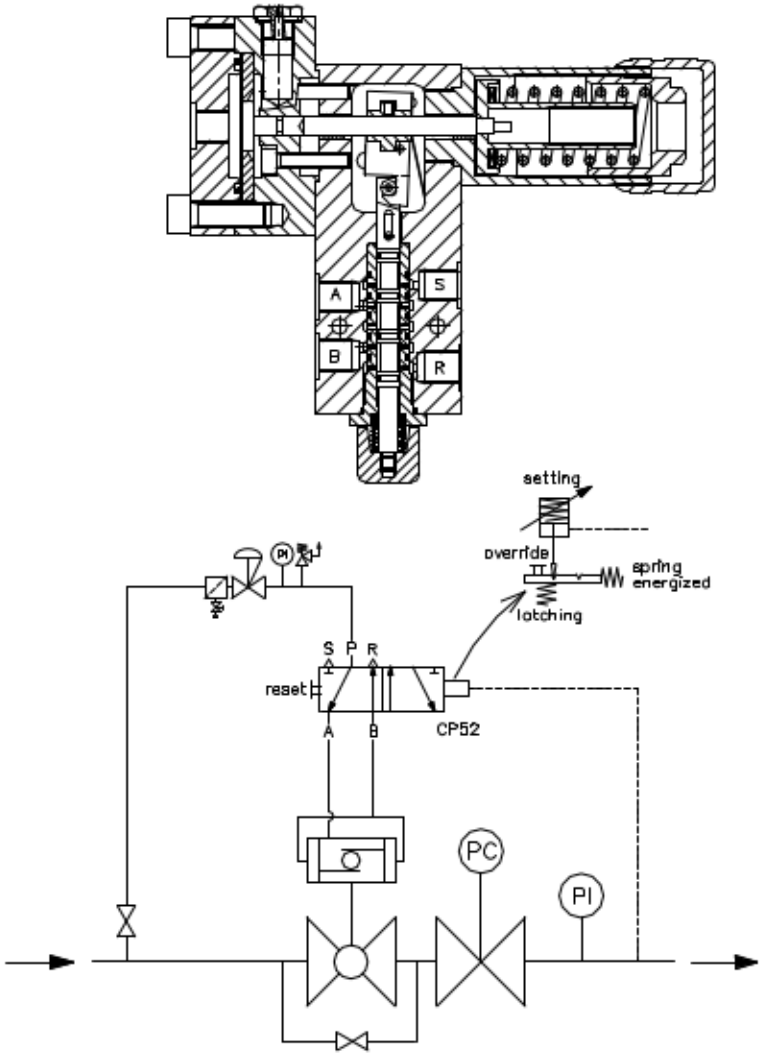
CONTROLS SUPPLY CHAIN
VALVES ACTUATORS INSTRUMENTATIONS

Control Pilot for Safety Shut-off Devices
HON CP52

Instruction Manual



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1 Specifications

1.1 Technical Data

Function	:	spring energized 5/2 valve released by pressure pilot with local reset
Application	:	control pilot for safety shut-off devices using a pneumatic actuator
Type	:	HON CP 52
Sensing element	:	SM1.x
Medium	:	non-aggressive gases *)
Operating temperature range	:	-20°C to + 60°C
Max. pressure sensing element	:	100 bar
Norm.operating press.5/2-valve	:	up to 16 bar
Shut off pressure range	:	100 mbar to 78 bar overpressure, see section 4.3
Reproduceability acc. DIN 3381	:	AG 10 for overpressure, see section 4.3
Connections	:	3/8" BSP screwed
Installation	:	may be installed in any position, may also be panel mounted
Shipping weight	:	4,5 kgf

*) *model suitable for aggressive gases can be supplied on request*

1.2 Dimensions & Materials

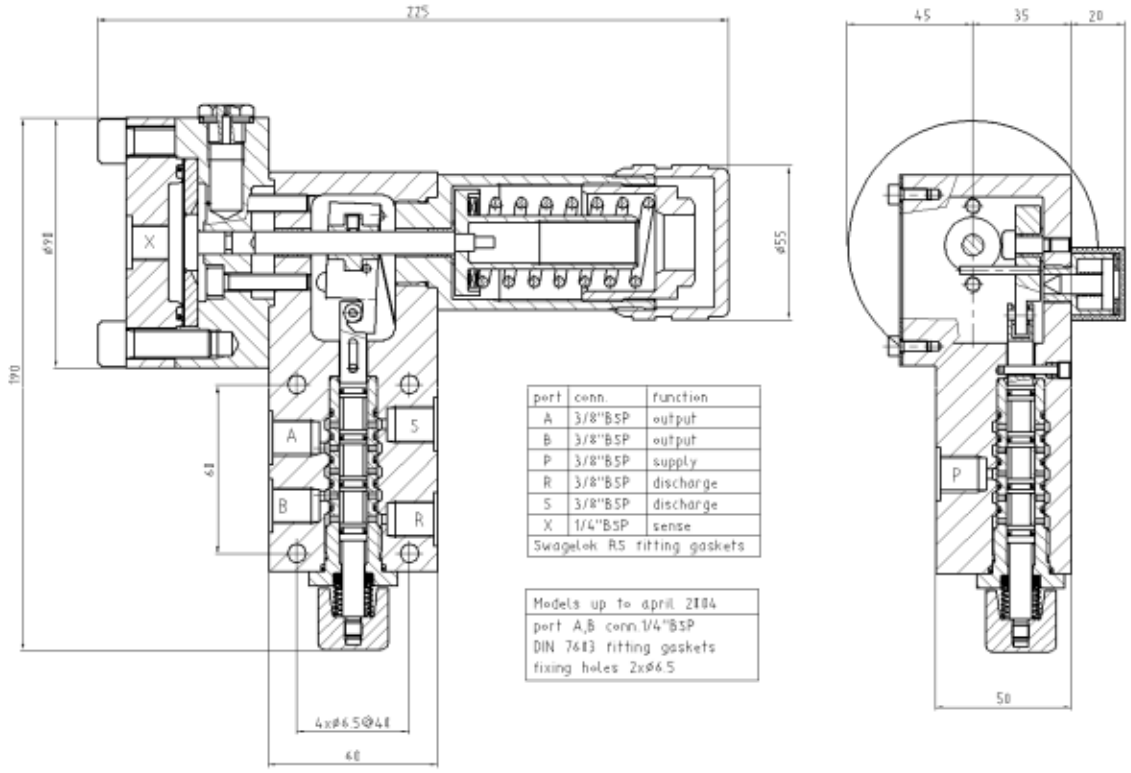

Fig. 1.2

Shortlist of materials

5/2-housing	:	aluminium
5/2-stem	:	stainless steel
5/2-insert	:	brass
Sensing element	:	stainless steel
Spring housing	:	stainless steel
Diaphragm	:	nitrile with nylon
O-rings	:	viton and nitrile

2 General Information

2.1 Description

The basic function of the control pilot is to close a pneumatically actuated valve on overpressure. The complete unit (typically a ball valve-actuator assembly with control pilot) can be applied as safety shut off devce. The 5/2-valve design enables both automatic closing on overpressure and automatic opening on manual local reset.

The control pilot contains the following elements:

- sensing element
- setting element
- 5/2-valve
- switching and latching mechanism
- manual reset (reset button)
- manual override (emergency button)

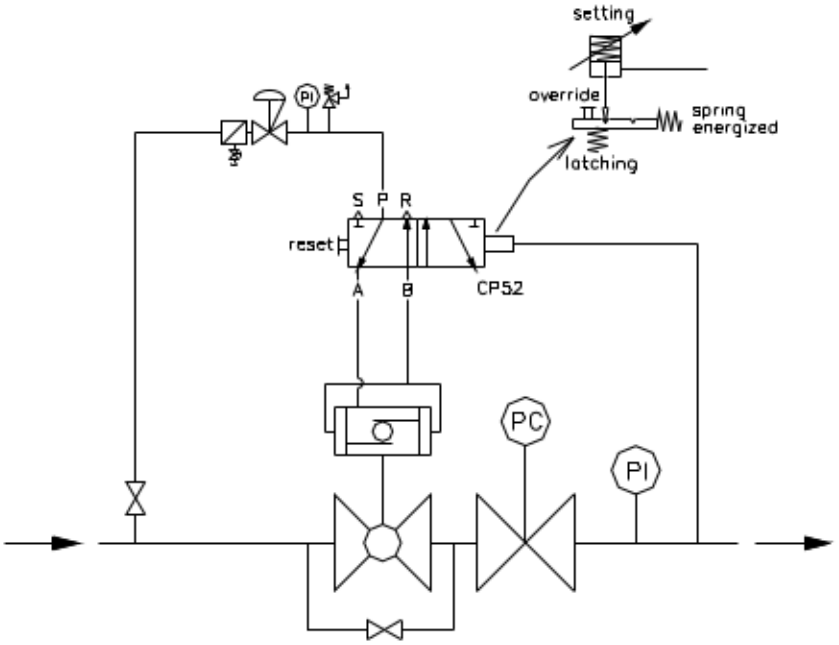

Fig. 2.1

2.2 Applications

The control pilot has been designed for shut-off operation of pneumatic actuated valves in :

- gas distribution
- gas transport
- industrial gas supply
- petrochemical industry

2.3 Product Features

The control pilot features

- multiple control functionality
- reliable and proven concept
- vibration and impact resistant design
- ease of operation
- low cost maintenance
- modular construction

3 Principle of Operation

3.1 Pressure Pilot

If the pressure in the sensing element (1) exceeds the value set with spring (2), the diaphragm (3) will move and rotate the latching element (4). This releases the spring energized valve stem (5) of the 5/2-valve. Supply (port P) will then be switched from port A to B and the discharge flowpath B-R will be switched to A-S

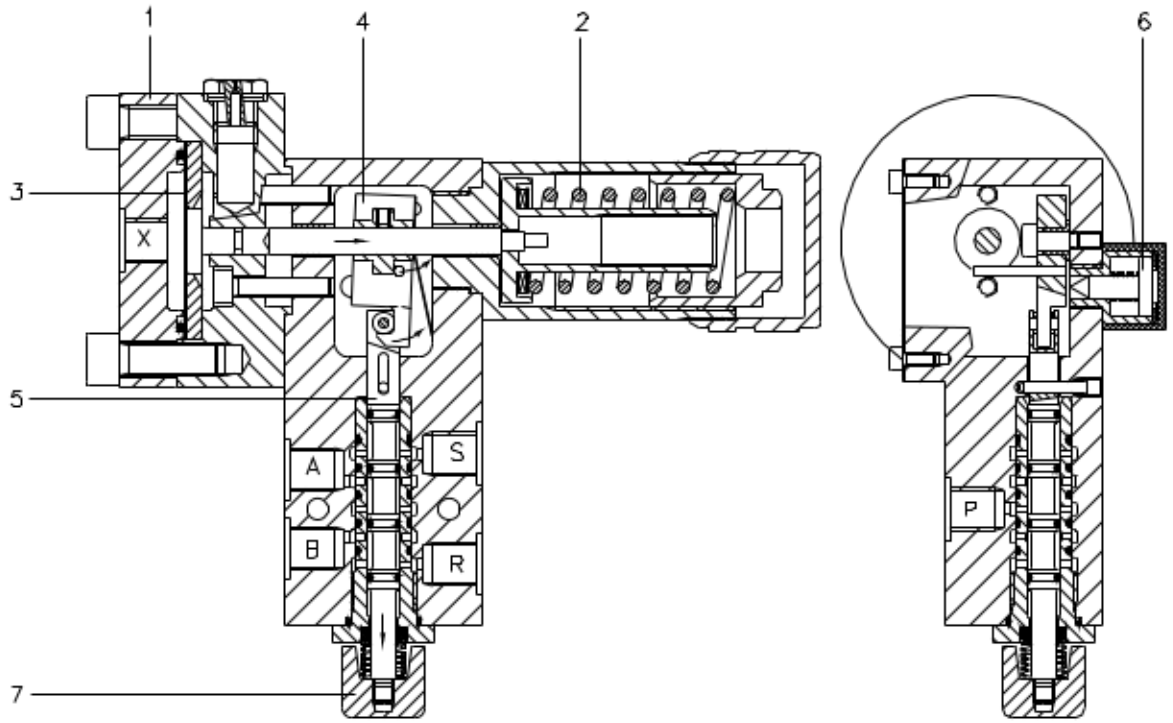

Fig. 3.1

3.2 Manual Override

The emergency button (6), on the backside, enables local intervention. Pushing down the button will unlatch and activate the switch mechanism. Note that unintended use of the emergency button is disabled by design.

3.3 Manual Reset

The reset button (7), on the bottom side, enables local automatic opening of the safety shut off valve. Pushing in the button will reset the 5/2-valve and latch the switch mechanism. Prior to opening of the valve the pressure on both sides of the valve must be equalized. Note that unintended use of the reset button is disabled by mounting position as pictured.

3.4 Actuator Control

Depending on the action of the actuator, two basic modes can be distinguished to control a pneumatic actuator. Double acting actuators may benefit from the 5/2-way design to close and open the valve automatically (provided that the safety of the downstream equipment is not compromised by a quick opening action). Single acting actuators will normally only use 3 out of 5 ports to open or close the actuator. See also the following examples. Note that ATC designates Air-To-Close and ATO likewise Air-To-Open.

3.4.1 5/2-mode (ATC+ATO)

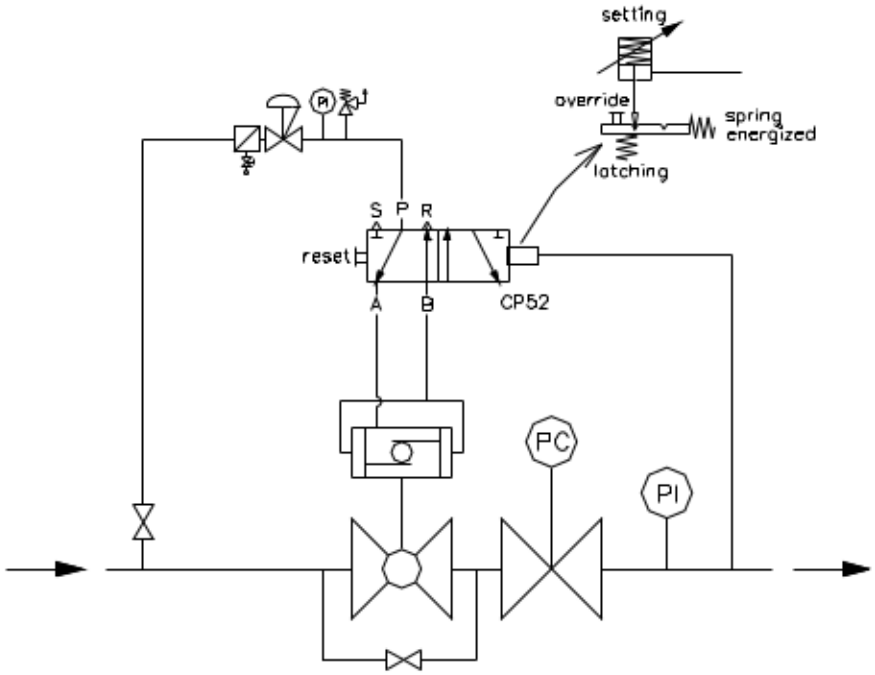

Fig 3.4.1

Normally the supply to the control pilot is fed to the actuator via port A, port B is vented. This keeps the actuator and main line valve in open position. Upon activation of the control pilot the supply switches to port B and port A is vented. This closes the actuator and main line valve. Upon local reset the supply to port A will open the main line valve automatically.

Note that loss of supply fails the actuator “as is“, normally open.

3.4.2 3/2-mode (ATC)

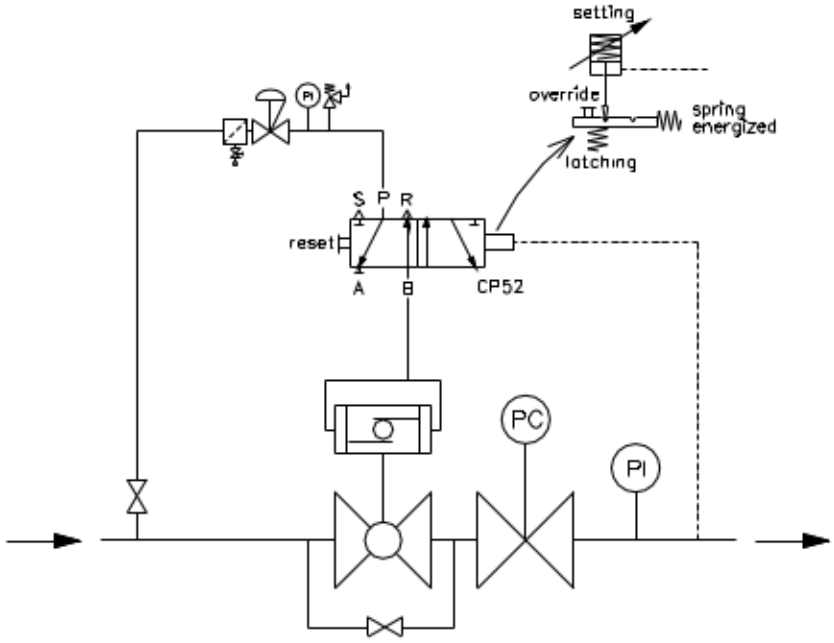

Fig. 3.4.2

Normally the supply to the control pilot is not fed to the actuator, port B is vented. Upon activation of the control pilot the supply switches to port B. This closes the actuator and main line valve. Upon local reset port B will be vented and manually opening of the main line valve is enabled.

Note that loss of supply fails the actuator “as is“, normally open.

3.4.3 3/2-mode (ATO)

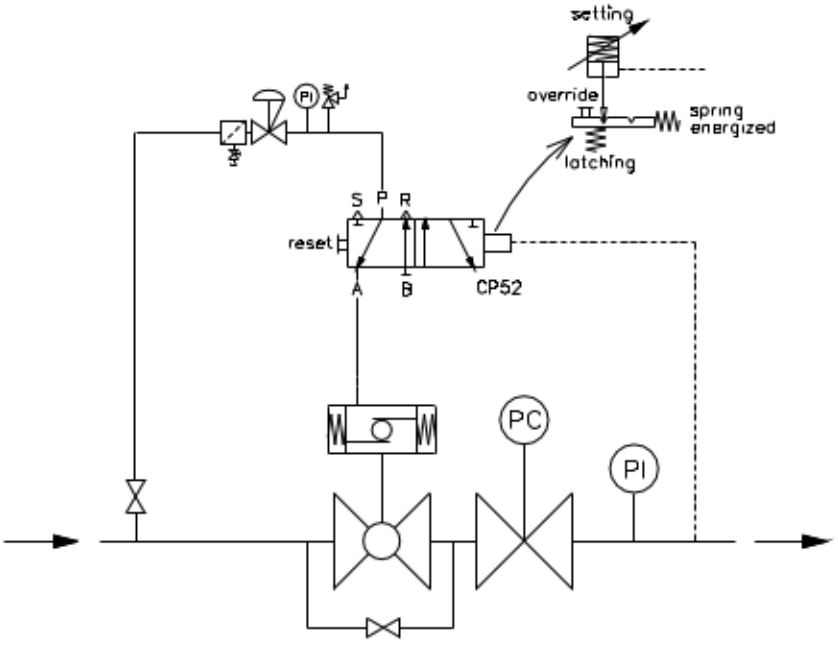

Fig. 3.4.3

Normally the supply to the control pilot is fed to the actuator via port A. Upon activation of the control pilot port A is vented. This closes the actuator and main line valve. Upon local reset supply switches to port A and opens the main line valve automatically.

Note that loss of supply fails the actuator “closed“.

4 Operation Instructions

4.1 Testing

The control pilot is set normally to the specified setpoint and provided with the proper sensing element and pressure setting spring. In general a simple functional test during commissioning will be sufficient to check if any fine-adjustment is required.

As the control pilot will be activated only seldom, we recommend to perform periodic functional tests to assure proper operation and availability.

Verify the upper trip value (for overpressure protection) by slowly increasing the outlet pressure untill the control pilot is activated. See section 4.5.1 for leak testing of the 5/2-valve.

Consider carefully, prior to testing, any possible damage to downstream equipment related to the introduced pressure gradient. We recommend to perform functional tests on isolated gas runs to avoid interference with the online proces.

4.2 Adjustment

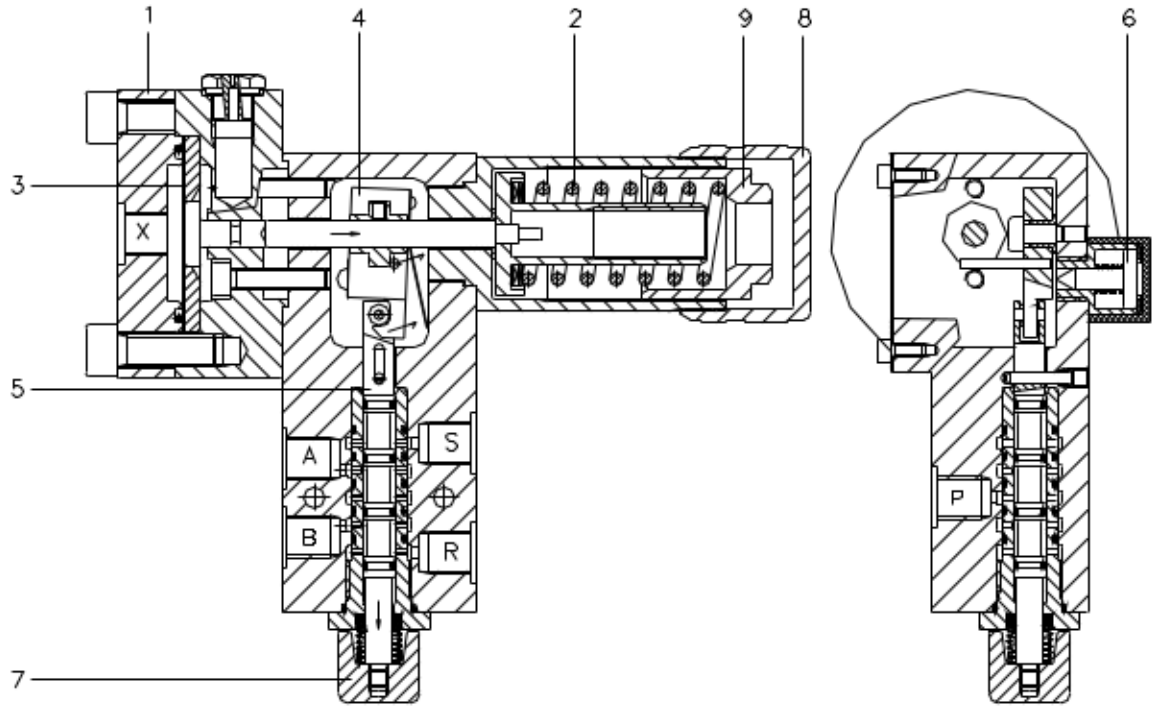

Fig. 4.2

1. Remove cap (8) and turn the adjusting nut (9) fully inward or above the required setting.
2. Reset the switch mechanism, use reset button (7)
3. Pressurize the setting element up to the required upper trip setpoint
4. Slowly unwind the adjusting nut (hex 27) untill the switch mechanism unlatches
5. Check pressure setting; depressurize the setting element, repeat same sequence starting from 2)
6. Fine-adjust if necessary

Note that torsion forces in the setting spring may be minimalized by finalizing the setting procedure with slightly turning in- and outward of the adjusting nut. See section 4.5.1 for adjustment of lower trip value.

4.3 Pressure Spring Ranges

The available upper trip spring pressure ranges *) depend on type of sensing element. Proceed as follows for optimal accuracy and proper selection:

- Step 1 choose sensing element **) :
  - *select by preference 1.9A to 1.4A and 1.4A to 1.2A*
- Step 2 choose spring for overpresure :
  - *select by preference lower range to higher*
  - *allow margin for up- en downward adjustment*

Control Pilot CP52	sensing element type			
	1.9A		1.4A	1.2A
overpressure range	3 to 8	8 to 21	18 to 46	40 to 78
accuracy class AG	2.5	1	1	1

Table 4.3.1

SM1.9a			
upper trip pressure range [barg]			
color	code	min	max
green	A	0.6	1.1
yelllow	B	0.9	1.8
black	C	1.7	4.1
white	D	3.7	7.1
orange	E	6.2	9.6
grey	F	7.9	11.3
purple	G	10.5	16.5
brown	H	15.6	21.7

SM1.4a			
upper trip pressure range [barg]			
color	code	min	Max
green	A	1.2	2.4
yelllow	B	1.9	3.8
black	C	3.7	8.8
white	D	8	15
orange	E	13	21
grey	F	17	24
purple	G	22	35
brown	H	33	46

SM1.2a			
upper trip pressure range [barg]			
color	code	min	Max
green	A	2.0	4.1
yelllow	B	3.3	6.5
black	C	6.2	15
white	D	13	26
orange	E	22	35
grey	F	29	41
purple	G	38	60
brown	H	56	78

blue ranges are preferred for optimal accuracy

Table 4.3.2

*) lower trip pressure is set normally to assure fail closed position on loss of sense pressure or diaphragm rupture, ranges available upon request

**) low pressure sensing elements are availabe for pressures from 100mbar u/i 3 bar upon request

4.4 Setpoint Considerations

The setpoint of the control pilot should be chosen **high enough** to

- avoid interference with pressure control during dynamic response or lock-up.
- enable trouble-free relatching of the control pilot at normal operating or reset conditions.

The setpoint of the control pilot should be choosen **low enough** to comply with safety standards on operational pressure limits of the downstream piping system and equipment

For multiple stream installations consideration should be given to stream discrimination and stream protection in order to avoid spurious tripping.

4.5 Miscellaneous

4.5.1 Adjustment of Lower Trip Value

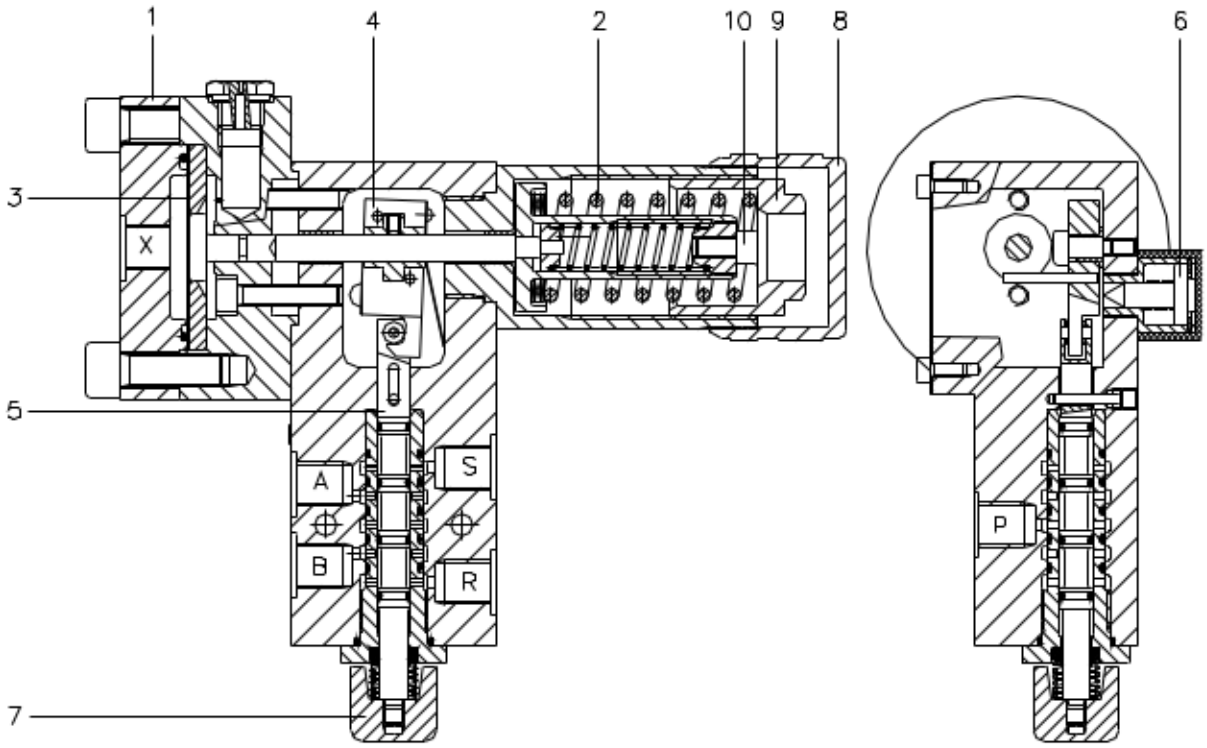

Fig. 4.5.1

7. Remove cap (8) and set upper trip value as per 4.2
8. Turn the adjusting bolt (10) fully outward or below the required setting
9. Pressurize the setting element above the required lower trip setpoint
10. Reset the switch mechanism, use reset button (7)
11. Depressurize the setting element down to the required setting
12. Slowly advance the adjusting bolt (allen key s5) untill the switch mechanism unlatches
13. Check pressure setting; pressurize the setting element, repeat same sequence starting from 8)
14. Fine-adjust if necessary

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4.5.2 Leak Testing of 5/2-valve

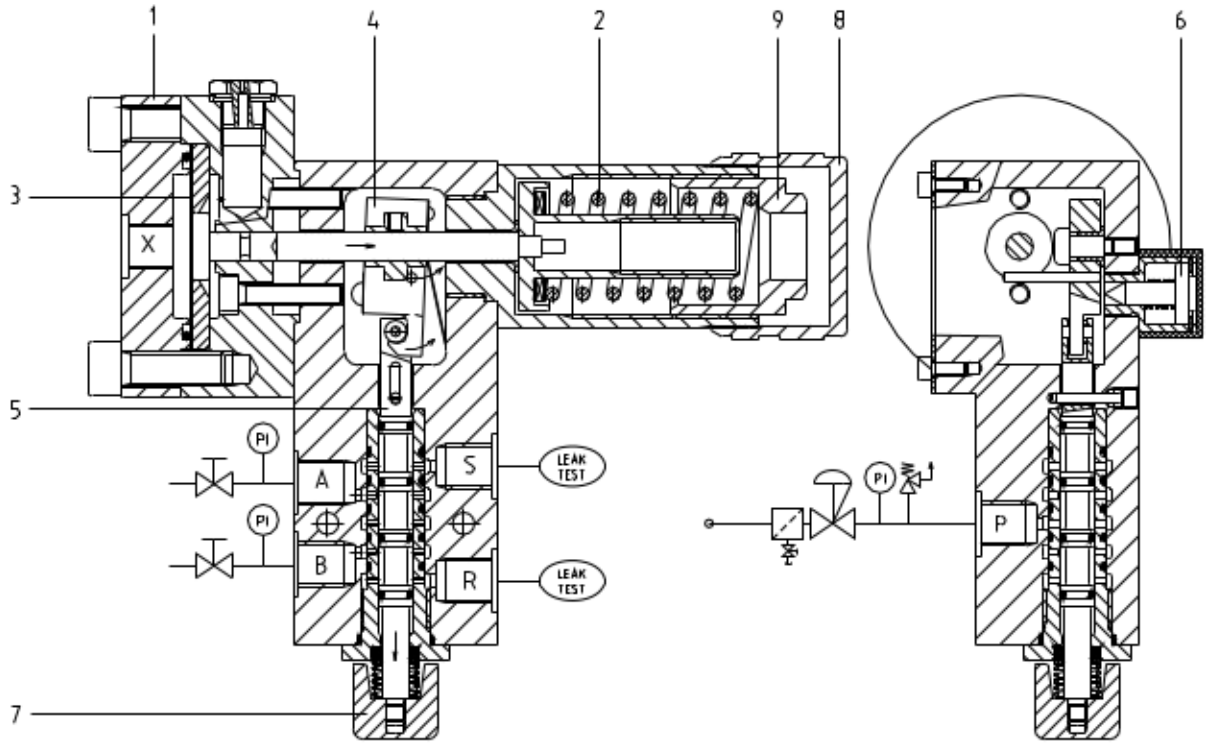

Fig 4.5.2.1

1. Isolate connections (bubble tight) to actuator and provide pressure indication on port A en B
2. Latch mechanism with reset button (7), *assure sense pressure on port X allows proper relatching*
3. Pressurize supply (port P) up to test pressure, port A shows supply pressure
4. Test port S and R for leakage (port B is now connected to R)
5. Switch 5/2-valve by activating the manual override, port B shows supply pressure, *mind the temporary discharge on port S and R during switch-over*
6. Test port S and R for leakage (port A is now connected to S)
7. Connect port A and B to the actuator after completion of tests

Note that not isolating connections port A and B may trouble testing as actuator may show leakage.

5 Installation Notes

5.1 Equipment Specific

➢ **The following should be assured at installation :**

- free access to reset and emergency button of pilot
- safe discharge for port R and S of pilot
- rugged mounting bracket with short arm to fixing if connected to piping or framework

➢ **The following is recommended at installation :**

- isolation valves and pressure indicators in instrument lines to actuator
- reset button from pilot pointing downwards
- panel or bracket mounted pilot isolated from piping and framework

5.2 General

➢ **Trained personnel**

- Trained personnel is referred to as persons who are able to judge the work they are assigned to and recognize possible dangers due to their knowledge of the pertinent standards.

➢ **Appropriate Measures**

- Any hazards which could be caused by the process medium, the signal pressure and moving parts of the main line valve are to be prevented by means of appropriate measures.

➢ **Validated Valve Data**

- It is required to make sure that the equipment is only used in areas where the operating pressure and temperatures do not exceed the operating limit values which are based on the data submitted in the order

➢ **Proper Shipping and Storage**

- Proper shipping and appropriate storage are assumed

7 Maintenance Instructions

7.1 Cross Section

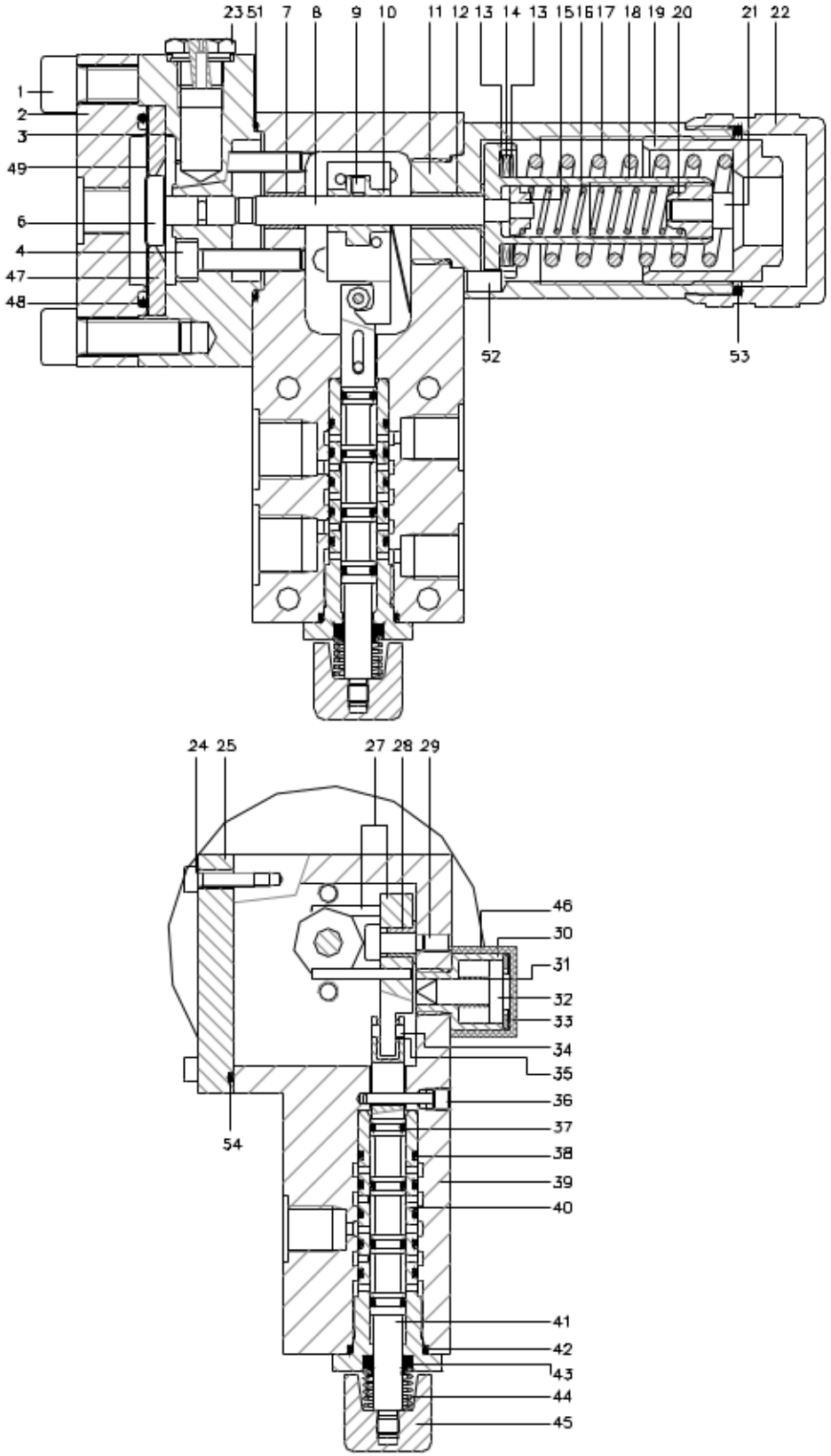

Fig. 7.1

7.2 Service Necessities

We recommend the use of the following products

- Lubricant for all O-rings and guidings: Parker Super-O-Lube
- Lubricant for theads : NeverSeez
- Sealant for threads : Loctite 577
- Threadlocker : Loctite 243
- Cleaning and protection : White Grease Spray

7.3 Service Items

- Regular testing, inspection and servicing of the equipment will assure reliable operation over a longer period.

- Maintenance intervals largely depend upon operation conditions, therefore these should be choosen by experience or initially by company policy. Note that consideration shall be given to applicable directives.

- Proper functioning is conditional on
  - clean, dry,and non aggressive gas
  - tightness and smooth operation of all soft moving parts, esspecially the O-rings (37) in the 5/2-valve
  - smooth operation of all moving metal parts, esspecially the latching element (27) and rod (8)

- In the following sections exploded views will show sequence of disassembly (and vice versa) as far as soft parts are concerned. Soft parts have been marked (circled).

7.4 Exploded Views

7.4.1 Sensing Element & Spring Housing

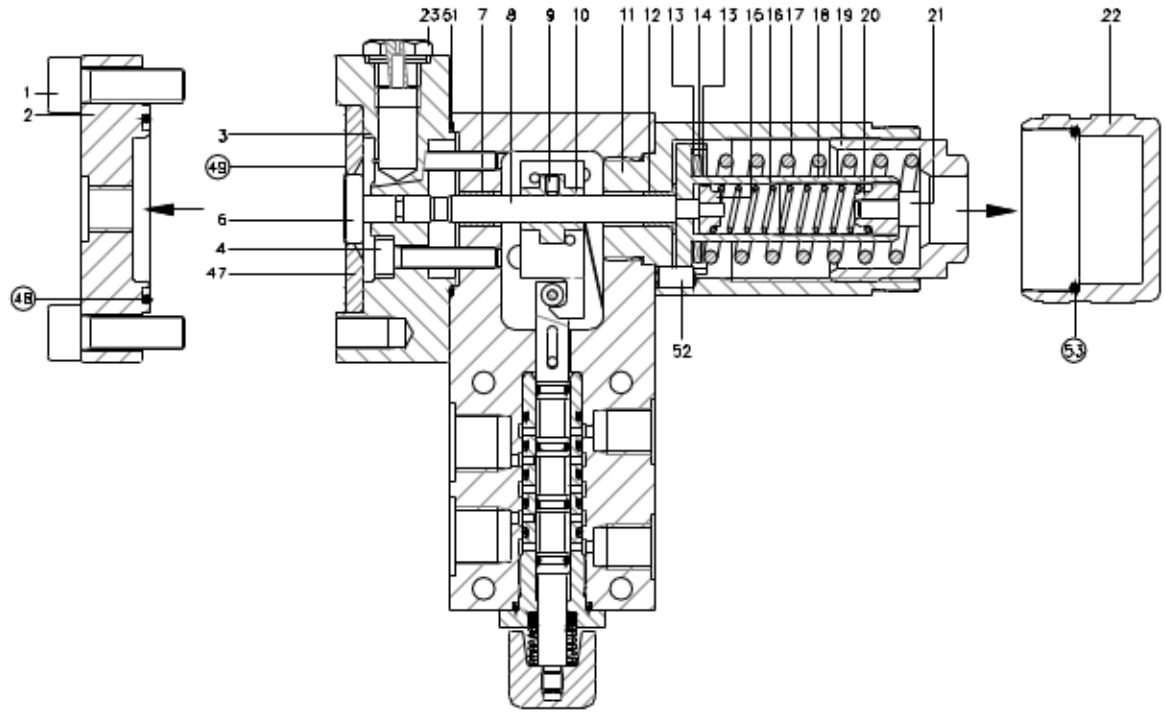

Fig. 7.4.1

7.4.2 5/2 Valve

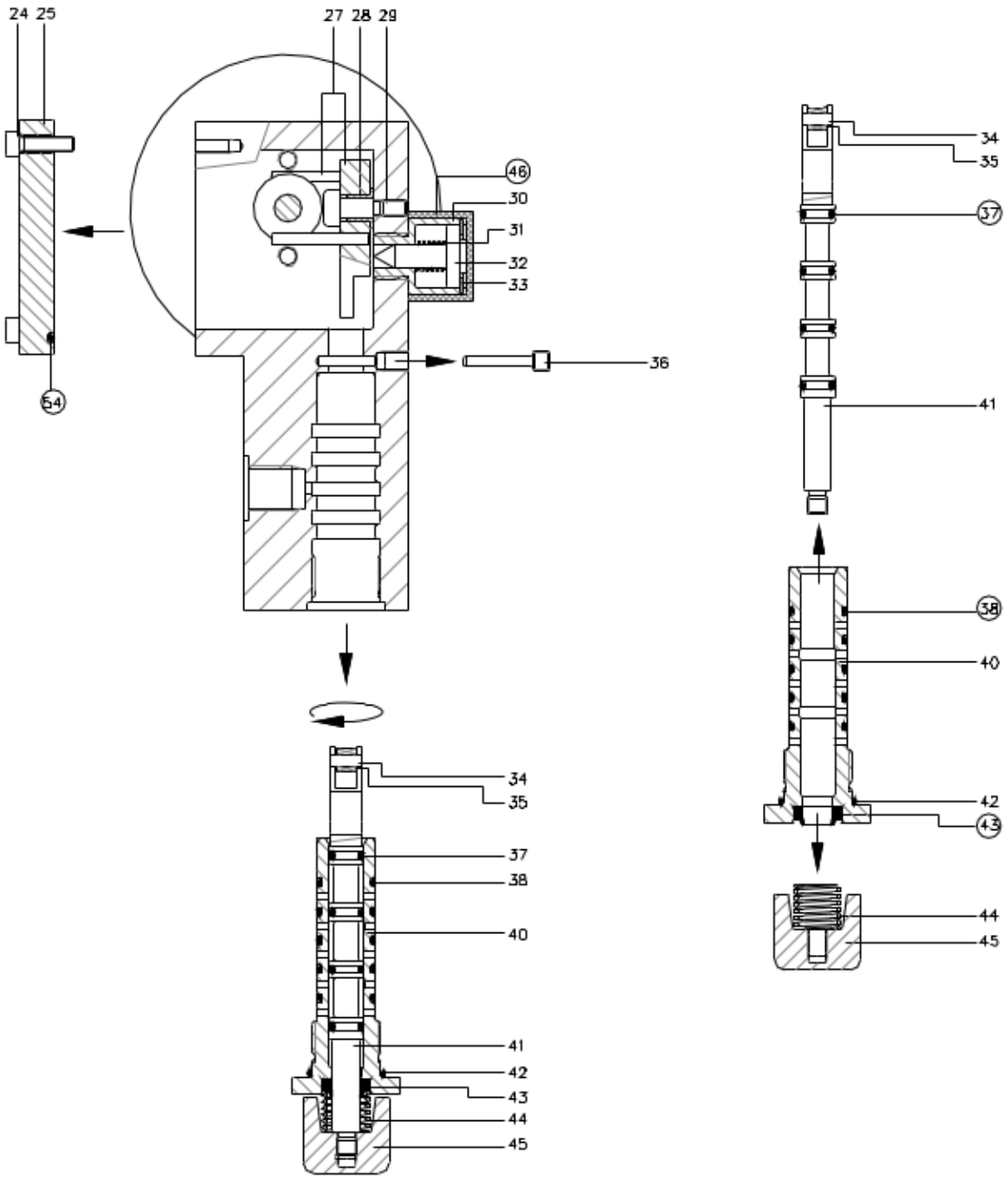

Fig. 7.4.2

7.5 Parts List

Item	Description	Qty	Remarks
1	bolt	4	
2	cover	1	
3	sensor housing	1	
4	bolt	2	
5			
6	sensor element	2	
7	bearing	1	
8	switch rod	1	
9	locking screw	1	
10	switch	1	
11	spring housing	1	
12	bearing	1	
13	washer	2	
14	needle bearing	1	
15	spring button - min	1	
16	set spring – min	1	
17	set spring – max	1	
18	spring button - max	1	
19	adjusting screw - max	1	
20	adjusting screw - min	1	
21	bolt	1	
22	cap	1	
23			
24	bolt	4	
25	cover	1	
26			
27	latching element	1	
28	bearing	1	
29	bolt	1	
30	bushing	1	
31	spring	1	
32	button	1	
33	retaining ring	1	
34	pin	1	
35	bearing	1	
36	bolt	1	
37	O-ring	4	
38	O-ring	5	
39	5/2-housing	1	
40	insert	1	
41	stem	1	
42	O-ring	1	
43	dirt scraper	1	
44	spring	1	
45	button	1	
46	rubber cap	1	
47	sensor ring	1	
48	O-ring	1	
49	sensor diaphragm	1	
50			
51	O-ring	1	
52	locking pin	1	
53	O-ring	1	
54	O-ring	1	

8 Typical Installation Examples

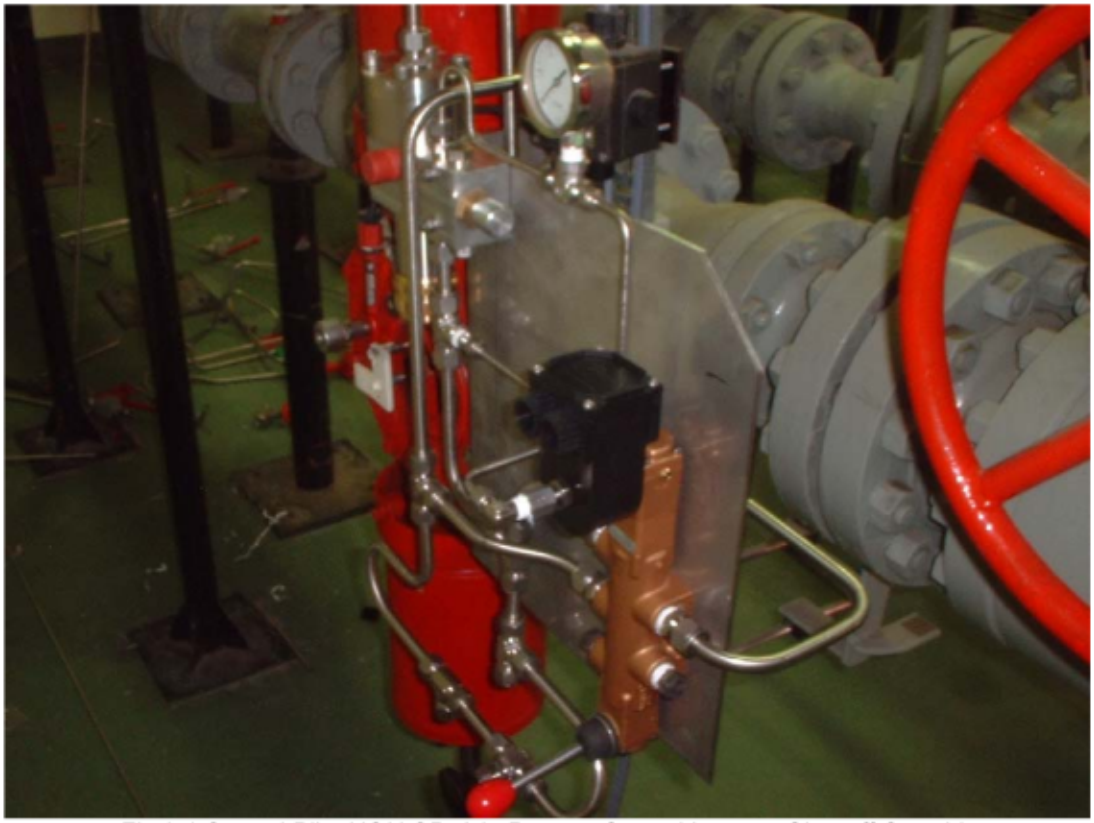

Fig 8.1 Control Pilot HON CP52 in Remote Control Loop as Shut-off Override

Fig 8.2 Control Pilot HON CP52 in Remote Control Loop as Shut-off Override