
- Slowly lift cover 09 with guide from valve rod above 08 by the load frame 37 provided for this purpose (not shown in figure 7a) and lift over connection rod 04.
- Place cover 09 on the same surface as the valve.
- Remove flat-headed screws 24.
- Remove rod guide top 06 from cover 09 and replace O-rings 22 and 23.
- Fit rod guide top 06 in cover 09 and tighten flat-headed screw 24.
- Remove compression spring 29.
- Re-fit retainer set 02 on connection rod 04.
- Re-mount connection rod 04 with retainer set 02 and suspension screws 03 to valve rod top 14 (fix suspension screw 03 with LOCTITE 243).
- Unscrew screw connection 31 and disconnect securing plate 13.
- Replace O-ring 30.
- Fit screw connection 31 (use new screws) and securing plate 13.
- Re-fit compression spring on valve.
- Slowly and carefully lower cover 09 with guide of valve rod top 08 over connection rod 04. Work very carefully to prevent damage.

- Slide filler block 01 over connection rod 04 and fit retainer set 02 (with new O-ring 21).
- Unscrew the screws from the seat of valve 15.
- Remove valve seat 15.
- Check valve seat 15 for damage to the top sealing edge.
- Replace O-ring 32 and slowly and carefully mount valve seat 15 in the body of valve 16.
- Slowly lower cover 09 with valve 12 hanging underneath it into body 16.
- Fit screw connection 28.
- Mount the complete SVC086 on cover 09 by means of screw connection 47.
- Connect impulse line of the pressure converter.
- Recommission the line (if no other maintenance work is necessary).

Remark

Check the threshold values of the HSV after each maintenance!

CAUTION !!!

**Always carry out an operational and tightness test
after maintenance work!**

5.1.5 Valve and body HSVS

(see figures 7a and 7b)

The following parts should be replaced in this component during maintenance:

- 2x O-ring retainer set 21 (no seal, must be replaced during fitting, however)
- O-ring rod 22
- O-ring guide 23
- 4x socket screw 24
- O-ring cover 26
- O-ring valve 30
- 12x socket screw 31
- O-ring valve seat 32
- O-ring guide 39
- O-ring 40
- O-ring guide of valve stem guide 41
- O-ring guide of valve stem seat 42
- O-ring bottom cover 48
- Filler block 01 (no seal, must be replaced during fitting)

Work as follows to replace these parts:

- The valve should be closed.
- Disconnect impulse line of the pressure converter (pos. 21 in fig. 6).
- Remove protective cap 25 (see figure 7a).
- Unscrew screw connection 47 and dismount the complete SVC086.
- Unscrew screw connections 38, 40 (figure 7a) and dismount the complete second stage.
- Detach connection rod 04 (figure 7a) from top coupling section 07a.
- Unscrew screw couplings 38, 53, 28.
- Lift cover 09 from body 16 by load frame 37 provided for this purpose (not shown in figure 7a). To simplify detachment of the cover 09 from body 16 you may use lock screws 55 (having released plug 56).
- When you have used the lock screws 55, you should tighten them again and fit plug 56.
- Valve 12 is now underneath cover 09.
- Place cover 09 with valve 12 on a surface which guarantees that valve rod below 19 sticks through the surface and that valve 12 with cover 09 lies horizontally (when putting it down on the surface, cover 09 slides over the valve rod top 14).
- Loosen the connections between coupling top 07a and coupling bottom 07b and disconnect coupling top.
- Disconnect retainer set 02 from connection rod 04.
- Replace O-ring retainer set 21.
- Slowly lift cover 09 with guide of valve rod top 08 by the load frame 37 provided for this purpose (not shown in figure 7a) and lift over connection rod 04.
- Place cover 09 on a similar surface as the valve.
- Remove lock ring 40

Take care that the guide of valve rod top 08 should not fall out of cover 09 unchecked.

- Remove guide of valve rod top 08 from cover 09 and replace O-ring 39.
- Fit guide of valve rod top 08 in cover 09 and fit lock ring 40.
- Unscrew screw connection 24 and fit rod guide 05.
- Replace O-ring guide 23.
- Remove lock ring 25 and fit ring 06.
- Replace O-ring rod 22, remove ring 06 and fit lock ring 25.
- Fit rod guide 05 in guide valve rod top 08.
- Connect screw connection 24 (use new screws, fix screws with a drop of LOCTITE 243).
- Remove compression spring 29.
- Remove suspension screw 03 from valve rod top 14;
- Remove retainer set 02 from bottom of connection rod 04.;
- Replace O-ring retainer set 21 and fit retainer set 02 to connection rod 04.
- Remove valve rod bottom 19 from valve rod top 14.
- Pull valve rod top 14 from valve 12 and replace O-ring 41.
- Re-insert valve rod top 14 in valve 12 and fix valve rod bottom 19 to valve rod top 14 (fix connection with LOCTITE 243).
- Replace filler block 01 of valve rod top 14.
- Fit connection rod 04 with retainer set 02 and suspension screw 03 back to valve rod top 14 (fix suspension screw 03 with LOCTITE 243).
- Unscrew screw connection 31 and disconnect securing plate 13.
- Replace O-ring 30.
- Connect screw connection 31 (use new screws) and securing plate 13.
- Re-fit compression spring on valve.
- Slowly and carefully lower cover 09 with guide of valve rod top 08 over connection rod 04. Work very carefully to prevent damage.
- Completely lower cover 09 with guide of valve rod top 08 over valve rod top 14.
- Slide coupling bottom 07b over connection rod 04 and fit retainer set 02 (with new O-ring 21).
- Connect coupling bottom 07b to coupling top 07a (fix with a drop of LOCTITE 243) and fit new filler block.
- Tighten connection rod 04 (figure 7a) and top of coupling 07a (fix connection with a drop of LOCTITE 243).
- Unscrew screws 33 approx. 15 mm from valve seat 15.
- Screw load frame for M10 into tap thread holes of valve seat 15 provided for this purpose.
- Slowly lift valve seat 15 from valve body 16 (with a suitable lifting tool).
- Check valve seat 15 for damage to the top sealing edge.
- Replace O-ring 32 and slowly and carefully mount valve seat 15 in the body of valve 16.
- Again tighten screws 33 and remove load frame from valve seat 15.

- To replace O-rings 42 and 48 there are two possibilities:

If there is any free space of 370 mm or more underneath the valve body:

- ◇ Unscrew screw connections 49, 50 (2x).
- ◇ Remove nut 43 (guide valve rod bottom 20 may be safeguarded against turning at the bottom or the jaw).
- ◇ Disconnect bottom cover 46 and guide valve rod bottom 20 and replace O-ring 42.
- ◇ Connect bottom cover 46 and guide valve rod bottom 20 by means of nut 43 (lock nut 43 with LOCTITE 243).
- ◇ Fit bottom cover completely to valve body by means of screw connections 49, 50.

If there is any free space of less than 370 mm underneath the valve body:

- ◇ Remove nut 43 (guide valve rod bottom 20 may be safeguarded against turning at the bottom).
- ◇ Lift guide of valve rod bottom 20 upwards from bottom cover 46.
- ◇ Replace O-ring 42.
- ◇ Fit guide of valve rod bottom 20 back in bottom cover 46.
- ◇ Fit bottom cover 46 and guide valve rod bottom 20 by means of nut 43 (lock nut 43 with LOCTITE 243).

- Slowly lower cover 09 with valve 12 hanging below it into body 16. In doing so, slowly lower valve rod bottom 19 over the guide of valve rod bottom 20.
- Tighten screw connections 38, 53, 28.
- Mount the complete SVC086 on cover 09 by means of screw connection 47. Mind that handle 15 does not touch the mounting of O-ring guide 23 (see figure 7a).
- Fit protective cap 25 (see figure 7a).
- Connect impulse line of the pressure converter.
- Take the line back in operation (if no other maintenance work is necessary).

Remark

Check the threshold values of the HSV after each maintenance !

CAUTION !!!

**Always carry out an operational and tightness test
after maintenance work!**

5.1.6 Spare-part sets

Pressure converter SM 1.x-A

(see figure 6 and partslist page 39)

This spare-part set consists of:

- 1x diaphragm 02
- 1x O-ring 16
- 1x O-ring 18
- 1x seal 34

Valve and valve body HSV086

(see figure 7a and partslist page 32)

This spare-part set consists of:

- 2x O-ring retainer set 21
- 1x O-ring rod 22
- 1x O-ring guide 23
- 1x O-ring top cover 26
- 1x O-ring valve 30
- 1x O-ring valve seat 32
- 2x O-ring 40
- 1x Safety nut 41

Valve and valve body HSVS086

(see figures 7b and 7c and partslist page 33)

This spare-part set consists of:

- 2x O-ring retainer set 21
- 1x O-ring rod 22
- 1x O-ring guide 23
- 1x O-ring top cover 26
- 1x O-ring valve 30
- 1x O-ring valve seat 32
- 1x O-ring guide 39
- 1x O-ring valve stem guide 41
- 1x O-ring valve stem seat 42
- 1x O-ring bottom cover 48
- 1x O-ring 40

Valve position indicator (accessory A8)

(see figure 9 and partslist page 46)

This spare-part set consists of:

- 1x O-ring guide 16
- 1x O-ring rod 17
- 1x flat-headed screw 10
- 2x socket screw 11
- 4x flat-headed screw 15

These parts may be ordered as a complete set:

NAME	ARTICLE NUMBER
HSV086 1" ANSI 300/600	939403S116970
2" ANSI 300/600	939403S116980
3" ANSI 300/600	939403S116990
4" ANSI 300/600	939403S117000
6" ANSI 300/600	939403S117010
8" ANSI 300/600	939403S117020
10" ANSI 300/600	939403S117030
12" ANSI 300/600	939403S117040
HSV086 16" ANSI 300/600	939403S117050
SM 1.x-A	939405S125370

20" up to 24" on request

Table V: Spare-part sets

5.1.7 Parts list valve and valve body HSV

(see also figure 7a)

PARTS LIST VALVE AND VALVE BODY			
Pos	Name	Pos	Name
01	Filler block	21 *	O-ring retainer set (2x)
02	Retainer set	22 *	O-ring connection rod
03	Coupling	23 *	O-ring guide
04	Connection rod	24	Countersunk screw
05	Connection rod guide	25	Retaining ring
06	Ring	26 *	O-ring top cover
07	Retainer holder	27	Plug
09	Top cover	28	Socket screw
10	Locking pin	29	Compression spring
11	Name plate	30 *	O-ring valve
12	Valve	31	Countersunk screw
13	Retaining plate	32 *	O-ring valve seat
14	Valve stem	33	Set screw with tap
15	Valve seat	34	Ring
16	Valve body	35	Collar plug
17 **	By-pass line	40 *	O-ring (only 8" - 10" - 12")
		41 *	Safety nut (only 8" - 10" - 12")

Table VI: Parts list shut-off device

* Recommended spare parts

** Standard, a by-pass line with by-pass valve in the form of a ball valve or a spring-closing push-button valve is supplied. This is used to equalise the pressure upstream and downstream of the shut-off valve to open the valve.

5.1.8 Parts list valve and valve body HSVS (see also figures 7b and 7c)

PARTS LIST VALVE AND VALVE BODY			
Pos	Name	Pos	Name
01	Filler block (2x)	21 *	O-ring retainer set (2x)
02	Retainer set	22 *	O-ring rod
03	Suspension screw	23 *	O-ring guide
04	Connection rod	24	Socket screw (4x)
05	Connection rod guide	25	Retaining ring
06	Ring	26 *	O-ring top cover
07a	Retainer holder top	28	Stud bolt
07b	Retainer holder bottom	30 *	O-ring valve
08	Valve stem guide top	31	Socket screw (12x)
09	Cover	32 *	O-ring valve seat
10	Set screw	33	Set screw with tap
11	Name plate	34	Seal
12	Valve	35	Sealing screw
13	Retaining plate	36	Hammer-drive screw
14	Valve rod top	37	Load frame
15	Valve seat	38	Hexagon nut
16	Valve body	39 *	O-ring guide
17 ¹⁾	By-pass line	40 *	Circlip
19	Valve stem bottom	41 *	O-ring valve stem guide
20	Valve stem guide bottom	42 *	O-ring valve stem seat
29	Compression spring	43	Blind nut
44	Support plate	45	Locking disc
46	Bottom cover	47	Socket screw
52	Cover plate	48 *	O-ring bottom cover
56	Plug	49	Socket screw
58 ²⁾		50	Locking disc
		51	Load frame
		53	Locking disc
		54	Socket screw
		55	Lock screw
		57	Plug

* Recommended spare parts

Table VII: Parts list valve and valve body

1) Not included in figure 7a

2) Pos 58 has been included in the parts list valve position indicator (accessory A8) (chapter 7.3)

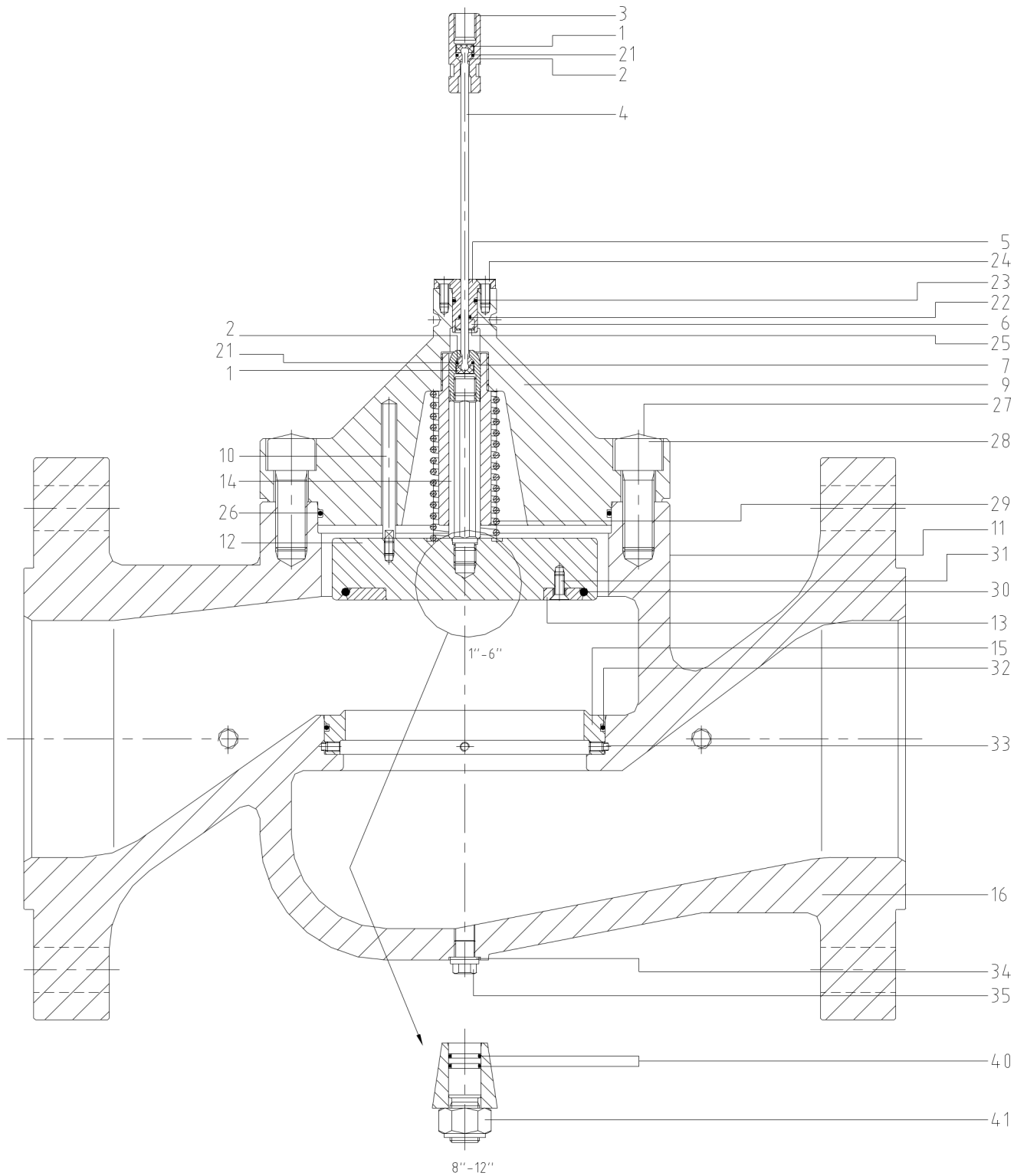


Figure 7a: Valve and valve body HSV086

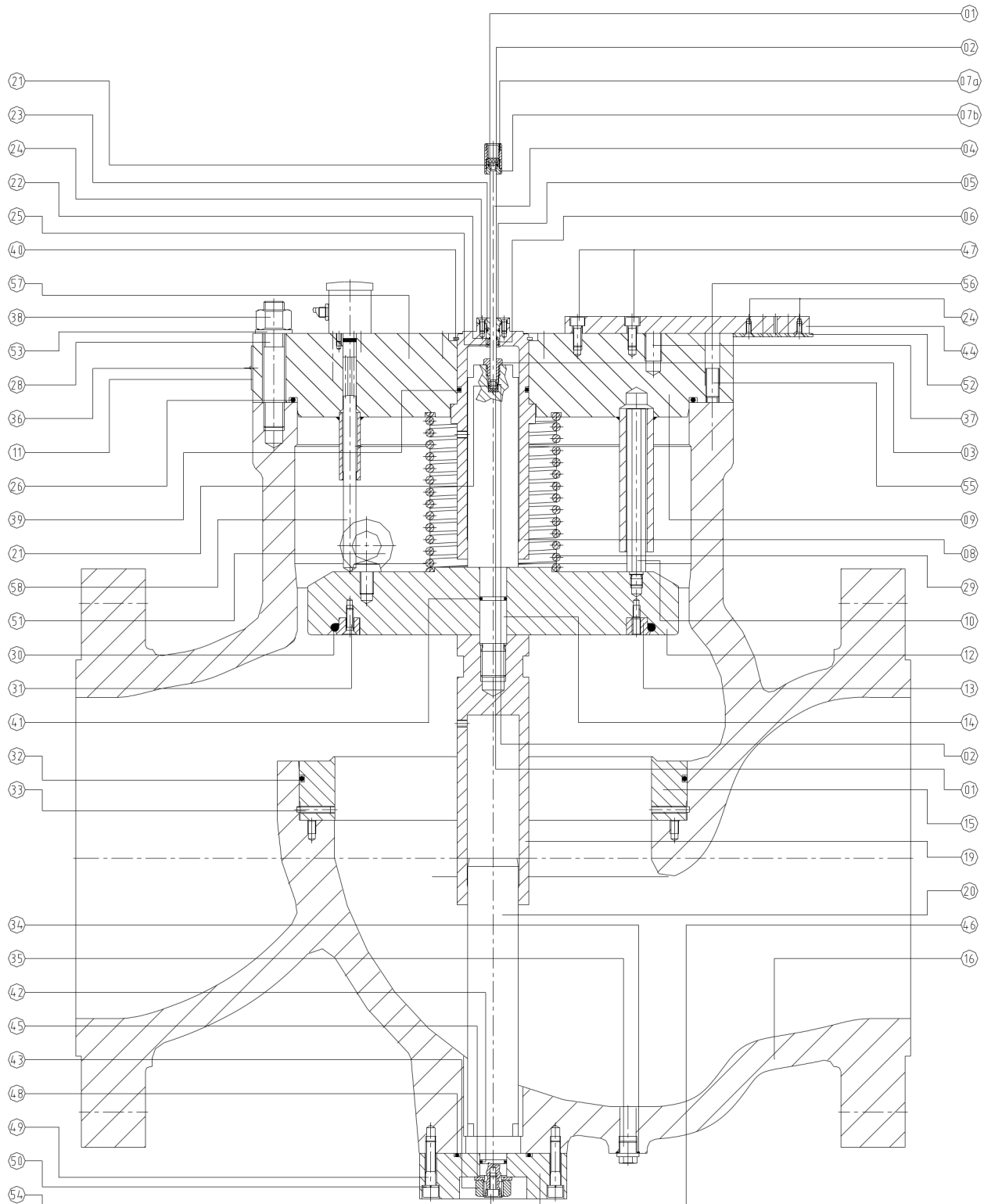


Figure 7b: valve and valve body HSVS086

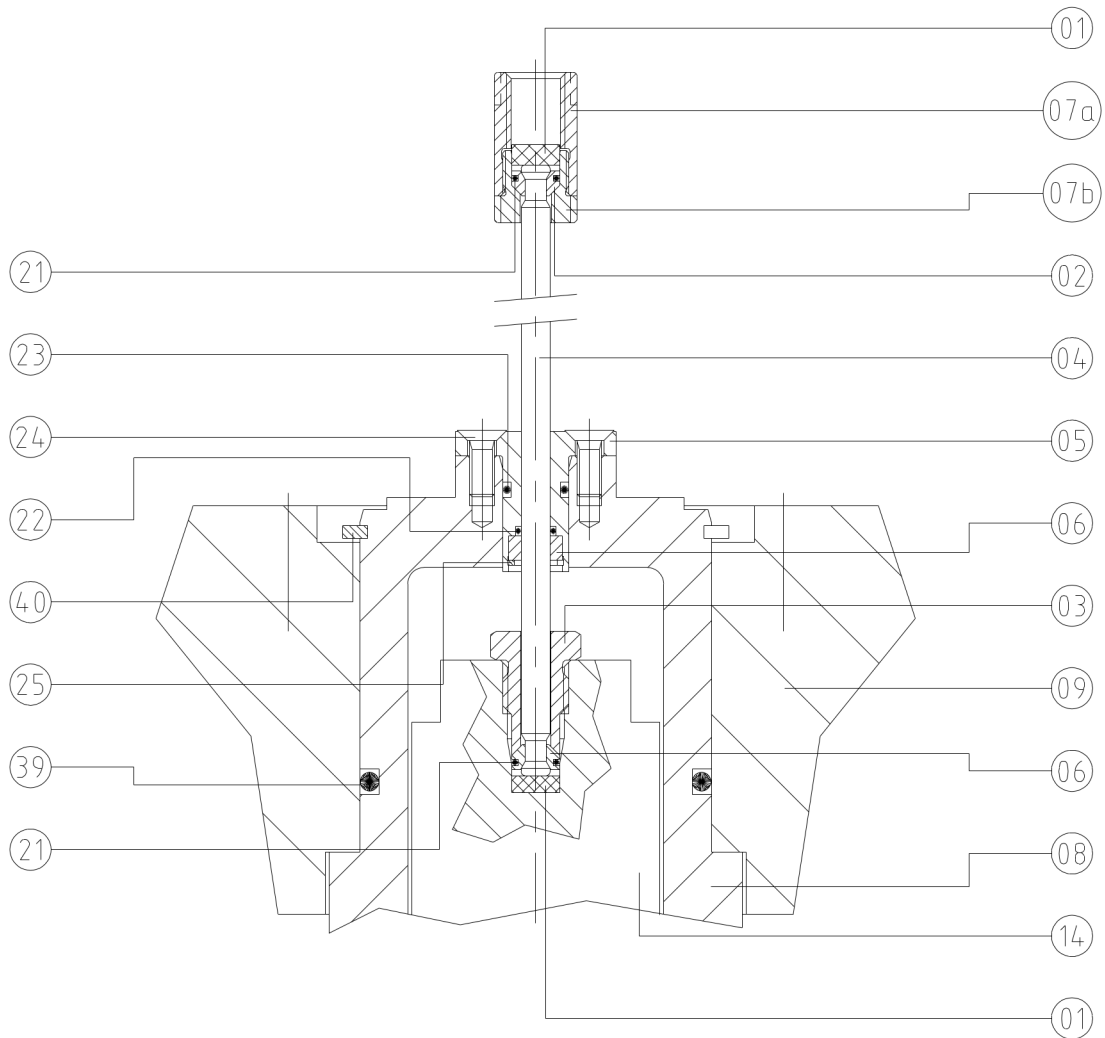


Figure 7c: Detail of connection rod and connection rod guide

Remark

Check the set pressures of the safety device after each maintenance !

5.1.9 Parts list switch and reset mechanism SVC086 (see also figure 8)

PARTS LIST CONTROL AND SWITCH MECHANISM SVC 086			
Pos	Name	Pos	Name
01	Emergency button	34	Compression spring
02	Nut	35	Gear wheel
03	Compression spring	36	Reducer nut
04	Emergency button housing	37	Reset button
05	Retaining ring	38	Socket screw
06	Emergency button pin	39	Compression spring
07	Housing valve gear	40	Reset pin
08	Gear rack	41	Spring clip
09	Needle bearing	42	Socket screw
10	Spring seat max.	43	Cover plate
11	Spring seat min.	44	Packing
12	Needle bearing	45	Stop collar
13	Compression spring max.	46	Pin
14	Spring seat max.	47	Guide
15	Adjusting nut	48	Packing
16	Column max.	49	Countersunk screw
17	Pressure pin	50	Switch pin unit
18	Assy. handle max.-min.	51	Compression spring min.
19	Nut	52	Column min.
20	Set screw	53	Spring seat min.
21	Cover plate	54	Relay housing
22	Retaining sleeve	55	Balance unit
23	Shaft handle	56	Clamping bush
24	Split pin	57	Switch shaft
25	Bolt	58	Needle bearing
26	Cover plate	59	Clamping bush
27	Packing	60	Eccentric
28	Button	61	Lock nut
29	Lifting arm	62	Bearing bush
30	Gear shaft	63	Axial-flow disc
31	Dirt scraper	68	Socket screw
32	Hexagon bolt	97	Locking disc
33	Cover plate		

Table VIII: Parts list control and switch mechanism SVC 086

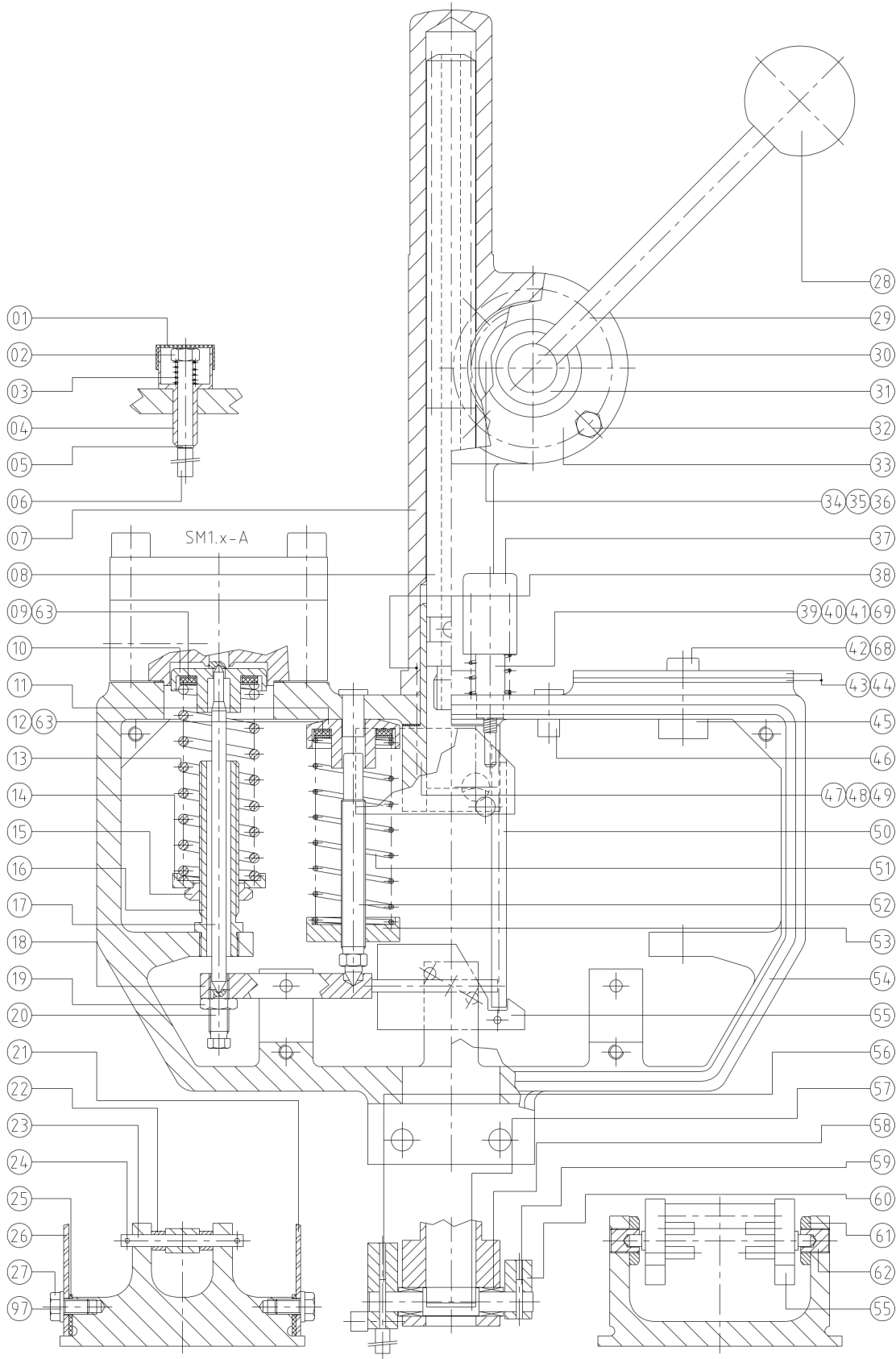


Figure 8: Control and switch mechanism SVC 086

5.1.10 Parts list pressure converter SM1.x-A

(see also figure 6)

PARTS LIST PRESSURE CONVERTER SM1.2-A; SM1.4-A; SM1.9-A	
Pos	Name
01	Cover
02 *	Diaphragm
03	Bottom seat
04	Housing
05	Bottom seat
06	Name plate
09	Packing
15	Fillister-head screw
16 *	O-ring
17	Sealing rings
18 *	O-ring
19	Hammer-drive screw
20	Fillister-head screw
21	Straight screw connection
34 *	Seal

* Recommended spare parts

Table IX: parts list pressure converter SM1.x-A



	6 Failures
	6 Failures
	6 Failures
	6 Failures
	6 Failures

Failure	Possible cause	Solution
Switching device does not or wrongly respond at too low a pressure	Setpoint spring for under-pressure incorrectly set	Repeat adjustment and check threshold value
	Handle H (figure 2) is not horizontal at average value of threshold value	Place handle H horizontally
Switching device does not or wrongly respond at too high a pressure	Setpoint spring for over-pressure has been set incorrectly	Repeat adjustment and check threshold value
	Handle H (figure 2) is not horizontal at average value of threshold value	Place handle H horizontally
Switching device does not respond without the lower switch-on pressure having been reached	Diaphragm in pressure converter is fractured	Check diaphragm in pressure converter and replace, if necessary
Valve cannot go up	Pressure upstream and downstream of the valve is not yet or not fully in equilibrium	Equilibrate pressure using the by-pass line
Control and switch mechanism cannot be reset	Handle H (figure 2) is not horizontal, so that switch pin M cannot be locked	Check that the pressure in the pressure converter is below the higher, resp. above the lower threshold value. If necessary, place handle H horizontally.
After the valve has dropped, the outlet pressure increases	Pressure converter seal is leaking	Inspect seal and seat of the valve and, if necessary, replace seal or seat
For HSVs equipped with accessories only		
Switch in SVC086 and K1 indication valve position indicate valve open. Indication valve position on body cover indicates valve closed.	Proximity switch in valve position indicator does not function properly.	Check locally whether valve has dropped (check indication position valve K1). If necessary replace proximity switch
	Breaking of a cable	Replace cable
Indication valve position K1 and indication on body cover indicate valve open, but valve position indicator in SVC086 indicates valve closed	(Proximity) switch valve position indicator in SVC086 does not function properly	Check locally whether valve has dropped (check indication position valve K1). If necessary replace proximity switch
	Breaking of a cable	Replace cable

Failure	Possible cause of failure	Solution
Indication valve position K1 and indication on body cover indicate valve closed, but valve position indication in SVC086 indicates valve open.	Mechanical problem to the valve.	Check locally whether the valve has dropped (second stage handle H2 has dropped) and, if necessary, carry out extensive maintenance work.

Table VII: Summary of possible failures



	7 Accessories
	7 Accessories
	7 Accessories
	7 Accessories
	7 Accessories

7.1 Accessories, general

In this table you find a summary of all accessories. On request special accessories are, of course, available.

	NAME	
A1	Cover plate plexiglas front	
A2	Cover plate plexiglas front and back	
A3	End switch in SVC086	
A4	End switch with connector in SVC086	
A5	Cover plate front with single proximity switch	
A6	Cover plate front with double proximity switch	
A7	Terminal board (lateral to SVC086 for A3)	
A8	Valve position indicator on cover of body	
A9	Locating device for setting threshold value SVC086	

Table X: Accessories general

7.2 By-pass pipeline

In addition to the optional accessories, the by-pass line can also be adapted to the requirements of the customer. In table XI you find a summary of the by-pass line executions available.

	NAME	MATERIAL
B1	Pipe Ø10 mm, ball valve	St ⁴⁾
B2	Pipe Ø10 mm, push-button valve, spring-closing	St
B3	Pipe Ø10 mm, ball valve	NSt ⁵⁾
B4	Pipe Ø10 mm, push-button valve, spring-closing	NSt
B5	Pipe Ø12 mm, ball valve	St
B6	Pipe Ø12 mm, push-button valve, spring-closing	St
B7	Pipe Ø12 mm, ball valve	NSt
B8	Pipe Ø12 mm, push-button valve, spring-closing	NSt

Table XI : Summary of by-pass pipelines

Model B6 is the standard by-pass pipeline for this safety shut-off valve

⁴⁾ Non-DVGW tested, is available

⁵⁾ NSt: corrosion-resistant steel

7.3 Valve position indicator (accessory A8)
(see also figure 9)

PARTS LIST VALVE POSITION INDICATOR (ACCESSORY A8)	
Pos	Name
01	Protective cap
02	Supporting block
03	Adjusting screw
04	Guide
05	Disc
06	Pin
07	Rod
10 *	Flat-headed screw
11 *	Fillister-head screw (2x)
12	Compression spring
13	Proximity switch
14	Nut
15 *	Flat-headed screw (4x)
16 *	O-ring guide
17 *	O-ring rod
18	Retaining ring
19	Compression spring

Table XII: Parts list valve position indicator

Recommended spare parts

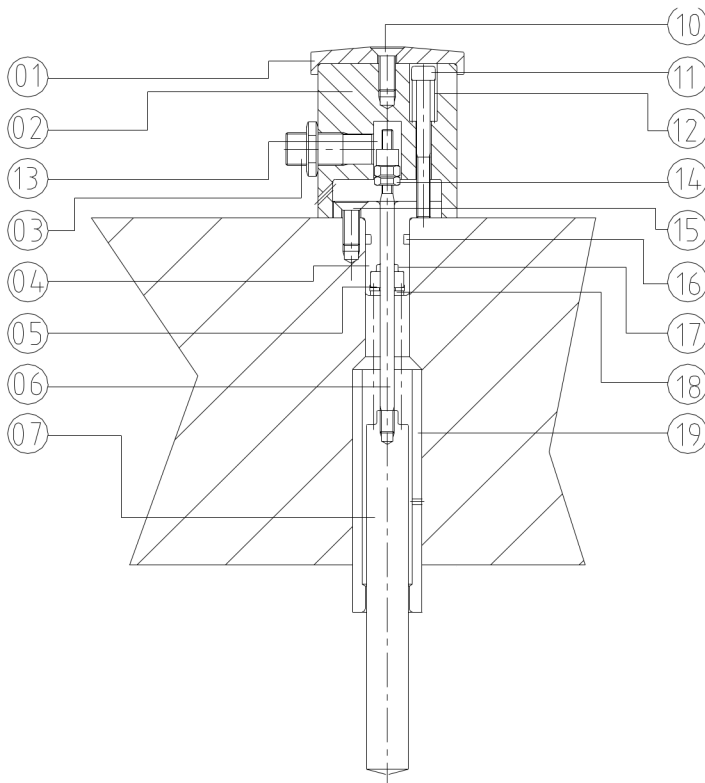


Figure 9: Valve position indicator

The following soft parts must be replaced during maintenance

- O-ring guide 16
- O-ring rod 17

To replace these parts, the following steps should be taken:

- Unscrew screw connection 10 and remove protective cap 01.
- Unscrew the fillister-head screws 11 and remove compression springs 12.
- Remove support block 02 with proximity switch 13.
- Unscrew screw connection 15 and remove guide 04 incl. all parts attached to it.
- Remove adjusting screw 03 and nut 14. Before removing these parts, mark the position of adjusting screw 03.

Careful: Because of compression spring 19 some parts are stressed.

- Remove pin 06 and rod 07 from guide 04.
- Remove retaining ring 18 and disc 05.
- Replace O-ring rod 17.
- Fit disc 05 and retaining ring 18.
- Replace guide O-ring 16
- Fit pin 06 and rod 07 and fit compression spring 19 in guide 04.
- Fit adjusting screw 03 and nut 14 in the earlier marked position.
- Fit complete guide 04 using the flat-headed screws 15 (use new screws).
- Fit support block 02 incl. proximity switch 13 using fillister-head screws 11. Don't forget the compression springs 12.
- Fit protective cap 01 with fillister-head screw 10 (use new screw).
- The perfect functioning of the proximity switch may be tested by pulling up the complete support block 02 against the force of the compression springs 12. If the switch does not function properly, adjusting screw 03 should be adjusted.