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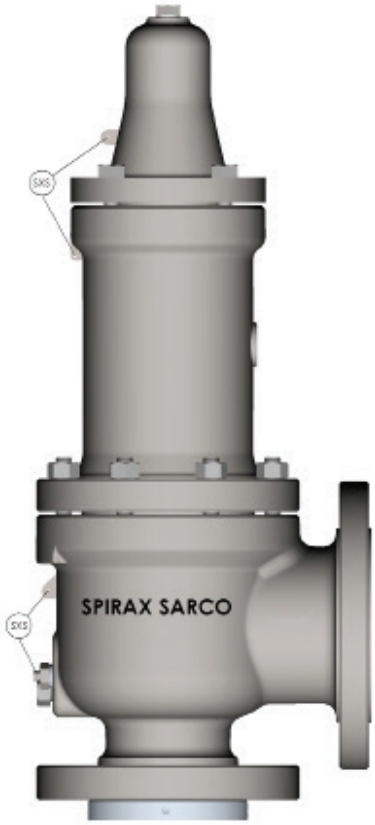
UV

IM-D344-01
BR Rev.03

SV80H
Safety and Relief Valves
Installation and Maintenance Guide



1. Warranty

Spirax Sarco warrants, subject to the conditions described below, to repair and replace without charge, including labor costs, any components which fail within 1 year of product delivery to the customer. Such failure must have occurred because of defect in material or manufacturing and not as a result of product not being used in accordance with the instructions of this manual.
This warranty does not apply to products which require repair or replacement due to normal wear out or products that are subject to accident, misuse or improper maintenance.
Spirax Sarco only obligation with Warranty is to repair or replace any product that we consider defective. Spirax Sarco reserves the right to inspect the product in customer installations or request the return of the product with freight prepaid by the buyer.
Spirax Sarco may replace or repair any parts that are deemed defective without further responsibilities. All repairs or services executed by Spirax Sarco, which are not covered by this warranty, will be charged according to the current price list.

THIS IS THE ONLY SPIRAX SARCO WARRANTY TERM AND ONLY HEREBY SPIRAX SARCO EXPRESS.BUYER DISCLAIMS ALL OTHER WARRANTIES IMPLIED BY LAW, INCLUDING ANY MARKET WARRANTY FOR A PARTICULAR PURPOSE.

2. General Safety Information

Access
Ensure safe access and if necessary a safe working platform (suitably guarded) before attempting to work on the product. Arrange suitable lifting gear if required.

Lighting
Ensure adequate lighting, particularly where detailed or intricate work is required.

Hazardous liquids or gases in the pipeline
Consider what is in the pipeline or what may have been in the pipeline at some previous time. Consider; flammable materials, substances hazardous to health, extremes of temperature.

Hazardous environment around the product
Consider; explosion risk areas, lack of oxygen (e.g. tanks, pits), dangerous gases, extremes of temperature, hot surfaces, fire hazard (e.g. during welding), excessive noise, moving machinery.

The system
Consider the effect on the complete system of the work proposed. Will any proposed action (e.g. closing isolation valves, electrical isolation) put any other part of the system or any personnel at risk? Dangers might include isolation of vents or protective devices or the rendering ineffective of controls or alarms. Ensure isolation valves are turned on and off in a gradual way to avoid system shocks.

Pressure systems
Ensure that any pressure is isolated and safely vented to atmospheric pressure.
Consider double isolation (double block and bleed) and the locking or labeling of closed valves. Do not assume that the system has depressurized even when the pressure gauge indicates zero.

Temperature
Allow time for temperature to normalize after isolation to avoid danger of burns.
Tools and consumables
Before starting work ensure that you have suitable tools and/or consumables available. Use only genuine Spirax Sarco replacement parts.

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Before starting work ensure that you have suitable tools and/or consumables available. Use only genuine Spirax Sarco replacement parts.

Protective clothing
Consider whether any protective clothing required by yourself and / or others in the vicinity to protect against the hazards of, for example, chemicals, high / low temperature, noise, falling objects, and dangers to eyes and face.

Permits to work
All work must be carried out or be supervised by a suitably competent person. Post 'warning notices' if necessary.

Electrical works
Before starting work study the wiring diagram and wiring instructions, and check any special requirements. Consider special emphasis on primary and phase source, local isolation of the major systems, fuse requirements, grounding, special cables, cable entries and electrical voltage selection.

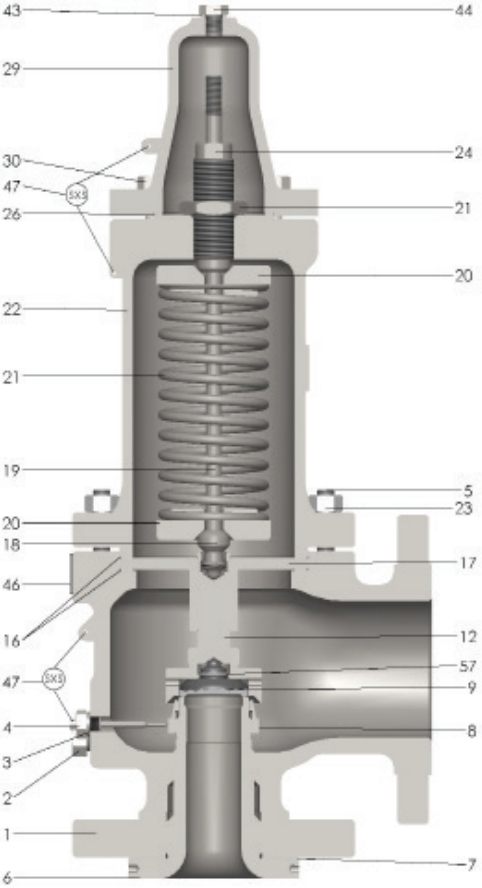
Commissioning
After installation or maintenance, ensure that the system is working properly.
Perform tests on all alarms and protective devices.

Storage
Equipment and materials shall be stored in a proper place and securely.

See Item 5.

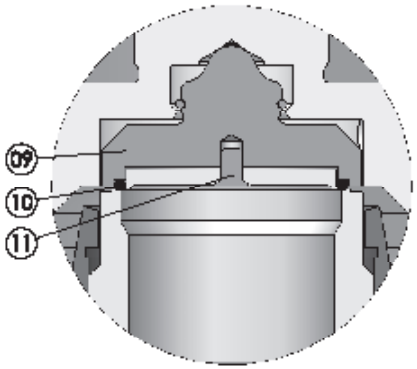
Disposal

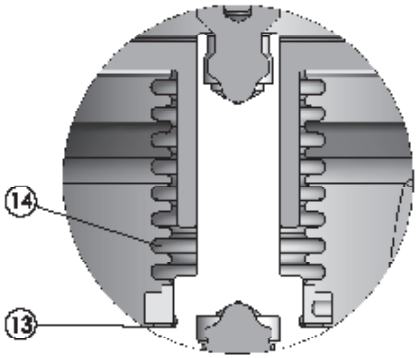
Unless otherwise stated in the Installation and Maintenance Instructions, this product is recyclable and no ecological hazard is anticipated with its disposal providing due care is taken.



Item	Description
1	Body
2	Pipe Plug
3	Lock Screw Gasket
4	Lock Screw
5	Body Studs
6	Nozzle**
7	Nozzle Gasket**
8	Blowdown Ring
9	Disc**
10	O' Ring **
11	Retainer Screw for O'Ring Disc
12	Disc Holder
13	Bellows Gasket
14	Bellows**
16	Guide Gasket**
17	Guide
18	Stem Retainer
19	Spindle
20	Spring Washer
21	Spring**
22	Bonnet
23	Hex Nut (Body)
24	Adjusting Screw
25	Adjusting Screw Locknut
26	Cap Gasket**
29	Flanged Cap
30	Cap Screw
43	Sealing Plug Gasket
44	Sealing Plug
46	Nameplate
47	Seal
57	Disc Retainer Ring

** - Spare parts recommended for 02 years of operation





3. Introduction

Safety Relief Valves SV80H have excellent performance characteristics to work in various applications with different fluids, including gases, process steam, liquid and hydrocarbons, it can operate as a safety or relief valve, depending on our application. SV80H Valves meet the requirements of ASME Code Section VIII. These valves must not be used in equipment designed in accordance with ASME Section I.
Proper storage, handling, installation and testing of valves, ensuring performance is consistent with the product specifications. This manual contains basic concepts of storage, installation, operation and maintenance of Safety Relief Valves SV80H, but does not replace the expertise and experience required for the execution of repair and maintenance of valves. Classifications applicable to the identification of the relevant parts of the model are defined in SV80H drawings on page 5.

4. Terms and Definitions

4.1 Safety Valves
Automatic pressure relief device characterized by an instantaneous opening ("pop") upon reaching the set pressure. Used in service with compressible fluids (gases and vapors).

4.2 Relief Valves
Automatic pressure relief device characterized by a progressive opening proportional to the pressure increase above the set pressure opening. Used in service with incompressible fluids (liquids).

4.3 Safety Relief Valves
Automatic pressure relief device, suitable for working as a safety or relief valve, depending on the desired application.

4.4 Maximum Allowable Working Pressure (MAWP)
It is the maximum working pressure of a vessel, according to the design code, the strength of the materials used, the equipment dimensions and its operating parameters.

4.5 Operating Pressure
It is the pressure at which the vessel is subject to normal operating conditions. A reasonable margin must be established between the operating pressure and maximum allowable working. For safe operation, the operating pressure must be at least 10% less than the MAWP, or 0.34 bar(g), whichever is greater.

4.6 Opening Pressure (Set Pressure)
It is the gauge pressure at which the valve is set to open.

4.7 Cold Differential Test Pressure
It is the pressure at which the valve is set to open on the test bench. This pressure includes corrections for service conditions (back pressure and / or temperature).

4.8 Relief Pressure
It is the pressure at which the valve relieves the maximum capacity for which was dimensioned. It is equal to the opening pressure plus overpressure.

4.9 Overpressure
The pressure increase over the set pressure of the relieving device. Overpressure is expressed in pressure units or as a percentage of set pressure.

4.10 Accumulation
It is the increase in pressure above the MAWP of the vessel during discharge of the safety device, expressed as a percentage of that pressure. Overpressure is the same as accumulation only when the relieving device is set to open at the maximum allowable working pressure of the vessel.

4.11 Closing Pressure
Is the pressure at which the Safety and Relief Valve closes, returning to its original position after the operational normality is restored, and is equal to the opening pressure minus the blowdown.

4.12 Blowdown
The difference between the set pressure and the closing pressure of a pressure relief valve, expressed as a percentage of the set pressure or in pressure units.

4.13 Lift
The actual travel of the disc from the closed position when a valve is relieving.

4.14 Relieving Capacity
It is the flow of a determined fluid that a valve is able to relieve in the operating conditions in which it was sized.

4.15 Coefficient of Discharge
It is the quotient of the actual capacity (measured in laboratory) divided by the theoretical capacity.

4.16 Backpressure
Is the pressure in the outlet connection of the Safety and / or Valve relief, it may be:

4.16.1 Superimposed Backpressure

4.16.1.1 Constant
When there is no pressure variation on the discharge side of the valve at any operating condition, with the valve closed.

4.16.1.2 Variable
When there is variation in pressure on the discharge side of the valve prior to opening.

4.16.2 Buil-up Backpressure
The increase in pressure at the outlet of a pressure relief device that develops as a result of flow after the pressure relief device opens.

4.17 Simmer
The audible or visible escape of compressible fluid between the seat and disc of a pressure relief valve which may occur at an inlet static pressure below the set pressure prior to opening.

4.18 Chatter
Abnormal condition characterized by rapid openings and closings in succession, causing serious damage to the valve.

5. Handling and Storage

- The storage should always be done in the original packaging with valves standing in the upright position.
-
- Store the valves in covered, clean and dry environment. The protection of input and output connections prevents the entry of impurities inside the valve; remove them only at the moment of installation.
-
- When moving them, avoid vibrations, sudden shocks and heavy impacts, keeping them in an upright position, with the entry down.
-
- Never carry or move the valves using the test lever.

6. Installation

6.1 General Requirements

• Safety and Relief Valves intended for relief of compressible fluids (gases or vapors) shall be connected to the vessel in the vapor space above any contained liquid or to piping connected to the vapor space in the vessel which is to be protected. Safety and Relief Valves intended for relief of liquids shall be connected below the normal liquid level. (ASME code Section VIII, UG135 (a)) **(Figures 01 and 02)**.

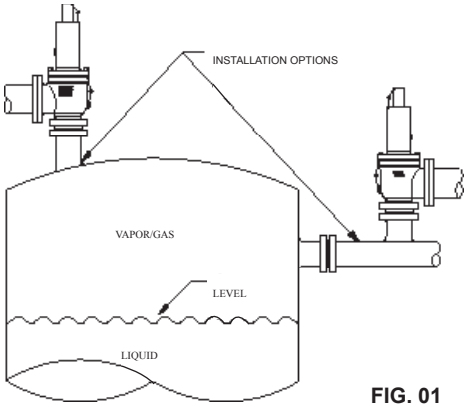


FIG. 01

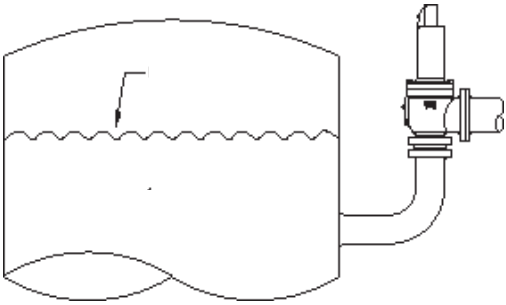


FIG. 02

It is recommended that valves be inspected prior to installation.

Calibration and seat tightness should be verified, for this, a suitable testing bench with compressed air or inert gas and water shall be used. The tests shall be performed by qualified professionals, in the presence of an equipment inspector.

• Make sure that the equipment to be protected underwent a process of purging to remove all debris and particles, such as welding residue, pieces of gaskets or other solid materials. We caution that any impurities that lodge between the seating surfaces or even pass between them at high speed may damage the surfaces and cause the valves to leak.

• The Safety and Relief Valves must receive periodic maintenance to ensure satisfactory performance. For this it is necessary to install them in easily accessible areas.
A working area around and above the valves shall be predicted. If two or more valves are installed too close together, the outputs should be parallel in order to provide protection to those working in the vicinities or in the maintenance of the valve.

• When lifting a valve, the valve should always remain in a vertical position. The valve may be lifted by using a sling around the valve yoke and the valve outlet neck. In no case should the valve be lifted by the lifting lever.

• The valve should not be bumped or dropped during installation. If the valve is dropped, an inspection for damage should be made, and the set pressure of the valve rechecked.

• Make sure that gaskets and connection's studs are in compliance with specifications of the pipeline. The studs and nuts should be properly lubricated.

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• When installing the valves, the flange's studs shall be fitted carefully to avoid distortions up in the valve body, misalignment and leaks. With the valve installed in position, screw the nuts manually. Initially with small torque, tighten each nut in the recommended sequence depending on the number of prisoners **(Table 01)**, then increase the torque following the same sequence of initial tightening, until the final torque required. The required torque varies with the material and size of the studs and nuts, and type of gasket used. Refer to your engineering on the torque values to be applied.

Nº of Studs	Tightening pattern
4	1-3-2-4
6	1-4-2-5-3-6
8	1-5-3-7 → 2-6-4-8
12	1-7-4-10 → 2-8-5-11 → 3-9-6-12
16	1-9-5-13 → 3-11-7-15 → 2-10-6-14 → 4-12-8-16

TABLE 01

• Install discharge piping using the same procedures used in the valve installation.

• Prior to completing the installation, a visual check should be made to ensure that the valve lifting lever is free to operate.
• Valves with bellows should have the plastic cap removed from castle vent during installation.

• After installation, an inspection of the valve should be made to confirm that all adjustment components are properly locked and sealed, as required by ASME Section VIII UG126 (c) and Standard NR-13.

• Safety Relief Valves operating under the best possible conditions (with favorable operating cycles, relatively stable ambient temperatures and no dirt) provide the maximum level of security, tightness and reliability.

6.2 Inlet Piping

• Safety and Relief Valves must be installed in upright standing position (+ / - 1) directly on the protected equipment in a pipe with nominal diameter equal or greater than valves diameter, and no longer than the face-to-face dimension of a standard “T” of the applicable pressure class. Sharp edges must be avoided in this pipe section **(Figure 03)**.

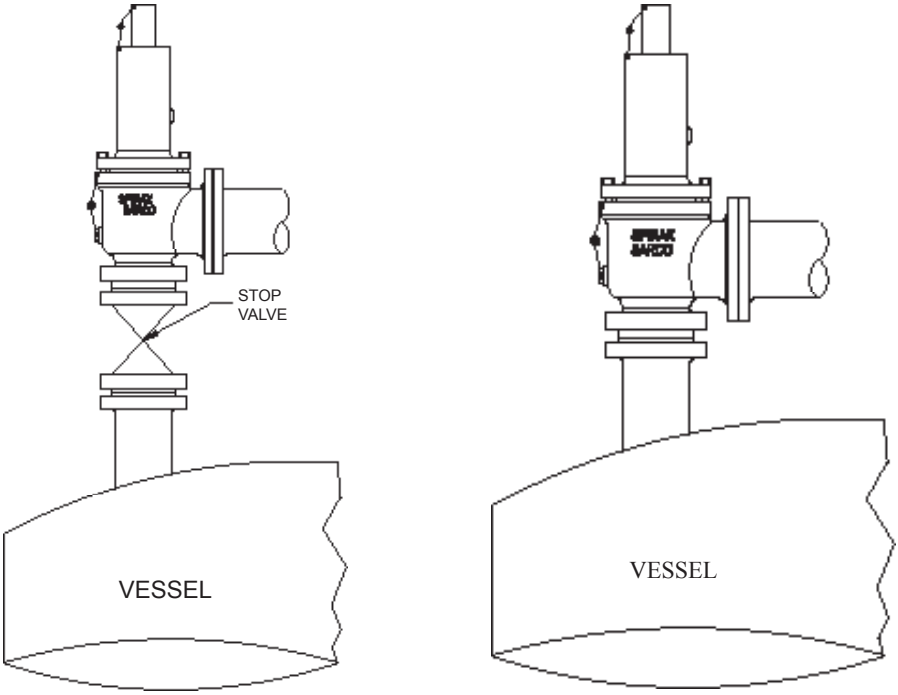


FIG. 03

• Header nozzle corners must be rounded to a radius of not less than 1/4 of the opening diameter.

• The safety and relief valve inlet should not be positioned at the end of a horizontal pipe in which there is normally no flow. Foreign materials or liquids may get stuck and interfere with the operation of the valve and increase the need for maintenance.

• A shutoff valve may be installed between the Safety and Relief Valve and the protected equipment, provided they meet the recommendations of API RP 520 Part 2, of the ASME Code Section VIII UG135 (d) and of Appendix M of the same code. If installed, the shutoff valve must be full bore and have a nominal diameter equal or greater than the Safety and Relief Valve inlet diameter.

• Excessive pressure loss at the inlet of the safety valve will cause extremely rapid opening and closing of the valve, which is known as “chattering”. Chattering may result in lowered capacity as well as damage to the seating surface of the valve. Severe chattering can cause damage to other parts of the valve. Pressure drop from the protected equipment to the Safety and Relief Valve shall not exceed 3% of set pressure when the valve is relieving the maximum flow rate for which it was sized

• To reduce the effects of excessive turbulence at the entrance of Safety Relief Valves, the following recommendations should be observed **(Figure 04)**:

• Safety valves should be installed at least eight to ten pipe diameters downstream from any bend in a steam line. This distance should be increased when the valve is installed on the horizontal section of a header which is preceded by an upward section.

• Safety valves should not be installed closer than eight to ten pipe diameters either upstream or downstream from a diverging, or a converging, “Y”.

• Safety valves should never be installed, in a steam line, in a position directly opposite to a branch line.

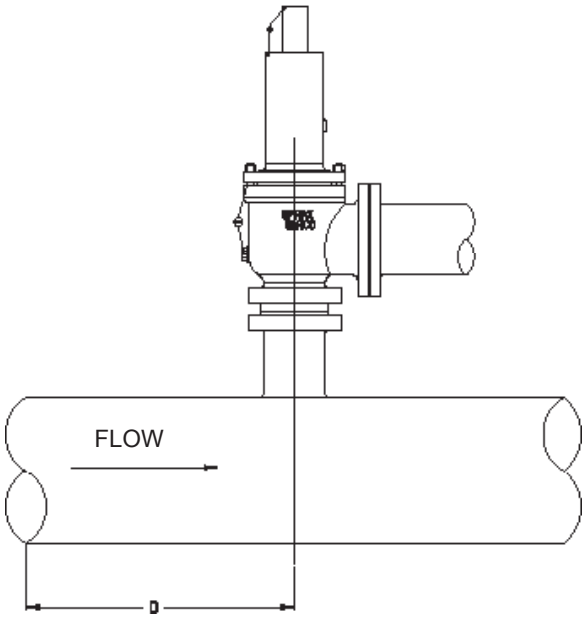


FIG. 04

• Excessive vibration in line produces changes in the Safety and Relief Valve set pressure, it also may cause leakage in the valve. Ways to eliminate this problem before installation should be studied.
• ASME Section VIII code requires that the design of the inlet connection consider the stress conditions that occur due to reaction forces during valve operation, external loads, vibration and loads resulting from thermal expansion of the discharge pipe.
• The calculation of reaction force during valve relief is responsibility of the designer of the vessel and / or piping. Spirax Sarco can provide this information only as technical assistance and does not assume any responsibility for its application.

• External loads resulting from support systems and poorly designed piping may be the cause of excessive stresses and distortion in the valve and inlet pipe. The accumulation of stress may cause the valve to malfunction or leak.
• Vibrations in the inlet piping systems may cause leaks, premature wear of certain parts of the valve and / or pipe failure by fatigue. The high frequency vibrations cause more damage to the tightness of Safety and Relief Valves than low frequency. This effect can be minimized, allowing a greater difference between the operating pressure of the system and the opening pressure of the valve, especially under conditions of high frequency.

6.3 Outlet Piping

• The discharge area of the outlet piping from a safety valve should not be less than the area of the outlet connection. Where more than one safety valve is connected to a common outlet pipe, the area of the pipe should not be less than the combined area of the outlet connections to the safety valves.

• All safety valve discharges should be piped so that the effluent is discharged clear from running boards or platforms. Ample provision for gravity drain should be made in the discharge pipe at, or near, each safety valve where water, or condensation, may collect. Each valve has an open gravity drain through the body, below the level of the valve seat, and this drain should be piped to a safe discharge area.

• A shutoff valve may be installed at the outlet connection, provided it meets the recommendations of API RP 520 Part 2, of the ASME Code Section VIII UG135 (d) and of Appendix M of the same code. If installed, the shutoff valve must be full bore and have a nominal diameter equal or greater than the Safety and Relief Valve outlet diameter **(Figure 05)**.

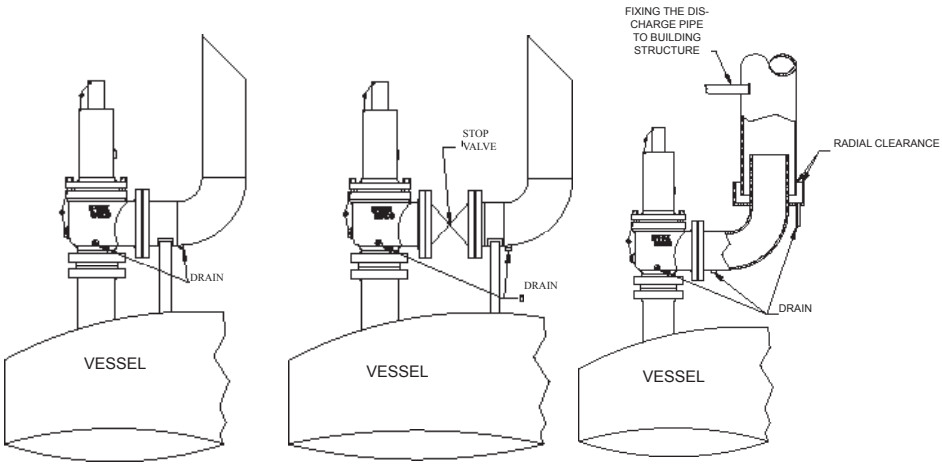


FIG. 05

• If a silencer is installed at the outlet of the valve, the area of the silencer shall be sufficient to prevent back pressure from interfering in the operation and in the valve relief capacity. The silencer or other necessary components shall be constructed so as not to allow the formation of corrosion deposits that may cause restrictions to process fluid passage.

• The discharge pipe must be installed so that no undue stress is imposed to the Safety and Relief Valve. Excessive stress may cause body distortions and leakage. To avoid them, the following recommendations should be observed:

1. The discharge pipe should not be anchored to the valve. The maximum weight on the valve outlet should not exceed the weight of a short radius elbow with flange, plus a small vertical tube compatible with the valve connection

2. It must be ensured that the thermal expansion of the brackets and piping system will not produce tensions on the valve. Spring Holders are recommended where needed.

3. The discharge pipe should be designed to allow for expansion of the vessel as well as its own. This is especially recommended for long pipelines.

7. Maintenance and Testing

• SV80H valves model can be easily disassembled for inspection, maintenance or parts replacement.

• The period for maintenance of each valve shall meet at least the requirements of NR13 Standard for the protected equipment; the specific characteristics of the process and operating conditions shall also be considered.

• Before disassembling or removal of the valve for maintenance, make sure that the equipment or process line is depressurized.

• Safety and Relief Valves might be installed on vessels or equipment containing hazardous materials. Decontaminate and clean the valve before disassembly, following applicable recommendations for cleaning and decontamination of the vessel or equipment.

7.1 Disassembly

7.1.1
Remove the cap **(29)**, including the lever system, if any.

7.1.2
Remove cap gasket **(26)**.

7.1.3
Note the dimension A, as shown in **Figure 06**, this information will be necessary to position the adjusting screw **(24)** when reassembling the valve.

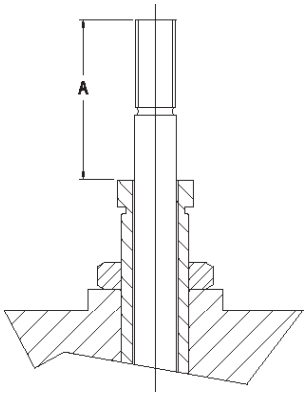


FIG. 06

7.1.4
Remove the lock screw **(04)** of the blowdown ring **(08)** and the gasket **(03)**. If the blowdown **(2.13)** needs to be restored after reassembly, the position of the blowdown ring relative to the disc holder must be observed. Turn the blowdown ring in a counter-clockwise direction, noting the number of notches that are needed for the ring to touch the disk holder **(12)**. This information will be necessary to position the blowdown ring when reassembling the valve.

7.1.5
Loosen the lock nut **(25)** and turn the adjusting screw **(24)** counterclockwise to fully relieve the spring **(21)**. Use a locking pliers to hold the spindle **(19)**, preventing it from rotating while the adjusting screw is being loosened.

7.1.6
Loosen the nuts **(23)** from the prisoners and remove the bonnet **(22)**. Remove the guide's gasket **(16)**.

7.1.7
Remove the spring and spring washers **(21) (20)**.

7.1.8
Remove the disc holder **(12)**, guide **(17)**, disc **(09)**, spindle **(19)** and bellows **(14)** assembly by pulling the spindle vertically upwards. If there is bellows, avoid damaging it in this operation. If the pieces are inlaid, use a suitable solvent to loosen the assembly. Remove the guide's gasket **(16)**.

7.1.9
Remove the spindle **(19)** from the valve. The spindle is attached to the disc holder by screwed thread.

7.1.10
Remove the guide from the disc holder.

7.1.11
In balanced valves, remove the bellows **(14)** from the disc holder. The bellows is attached to the disc holder by screw thread. Using a 3 or 4 clamps mandrel, attach the bellows skirt ring to the mandrel **(Fig. 6A)** and release the bellows using a spanner wrench on the bottom of the bellows, turning it counterclockwise. Take care not to damage the corrugations of the bellows. Remove the bellows' gasket **(13)**.

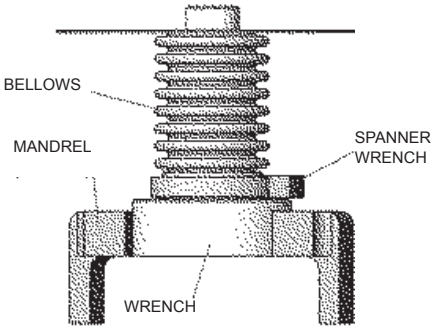


FIG. 06A

7.1.12
To remove the disc from the disc holder, support the disc holder on a bench with the disc facing the bench and insert two wrenches in the disc holder orifices. **(Figure 06B)**, forcing the disc away from it.

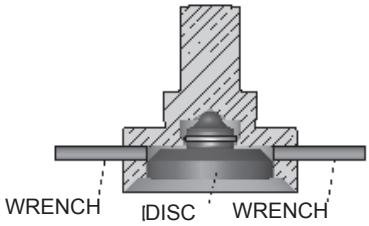


FIG. 06B

7.1.13
For valves with O-ring, remove the (s) retainer screw (s) **(11)**, retainer and O-ring **(10)**.

7.1.14
Remove the blowdown ring **(08)** by turning it counter-clockwise.

7.1.15

Remove the nozzle **(06)** from the body **(01)**. The nozzle is mounted to the body by right-hand threads. Using a 3 or 4 clamps mandrel, hold the nozzle in the mandrel and loosen it from the body using a bar or pipe **(Figure 07)** and rotating the body in an counterclockwise direction. Be careful when using the bar or pipe in the outlet connection to ensure that the nozzle is not damaged during operation. Where the nozzle is stuck in the body, removal may be facilitated by heating the body externally in the threaded area while a cooling agent is applied to the inside of the nozzle. Remove the nozzle **(07)**.

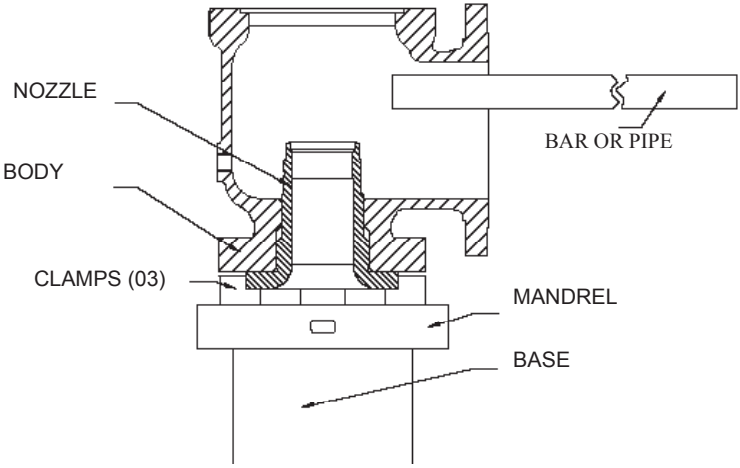


FIG. 07

7.1.16
The nozzle may also be removed from the body using a large plumber wrench **(Figure 08)**.

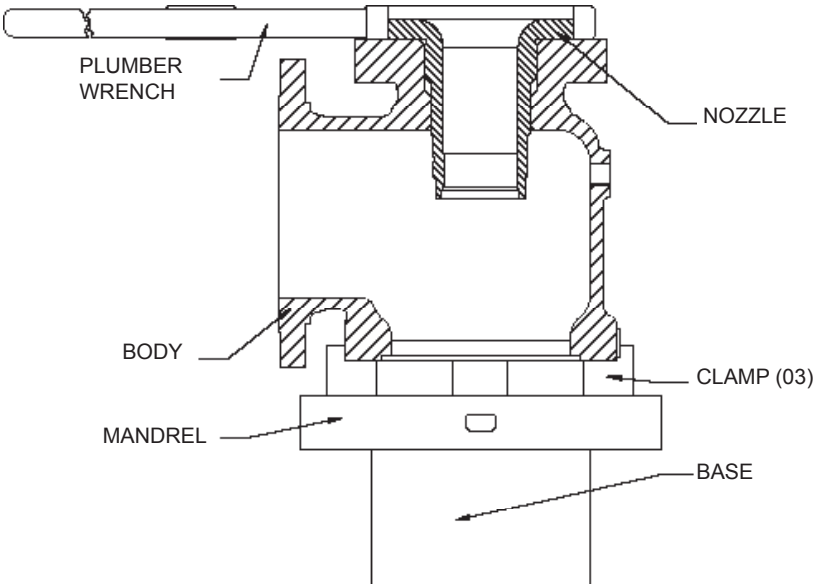


FIG. 08

7.1.17
The valve is ready for cleaning and inspection.

7.2 Cleaning

The parts should be cleaned using sandpaper and a suitable solvent. During the cleaning process special attention must be take to the seating surfaces, guided surfaces and threads. Remove any encrustations from the body **(01)** and bonnet **(22)** by scraping, wire brushing or if necessary, sand blast. It is not recommended to use sand blast for cleaning the internal parts of the valve

7.3 Inspection

Carefully inspect each internal valve component, noting any defects such as cracks, corrosion, excessive wear or other mechanical defects. For the following parts some details must be observed:

7.3.1 Nozzle **(06)**
Look for cuts, nicks or other damage on the seating surface. The threads of the blowdown ring and of fixation to the body must be in good condition without abrasions, tears or other damage. Verify if the nozzle has defects like cracks (w / dye penetrant) and/or severe corrosion. After re-machining, if necessary, and lapping, check the **G (Figure 09)** dimension. If it is too badly damaged or the dimension G is less than the minimum indicated in **Table 02,** the nozzle should be replaced.

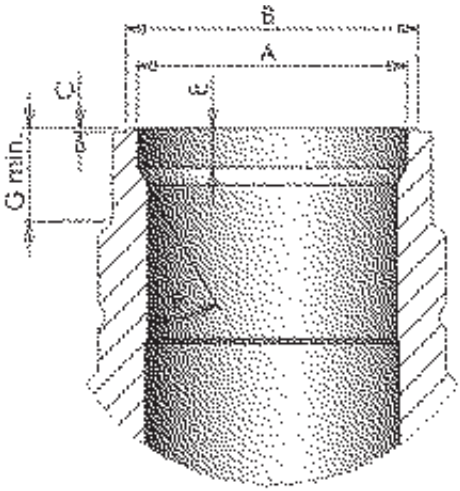


FIG. 09

Metric units, mm							
Nozzle		Metal / Metal Seat.					
Orifice	**Class**	**G** Mín.	**A** + 0.10 - 0.00	**B** + 0.00 - 0.10	**C** + 0.10 - 0.00	**E** + 0.10 - 0.00	**F** + - 1/2º
D	**150# à 1500#**	6,8	13,1	15,7	0,5	2,5	30º
	2500#					0,5	
E	**150# à 1500#**	6,8	17,3	19,9	0,5	3,0	30º
	2500#					0,5	
F	**150# à 600#**	5,8	20,4	23,6	0,4	2,7	30º
	900# à 2500#					0,4	
G	**150# à 900#**	8,1	23,7	26,3	0,7	3,5	30º
	1500# e 2500#					0,7	
H	**150# à 600#**	8,1	28,5	31,5	0,4	4,0	30º
	900# e 1500#					0,4	
J	**150# à 600#**	8,5	36,5	39,5	0,7	5,0	30º
	900# e 1500#					0,7	
K	**150# à 600#**	13,2	43,4	47,0	0,7	6,3	30º
	900# e 1500#					0,7	
L	**150# à 600#**	14,4	54,4	57,5	0,7	7,4	30º
	900# e 1500#					0,7	
M	**All**	14,2	61,1	64,6	0,7	7,7	30º
N	**All**	18,0	67,0	71,0	0,7	9,0	30º
P	**All**	20,3	81,2	85,2	0,9	11,0	30º
Q	**All**	27,0	106,3	111,3	0,9	15,3	30º
R	**All**	32,5	128,1	133,1	0,9	16,7	30º
T	**All**	43,8	158,8	164,4	1,2	16,4	30º
T2	**All**	43,8	164,6	171,0	1,2	16,4	30º
U	**All**	43,8	172,0	178,4	1,2	16,4	30º
V	**All**	41,6	207,1	215,1	1,6	13,7	30º
W	**All**	44,7	250,5	259,1	2,1	30,3	30º

TABLE 02

7.3.2 Disc (09)

Look for cuts, nicks or other damage on the seating surface. Check the disc for defects such as cracks (w/ dye penetrant) and/or severe corrosion. The disc can be re-machined, if necessary, up to the dimension **A** minimum **(Figure 10)** shown in **Table 03**. Dimension C should be redone when the disc is re-machined. Dimension **B** is informed to ensure that the disk is not machined beyond the limit. Failure to observe this limit will result in a significant change in the flow configuration of the disc and disc holder assembly and will result in a significant increase in simmer **(4:17)** before the valve opening. If the disc is too badly damaged or the B dimension is less than the minimum indicated in **Table 03**, the disc must be replaced. In the case of disc with O-Ring, the O'ring must be replaced every maintenance. Loosen the retainer screw **(11)**, the retainer and the O-ring **(10)**.

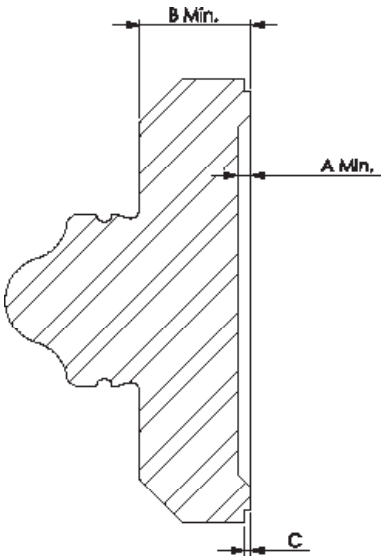


FIG. 10

Disc (mm)			
Orifice	A Mín.	B Mín.	C + 0,1 - 0,0
D	0,4	5,8	0,5
E	0,2	6,3	0,4
F	0,2	7,6	-
G	1,1	8,9	-
H	0,4	8,9	0,8
J	1,1	11,1	0,7
K	1,1	12,1	0,7
L	1,1	15,4	1,0
M	1,1	17,7	1,0
N	1,1	15,4	1,0
P	1,1	15,4	1,0
Q	1,1	20,5	1,0
R	1,1	20,5	1,0
T	1,1	22,4	1,2
T2	1,1	22,4	1,2
U	1,1	22,41	,2
V	1,5	29,3	1,2
W	1,5	39,3	2,1

TABLE 03

7.3.3 Bellows (14)

Look for marks or other deformations on the surface of the bellows. Verify if the bellows presents defects like cracks, holes (w/ dye penetrant) and/or severe corrosion in the gasket sealing areas. If it is badly damaged, the bellows must be replaced.

7.3.4 Disc Holder (12)

Make sure the outside diameter is not galling and the surface is smooth. If any small indication of galling is present, polish the high spots with an emery cloth. If serious or large scale galling is present, the disc holder should be replaced.

7.3.5 Guide (17)

Inspect the guide inside diameter for galling, and make sure the inside surface is smooth and there is no corrosion on the gasket sealing areas. If some imperfection is found, the surfaces can be polished with emery cloth. If it is badly damaged, the guide should be replaced. In cases where the clearance between the inside diameter of the guide and the guided outside diameter of the disc holder is larger than value shown in **Table 04**, both the guide and the disc holder must be replaced.

Allowable Clearance (mm) / Guide and Disc Holder (mm)*

Orifice	Class	Guided Nominal Diameter Disc Holder (mm)*	Máx.
D	All	12,0	0,23
E	All		
F	All		
G	150# à 900#	14,0	0,23
	1500# e 2500#	15,50	0,23
H	All	15,00	0,23
J	All	24,00	0,28
K	150# à 600#	23,40	0,28
	900# e 1500#	29,00	0,28
L	150# e 300#	29,00	0,28
	300# à 1500#	32,00	0,35
M	All	32,00	0,35
N	All		
P	150# e 300#	32,00	0,35
	600# e 900#	47,00	0,37
Q	150# e 300#	32,00	0,35
	300# e 600#	47,00	0,37
R	150# e 300#	32,00	0,35
	300# e 600#	47,00	0,37
T	All	49,00	0,37
T2			
U			
V	All	70,00	0,43
W	All	94,00	0,51

* Guided Nominal Diameter Disc Holder

TABLE 04

7.3.6 Body (01)

Make sure the body has no defects like cracks (w/ dye penetrant) and severe corrosion on the gasket sealing area. Inspect the condition of the outlet flange grooves for corrosion, tears, scratches or other damage. If necessary, the grooves can be remade, observing the minimum flange thickness, defined by the valve connection standard.

7.3.7 Spring (21)
Inspect the spring for defects such as cracks (w/ dye penetrant), high corrosion and warping (parallelism and perpendicularity). When the proper performance of the spring cannot be guaranteed, it is recommended to perform a load test according to ASME code Section VIII UG136 (a) (2). Spring and its washer should be kept as a single assembly. Replace the spring if it presents excessive wear.

7.3.8 Spindle (19)
Inspect for warping, corrosion and wear. If it is warped, the spindle should be straightened before being reused, taking care not to damage the supporting surface of the disc holder and threads.

7.4 Lapping

SV80H valves have its seating surfaces (nozzle and disc) lapped in an automatic lapping machine, which ensures the best tightness characteristics. In maintenance services, where de lapping machine is not available, a cast iron block or another perfectly flat surface (e.g. glass) can be used, performing lapping according to the conventional method **(Figure 11)**.

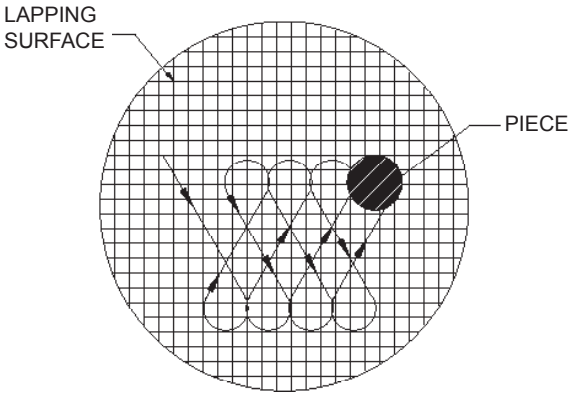


FIG. 11

For lapping, it is recommended the following diamond compounds:

Micron Size	Lapping phase
20-40	Initial thinning
10-20	quick thinning and pre-polishing
6-12	Fine polishing
3-6	Extra fine polishing

7.5 Assembly

SV80H valves can be easily reassembled, without the need of any special tools. Make sure that the internal parts are clean, especially the seating surfaces and the guided parts. Replace the gaskets. Use a lubricant with anti-seize properties in all threads and bearing surfaces.

7.5.1
After installing the nozzle gasket, install the nozzle **(06)** in the body **(01)**. Final tightening should be done on the same device used for removal **(see Figure 06, page 17)** and turning the body clockwise. Be careful when using a bar or pipe in the valve outlet connection to ensure that the nozzle is not damaged during operation.

7.5.2
Install the blowdown ring **(08)** on the nozzle and the locking screw **(04)** and gasket **(03)** in the body. The blowdown ring must be positioned below the seat level, so the disc is based on the nozzle and not the ring. Once the blowdown ring is in its correct location, lock it in place by screwing in the lock screw. Verify that the blowdown ring is capable of a slight movement. If the blowdown ring does not move, the lock screw is too long. Should this be the case, grind the end of the screw slightly to shorten it, while retaining the original tip contour, then reinstall the screw.

7.5.3
Install the disc **(06)** in the disc holder **(12)**. The disc should be fitted to the disc holder with moderate strength of finger or hand. Do not use excessive force to fit the disc. Check if the disc moves freely, supporting the disc holder.

7.5.4
For valves with bellows **(14)**, place the bellows' gasket **(13)** on the disc holder and screw the bellows to the disc holder. Use a wrench to tightly screw the bellows until the gasket is leakage free under pressure.

7.5.5
Install the guide **(17)** on the disc holder. If the valve has bellows, the weight of the guide will slightly compress the bellows.

7.5.6
After placing the guide's gasket in the body, install guide, disc holder and disc assembly, gently supporting the disc in nozzle. Be careful not to damage the seating surfaces during assembly.

7.5.7
Install the spindle **(19)** in the disc holder. Make sure the spindle moves freely

7.5.8
Install the spring **(21)** and spring washers **(22)** assembly.

7.5.9
Install the bonnet **(22)** and nuts **(23)**. Tighten the nuts in the recommended sequence for the number of studs **(Table 01)**, and using the torque values recommended in Table 06. Use this same table to determine the torque required for each turn of the tightening sequence.

Bolts	Riquired Torque in Nm	Torque required for Each Round of Pathern				
		1ª	2ª	3ª	4ª	5ª
7/16"	50	Key grip	12	30	50	50
1/2"	80	Key grip	15	40	60	60
5/8"	70	Key grip	20	45	70	70
3/4"	70	Key grip	20	45	70	70
7/8"	120	Key grip	30	75	120	120

TABLE 06

7.5.10

Thread the locknut **(25)** on the adjusting screw **(24)** and install the assembly in the bonnet. Compress the spring by turning the adjustment screw clockwise until the original distance between the spindle end and the top adjusting screw **(see 7.1.3)** is reached. This procedure will restore approximately the original pressure setting. The valve should be further regulated the pressure required. When compressing the spring, hold the spindle with locking pliers to prevent it from rotating in the disc holder.

7.5.11

Restore the original position of the blowdown ring **(see 7.1.4)**. If the original position is not known, refer to **Table 07** for the number of notches to be lowered (moving clockwise) from the contact of the blowdown ring with disc holder. The number of notches to be lowered is also recorded in the valve body below the locking screw **(04)**. Lock the ring with locking screw. Once the blowdown ring is in its correct location, lock it in place by screwing in the lock screw. Verify that the blowdown ring is capable of a slight movement. If the blowdown ring does not move, the lock screw is too long. Should this be the case, grind the end of the screw slightly to shorten it, while retaining the original tip contour, then reinstall the screw

• **Gas and Steam**

Orifice	Área (cm2)	Set pressure (barg)			
		< 2.5 bar	2.5 à 10.0	10.1 à 25.0	>25.0
		Nº of Notches			
D	0.709	3	5	10	20
E	1.265	3	5	10	20
F	1.980	2	4	6	15
G	3.245	2	6	15	25
H	5.065	2	6	15	25
J	8.303	2	6	15	25
K	11.86	3	8	20	40
L	18.40	3	8	20	40
M	23.23	6	12	25	50
N	28.00	6	12	25	50
P	41.16	6	12	25	50
Q	71.30	8	15	30	60
R	103.20	8	15	30	60
T	167.70	8	15	30	60
T2	180,70	8	15	30	60
U	209,70	9	17	33	65
V	292,55	12	18	35	70
W	438,00	12	18	35	70

TABLE 07A

- **Liquid**

Orifice	N° of Notches
D - E	- 15 notches
F	- 10 notches
G	- 20 notches
H - J	- 20 notches
K - L	- 20 notches
M - N - P	- 30 notches
Q - R - T- T2	- 40 notches
U	- 43 notches
V	- 25 notches
W	- 30 notches

TABELA 07B

7.5.12 The valve is ready for final setting and testing.

7.6 Bench Testing and Setting

Although the valve can be adjusted in the service facility, it is recommended that the setting of the valve, and checking of the seat tightness, to be done on a test bench.

7.6.1
The test bench shall have an accumulator (buffer).

7.6.2
The valve must be set to open at the cold differential test pressure **(AJ/F) (4.7)**, indicated on the nameplate of the valve **(Figura 12)**.

FIG. 12

7.6.3
The Safety and Relief Valves bench testing procedure shall be in accordance with API Standard 527 STD and ASME Seç. VIII - UG 136 (d) (4) for the marked fluid.

7.6.4
Valves shall be tested by type as fallows:
- Steam valves are tested on saturated steam or air
- Air, gas or vapor valves are tested on air or gas at ambient temperature.
- Liquid valves are tested on water at ambient temperature.

7.6.5
For compressible fluids, the opening pressure is defined as the pressure at which the valve opens abruptly (Pop) and not the one that leakage start (simmer) **(4.17)** .

7.6.6
For liquids, the opening pressure is indicated by the first continuous flow of water through the valve outlet.

7.6.7
Before installing the valve on the test bench, remove all debris and particles, such as gasket pieces or any other solid material, from the test bench and valve inlet. Select the gauge according to the valve set pressure, between 25% to 75% of the scale. Make sure that the pressure gauge is calibrated and within the period of validity.

7.6.8
Install the valve on the test bench. If the valve opens below the desired pressure, it is necessary to compress the spring. Hold the spindle **(19)** to prevent it from rotating on the disc holder and turn the adjustment screw **(24)** clockwise. If the valve does not open at the desired pressure, decrease pressure on the bench In about 20% and slowly decrease the spring compression by turning the adjustment screw counter-clockwise. Continue the adjustment until the valve opens at the desired pressure. Hold the spindle while turning the screw. The valve spindle should be centralized with the screw. Hard rubbing of the spindle against the side of the adjusting screw can cause poor valve action.

7.6.9
If there is difficulty in presenting pop the valve **(see 4.1),** due to low volume available on the bench, the blowdown ring **(08)** can be lifted (turn anti-clockwise), until it touches the disc holder, and then lowered 2 to 3 notches. Depressurize the bench to make this adjustment. After testing reposition the ring as shown in **7.5.11**.

7.6.10
Verify that the valve's opening pressure meets the requirements of ASME Section VIII **(Table 08)**.

Code Section	Set Pressure (bar)		Blowdown
	Set Pressure	Tolarance (+/-)	
ASME Sec. VIII	<= 4.8	0.13	After opening the valve must reclose before the system pressure returns to normal operating pressure.
	>4.8	3%*	

* Percentage of set pressure.

TABLE 08

7.6.11
Lock the lock nut **(25)** and repeat the test. At least two replicates of the same opening pressure must be obtained in order to make sure that the valve was adjusted correctly.

7.6.12
Check the seat tightness according to API STD 527 standard for the fluid used.

7.6.13
Install cap **(29)** and lever system, if any.

7.6.14
Back pressure testing for joint leakage.

• Apply air or nitrogen to the body drain or to the valve outlet. Seal all other openings. Test pressure should be the actual valve back pressure or 2.1 barg, wichever is greater. The following components shall be examined for leakge during back pressure testing:

• Nozzle / Body joint
• Lock screw / Body joint
• Body / Bonnet joint
• Bonnet / Cap joint
• Packed lever system (if any).
• "Tight" bonnet vent plug, if conventional valve.
• "Loose" bonnet vent plug, if bellows valve.

7.6.15
After all setting and testing, the valve must be sealed (ASME Section VIII UG136 (a) and NR-13 standard).

7.7 Blowdown adjusting (4.12)

• The blowdown is adjusted through the blowdown ring **(08)**.

• To increase the blowdown (decrease closing pressure), the blowdown ring should be lifted, move the notches counter-clockwise through the lock screw **(04)** hole.

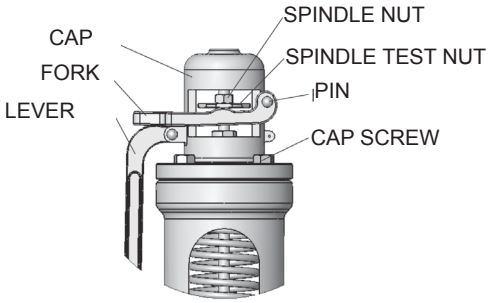
• To decrease the blowdown (increase closing pressure), the blowdown ring should be lowered, move the notches clockwise through the lock screw **(04)** hole.

Note:
Unless the test bench capacity is equal to or greater than the capacity of the valve, it is not possible to adjust the blowdown. If so, place the blowdown ring as shown in **Table 07**.

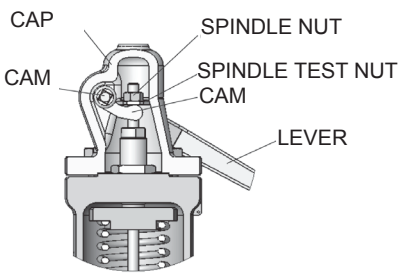
• The valve will not schieve rated relieving capacity if the blowdown ring **(08)** is positioned too low.

7.8 Manually opening the valve (Under flow)

• Every safety and relief valve operating on air, water at the valve inlet that exceeds 60ºC, excluding overpressure or relief events, and steam services shall have a substantial lifting device **(13 e 14)**, in accordance with ASME Section VIII (UG-136 (a) (3)). When the valve is to be opened by hand, ensure the pressure at the valve inlet is at least 75% of the valve's set pressure **(4.6)**. Under flowing cinditions, the valve must be fully lifted from its seat so that dirt, sediment, and scale do not become trapped on the seating surfaces. When allowing the valve to close under flowing conditions, completely release the lever from maximum lift to snap the valve back on its seat.



OPEN LEVER
FIG. 13



PACKED LEVER
FIG. 13

7.9 Hydrostatic Testing

• When hydrostatic tests are required after installation of Safety and Relief Valves, these should be removed and replaced by a blind flange. If the valve cannot be removed, a test gag **(Figure 15)** must be used. It is common for Safety and Relief Valves to have problems caused by excessive tightening of the test gag. When the use is required, the gag must be tightened manually, without the use of tools. This will be enough not to allow the valve to open during the hydrostatic test.

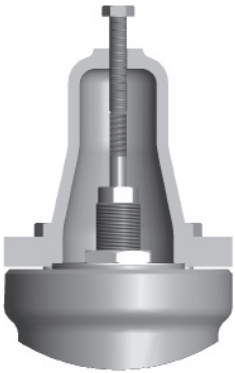


FIGURE 15

8. Trouble Shooting

KEYWORD	PROBLEM	EFFECT	DIAGNOSIS	CORRECTIVE ACTION
CHATTER	CHATTER	THE VALVE WILL BE DAMAGED	The PSV is oversized for the installation - The flow is less than 25% of the required capacity	Check the required capacity and replace PSV if necessary
			The inlet piping is of excessive length	Redesign inlet piping so that the pressure drop is less than 3% of the set pressure
			Inlet piping undersized for PSV	Increase inlet piping so to at least inlet size of PSV
			The outlet piping is of excessive length - Built up back pressure	Redesign outlet piping so that back pressure doesn't build up
			Outlet piping undersized for PSV - Built up back pressure	Increase outlet piping to at least outlet size of PSV
SET PRESSURE	INCORRECT SET PRESSURE	THE PROCESS CAN BE DAMAGED DAMAGE TO THE PRESSURE VESSEL AND STAFF	Misreading the PSV nameplate - Back pressure and temperature	Adjust PSV to compensate the temperature and/or back pressure, according to the nameplate
			Ring in an incorrect position - Locking pin may not be engaged	Adjusting ring and engage locking pin
			Internals are misaligned - Aligned is citical to operation	Disassemble PSV and inspect all components - Repair or replace if necessary
			Compression screw lock nut loose	Adjust set pressure and tighten lock nut
			Rough handling - A PSV is a precision instrument, handle with care	Pop PSV once or twice to realign parts after rough handling
			Pressure surge - Sudden impact of fluid may cause premature opening of PSV	Build pressure gradually to set pressure
			Belows not vented - Pressure in PSV bonnet may affect set point	Remove pipe plug so that bonnet is exposed to atmospheric pressure
LEAKAGE	SEAT LEAKAGE	THE PROCESS CAN BE DAMAGED DAMAGE TO THE PRESSURE VESSEL AND STAFF	PSV seats are damaged - Foreign particles may score seats	Lap seats to restore proper finish (machine if required)
			Operating pressure is too close to the set point - 10% differential is recommended	Lower operating pressure to increase differential
			Misaligned lifting gear - Lift nut may be holding seats open	Adjust lift nut to approx. 1/8" clearance
			Excessive external loads on outlet - Extra weight pulls PSV seats apart	Support outlet piping
			Horizontal mounting - Causes excessive friction on guide	Remounting PSV vertically to improve alignment and performance
			Adjusting ring pin binding - Pushes ring against disc holder	Check pin length and align pin between notches on adjusting ring
			Misaligned internals - May be caused by external forces	Disassemble and inspect internals - Repair or replace if necessary - Check for bent spindle - Excessive spring washer clearance - Excessive guide and holder clearance - Check for piping stress
BLOWDOWN	BLOWDOWN	PROCESS CAN BE DAMAGED	Blowdown is too short	Adjust ring Check spring range (high)
			Excessive blowdown - PSV is hanging up	Adjust ring - Upper ring too low - Lower ring too high Chack spring range (low) Check alignment
SIMMER	SIMMER	NOISE	- Adjustment - Alignment	- Raise low ring Check internals alignment

Notes

Notes

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