

SAPAG



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1. Description

Sapag atmospheric relief valves type 1100 have been selected for installation because of their performance features, reliability and ease of maintenance. They are designed to protect vessels under vacuum during normal operation against excessive pressure.

The tightness is achieved using a rubber seal seating on a stainless steel seat.

A water ring is provided on the disc to prevent any leak from the atmosphere to the vessel when it is under vacuum.

Whenever part names are used in this manual, piece number in parenthesis follows. The piece numbers are an aid to identifying the parts in Figure 1 and the relevant part list.

2. Warranty information

Warranty statement

Sapag warrants that its products and work meet all applicable specifications and other specific product and work requirements (including those of performance), if any, and will be free from defects in material and workmanship.

Defective and non-conforming items must be held for Sapag's inspection and returned to the original F.O.B. point upon request.

Incorrect selection or misapplication of products

Sapag cannot be responsible for customer's incorrect selection or misapplication of our products.

Unauthorized repair work

Customers contracting repair services from unauthorized sources must do so at their own risk.

3. Spare parts

Sapag recommends spare parts as shown in Figure 1. When ordering spare parts, the valve size, style and serial number should be given together with set pressure, part designation and item number from Figure 1.

Spare parts may be ordered from any Pentair Valves & Controls Regional Sales Office or Representative.

4. Safety precautions

Proper handling, storage, installation, maintenance and operation are essential to the safe and reliable operation of any pressure relief product. The relevant procedures recommended by Sapag and described in this manual are effective methods of performing the required tasks. Some of them require the use of tools specifically designed for an intended purpose. These special tools should be used when, and as recommended.

This manual contains various safety instructions which should be carefully read in order to minimize the risk of personal injury, or the possibility that improper procedures will be followed which may damage the involved Sapag product, or render it unsafe. The precautionary statements given in this manual are by no means exhaustive. Pentair Valves & Controls cannot be expected to know, evaluate and advise customers of all conceivable ways in which tasks might be performed, or of the possible hazardous consequences of each way.

Consequently, Pentair Valves & Controls (Pentair) has not included such comprehensive evaluation, and disclaims liability for work performed by other than Pentair personnel. All personnel working with Pentair product should be adequately trained and thoroughly familiar with the contents of this manual.

The installation, operation and maintenance of valves may involve proximity to fluids at high temperature. Every precaution should be taken to prevent injury to personnel during the performance of any procedure. It is important to note that Pentair Valves & Controls cannot evaluate all conditions that might injure personnel or damage equipment. However, Pentair does offer the following general safety precautions:

- Hearing and eye protection should be used when working on a valve which is under pressure
- Never strike a valve which is under pressure. Premature actuation can result.
- Never stand in front of the discharge outlet of a pressure relief valve which is under pressure.
- Always approach and use any pressure relief valve with great care.
- Wear protective clothing. Hot water can be present and superheated steam is not visible.
- Before performing any machining on valve parts, consult Sapag or its authorized representative. Deviation from critical dimensions can adversely affect valve performance.

5. Storage and first handling

Safety relief valves are often on the job site months before they are installed. Unless they are properly stored and protected, their performance may be seriously affected. Rough handling may damage flanges or cause misalignment of the parts. It is best to leave the safety valves in their shipment cases and store them in a dry place under cover until they are to be installed. Flange protectors, sealing plugs and valve gag should remain installed until just prior to installation. Unpacked valve should be moved or hoisted with a chain or sling using the two lifting eyes on the top of the body in such manner as will insure that the valve is in vertical position during lift.

When safety relief valves are unpacked and the flange protectors removed, immediately prior to installation, meticulous care should be exercised to prevent dirt from entering the inlet and outlet ports while bolting in place.

While hoisting to the installation, care should be exercised to prevent bumping the valve against steel structures and other objects.

6. Installation

General Requirements

For optimum performance, safety valves must be serviced regularly and otherwise maintained. So that servicing can be properly performed, valves should be located in a manner that allows for easy access. Sufficient working space should be provided around and above the valve to permit access to the water ring connections and the visual gauge indicator. If two or more valves are located close together, the outlets should be parallel so as to offer as much protection as possible to personnel repairing, or working close to the safety valve.

Excessive line vibrations are known to produce shifts in safety valve set pressures. Vibrations may possibly introduce chatter, causing damage to the valve and reduce its capacity. This vibration also contributes to increased incidents of seat leakage. Considerations should be given to eliminating this problem prior to installing the valve on the unit.

Regarding flanges connections, it is utmost importance that the gaskets used are dimensionally correct for the specific flange and that they fully clear the valve inlet and outlet openings. Gaskets, flange facings and bolting should meet the service requirements for the pressure and temperature involved.

Inspection

Each atmospheric relief valve should be visually inspected before installation to ensure that no damage has occurred during shipment or storage. All protective material, sealing plugs and any extraneous material inside the valve body or nozzle must be removed.

The valve nameplate and other identifying tags should be checked to ensure that the particular valve is being installed at the location for which it was intended.

The valve seal protecting the spring setting should be intact. If not, the valve should be inspected, tested and seal properly installed before use.

Inlet Piping

Many safety valves are damaged when first placed in service because of failure to clean the connections properly before installation. Because foreign material passing into, and through, a safety valve is damaging, the system on which the valve is tested and finally installed must be inspected and cleaned. New systems are prone to contain welding beads, pipe scale, and other foreign materials which are inadvertently trapped during constructions, and destroy the valve seating surfaces the first few times the valve opens. Therefore, the system should be thoroughly purged before the safety valve is installed.

Valve should be mounted in a vertical position, directly on the pressure vessel. Nominal tolerance on vertical installation is plus or minus 1 degree.

The ASME Boiler and Pressure Vessel Code limits the distance between the safety valve inlet and the boiler to the length of a standard tee fitting. The nozzle should have a well-rounded approach that provides smooth, unobstructed flow between the vessel and the safety valve. Header nozzle corners must be rounded to a radius of no less than 1/4 of the opening diameter. A safety valve should never be installed on a fitting having an inside diameter smaller than the inlet connection of the valve. Such restriction of flow can cause faulty valve operation.

Steam flowing vertically out a discharge elbow produces a downward reaction on the elbow. Bending stress in the valve is determined by the production of this reactive force and the moment arm between the point of steam exhaust and the section being analyzed for bending stress. The effects of reaction force, vibration and seismic loads will depend on the configuration of the safety valve and the discharge piping. Determination of outlet reaction forces is the responsibility of the designer of the vessel and/or piping.



Caution

Never lift the full weight of the valve by the lifting lever or the valve gag.

Outlet Piping

Back pressures built-up by discharge flow affect the operation of safety valves. Where possible, a short vertical pipe connected through a long radius elbow discharging directly into the atmosphere is the most desirable type of outlet piping. Such discharge piping should be at least the same size as the valve outlet. Sectional area of the discharge pipe must never be less than the full area of the safety valve outlet and shall be as short as possible to avoid undue stresses on the valve.

The exhaust piping should be as straight as possible and without any shut-off device.

When required, low point drains shall be provided in the discharge pipe. Drain pipes should be collected to the main collector and shall be designed to avoid flow return into the valve.

If a silencer is used on a safety valve, it should have sufficient outlet area to prevent back pressure from interfering with the proper operation and discharge capacity of the valve. The silencer or other piping components should be constructed so as to avoid the possibility of creating corrosion deposit restrictions in the steam passages.

Site erection

The valve must be installed vertically, spring up.

Fit the inlet/outlet mating flanges to the valve. The NPS of inlet/outlet pipes must be the same as the valve.

As shown in Figure 2, the valve body is provided with two threaded connections for water ring supply and overflow.

Remove the plugs (25) and connect inlet and outlet pipes to the valve body (1) in order to feed the water ring as shown in Figure 2.

Connect upper water ring connection to a drain pipe.

Start-up

Remove the gag (50) that locks the disc onto the seat.

Check the disc operability using the lift lever (41).

Check water feeding of the water ring. It is recommended to feed the water ring with a constant stream of water to compensate water vaporization.



Caution

It is mandatory to remove the gag after installation and before use.

With the gag in place the valve cannot open.



Caution

The disc cannot be lifted when the vessel is under vacuum.



Caution

- Before starting to disassemble the valve, be sure that there is no steam pressure in the drum or header.
- Parts from one valve should not be interchanged with parts from another valve.

7. Maintenance - repairing

Seat tightness and water ring

The valve seat tightness is provided using an elastomer rubber seal for the disc in contact with a 316L stainless steel nozzle. The soft material is bonded with a specific groove machined onto the disc by high temperature with high pressure molding process. Therefore, the soft material is totally adherent to the disc metal and cannot be replaced.

If the valve is equipped with a visual indicator as shown in Figure 2, the water level should be regularly checked in order to ensure that the water flow is sufficient and properly adjusted.

Periodic inspection

Sapag strongly recommend that Atmospheric Relief Valves be opened at least once every six months using the lift lever, preferably at more frequent intervals, and at any time the unit is down for periodic inspection.

We also urge that valves be opened, internally inspected and cleaned, if necessary, during the regular turbine or condenser inspection.

Disassembly instructions

The type 1100 Sapag safety valve can be easily disassembled for inspection or replacing internal parts.

Refer to Figure 1 for the following disassembly instructions:

1. Unscrew and remove the two lever axles (42).
2. Remove the lever (41) from the cap (40).
3. Remove the cap bolts (24) and then remove the cap (40).
4. Unscrew and remove both release lock nut (22) and release nut (21) from the spindle (14).
5. Refer to Figure 3 to measure using a depth micrometer and record dimension L between the top of the adjusting bolt (11) and the topside of the body (1), as this information will be required to correctly reassemble the valve.
6. Loosen and unscrew the adjusting bolt nut (12) in order to unscrew the adjusting bolt (11) until it becomes free.
7. Loosen and remove the body-nozzle bolts (20).
8. Using suitable lifting means carefully lift the body (1) over the spindle (14), and away from the valve.
9. Remove the body-nozzle gasket (3).
10. If applicable, unscrew and remove both pre-compression lock nut (32) and pre-compression nut (31) from the spindle (14).
11. Remove the upper spring washer (10).
12. Using suitable lifting means carefully lift the spring (9) over the spindle (14), and away from the valve.

13. Unscrew and remove the spring guide bolts (23) and then remove both spring guide (8) and spindle (14).
14. Remove the pin (18) which retains the disc holder nut (17).
15. Unscrew and remove the disc holder nut (17) and then remove the disc holder (6) out of the nozzle (2) and the disc (4).
16. Remove the disc holder gasket (7).

Cleaning

External parts such as body (1) and cap (40) should be cleaned by immersion in a bath such as hot Oakite solution or equivalent. These external parts may be cleaned by wire brushing, provided the brushes used do not damage nor contaminate the base metals.

Nozzle (2) and internal parts including the disc (4) should be cleaned by immersion in a commercial high alkaline detergent. Guiding surfaces on the disc holder (6) and the nozzle (2) may be polished using a fine emery cloth.

Inspection

Check all valve parts after cleaning for wear and corrosion. The disc soft seat (5) and the nozzle seat must be examined to determine if they have been damaged.

The valve spring (9) should be inspected for evidence of cracking, pitting or deformation. The bearing surface on the spring washer should be checked for residual product build-up and any evidence of scoring.

Inspection of valve components is important to ensure proper valve performance. Damaged parts must be repaired or replaced.

Maintenance

The normal maintenance required is most often confined to the disc replacing.

Valves that have been leaking should be disassembled in accordance with prior instructions.

Parts for each valve should be kept together or marked, in order to ensure that they are replaced in the same original valve.

Re-assembly

The Sapag 1100 safety valve can be easily re-assembled after required inspection and/or maintenance of internal parts has been performed. All parts should be cleaned and dry prior to assembly.

1. Use new gaskets (3) and (7).
2. All threads and spring load seating surfaces shall be lubricated using appropriate lubricant to avoid seizure. The guiding surfaces must be kept absolutely dry.
3. Place the disc (4) on the top of the nozzle (2).
4. Lubricate the disc holder gasket (7) and place it into the disc (4).
5. Install the disc holder (6) inside the disc (4).
6. Screw the disc holder nut (17) onto the disc holder (6) and lock the nut with the pin (18).
7. Install the spindle (14) inside the spring guide (8) and screw the spring guide bolts (23).
8. Using suitable lifting means carefully place the spring (9) onto the spindle (14).
9. Install the upper spring washer (10).
10. If applicable, screw the pre-compression nut (31) onto the top of the spindle (14) and tighten the pre-compression lock nut (32).
11. Lubricate the body-nozzle gasket (3) and install it onto the nozzle (2).
12. Using suitable lifting means carefully place the body (1) on the nozzle (2).
13. Screw and tighten the body-nozzle bolts (20).
14. Hand tight the adjusting bolt (11) and lock it with the adjusting bolt nut (12).
15. Perform setting and tests as below specified.
16. Screw the release nut (21) onto the spindle (14) and then lock it with the release lock nut (22).
17. Place the cap (40) on the top of the body (1).
18. Screw and tighten the cap bolts (24).
19. Install the lever (41) into the cap (40).
20. Screw the two lever axles (42).



Caution

Do not permit any rocking motion of the spindle or any other parts while lifting the body and the spring out of the valve. Any rocking motion could damage the valve seats.

8. Setting and tests

Test bench and Test fluid

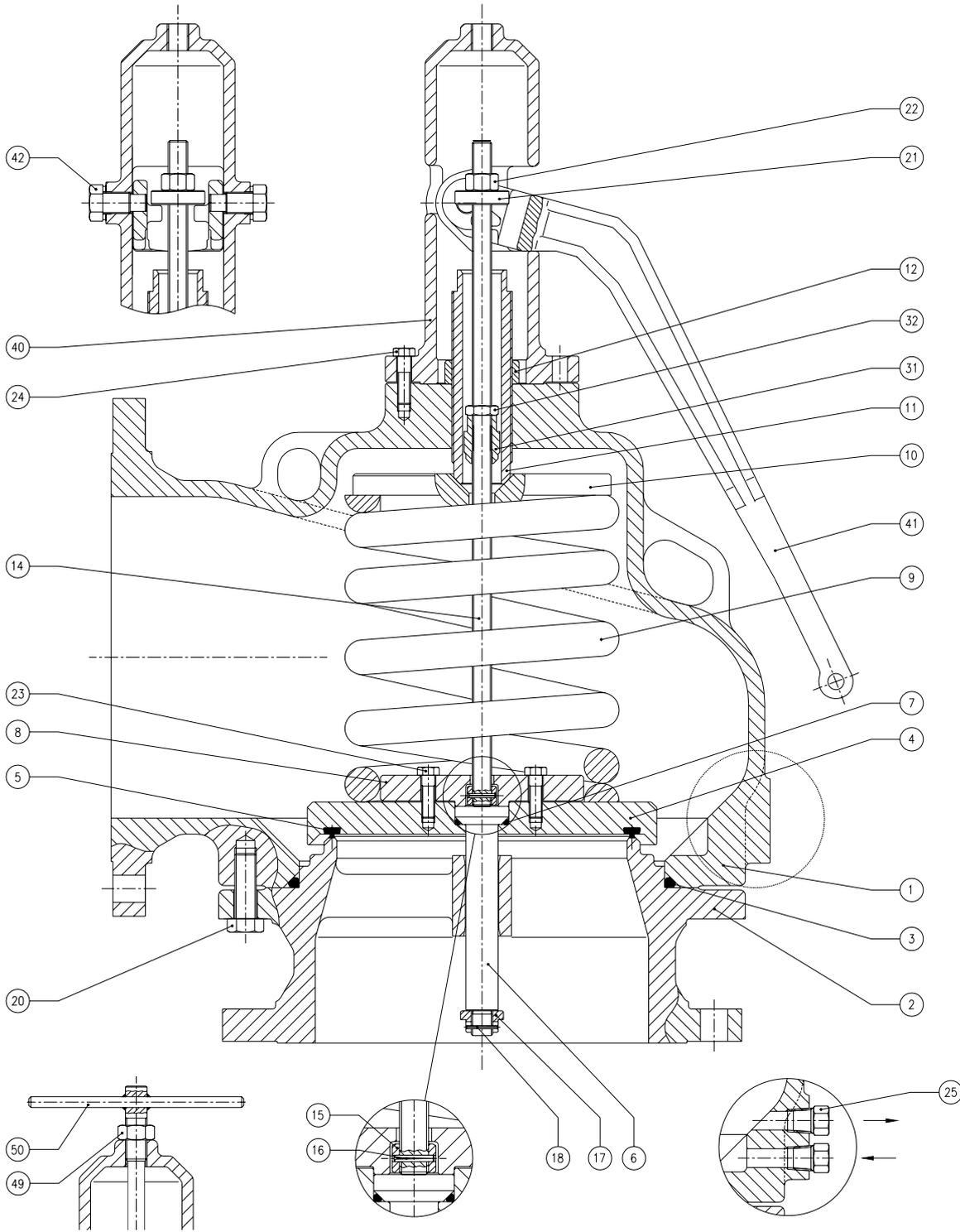
The quality and condition of the shop test bench is paramount to obtaining proper test results. In particular, the test bench must be free of leaks and the test fluid must be clean. Solids or other foreign material in the test medium will damage the seating surfaces of the atmospheric relief valve being tested.

The test pressure gage must be calibrated and have a range proper to the pressure level of the valve setting. Set pressure should fall within the middle third of the dial range of the test gage. The test fluid shall be air or nitrogen for valves used on gas and vapor service.

Set pressure adjustment

1. Put the valve on the appropriate test stand.
2. Before making any adjustments reduce the pressure under the valve seat to at least 50% below the stamped set pressure on the valve nameplate. This will minimize the chance of an inadvertent valve opening. Prevent the spindle from rotating with a wrench to avoid seat damage due to turning of the disc on the nozzle seat.
3. Screw the adjusting bolt (11) to its original position "L" recorded during disassembly and lock it with the adjusting bolt nut (12).
4. Increase the pressure underneath the disc and check the opening pressure. Standard allowable tolerance for set pressure is +/- 0.14 barg (+/- 2 psig).
5. To properly adjust the valve, turn the adjusting bolt (11) clockwise to increase set pressure or counter clockwise to reduce set pressure.
6. Retighten the adjusting bolt nut (12) following each adjustment.
7. When the specified set pressure has been reached, pop the valve three to four times to check its regularity.
8. The 1100 soft seated atmospheric relief valves are bubble tight from vacuum up to 90% of set pressure. Check the tightness at 90% of the set pressure.
9. Finalize the valve assembly as above specified.
10. Seal the valve and identify the valve with a plate showing the authority conducting the adjustments.

Figure 1 - General assembly drawing



Parts list

Rep.	Part Name	Rep.	Part Name	Rep.	Part Name
1	Body	12	Adjusting bolt nut	24	Cap bolt
2	Nozzle	13	Cover	25	Plug
3	• Body-Nozzle gasket	14	Spindle	31	Pre-compression nut
4	• Disc	15	Spindle nut	32	Pre-compression lock nut
5	Disc Soft seat	16	Spindle nut pin	40	Cap
6	Disc holder	17	Disc holder nut	41	Lever
7	• Disc holder gasket	18	Disc holder nut pin	42	Lever axle
8	Spring guide	20	Body-Nozzle bolt	49	Gag nut
9	• Spring	21	Spindle nut	50	Gag
10	Spring washer	22	Spindle lock nut		
11	Adjusting bolt	23	Spring guide bolt		

• Recommended spare part

Figure 2 - Water ring

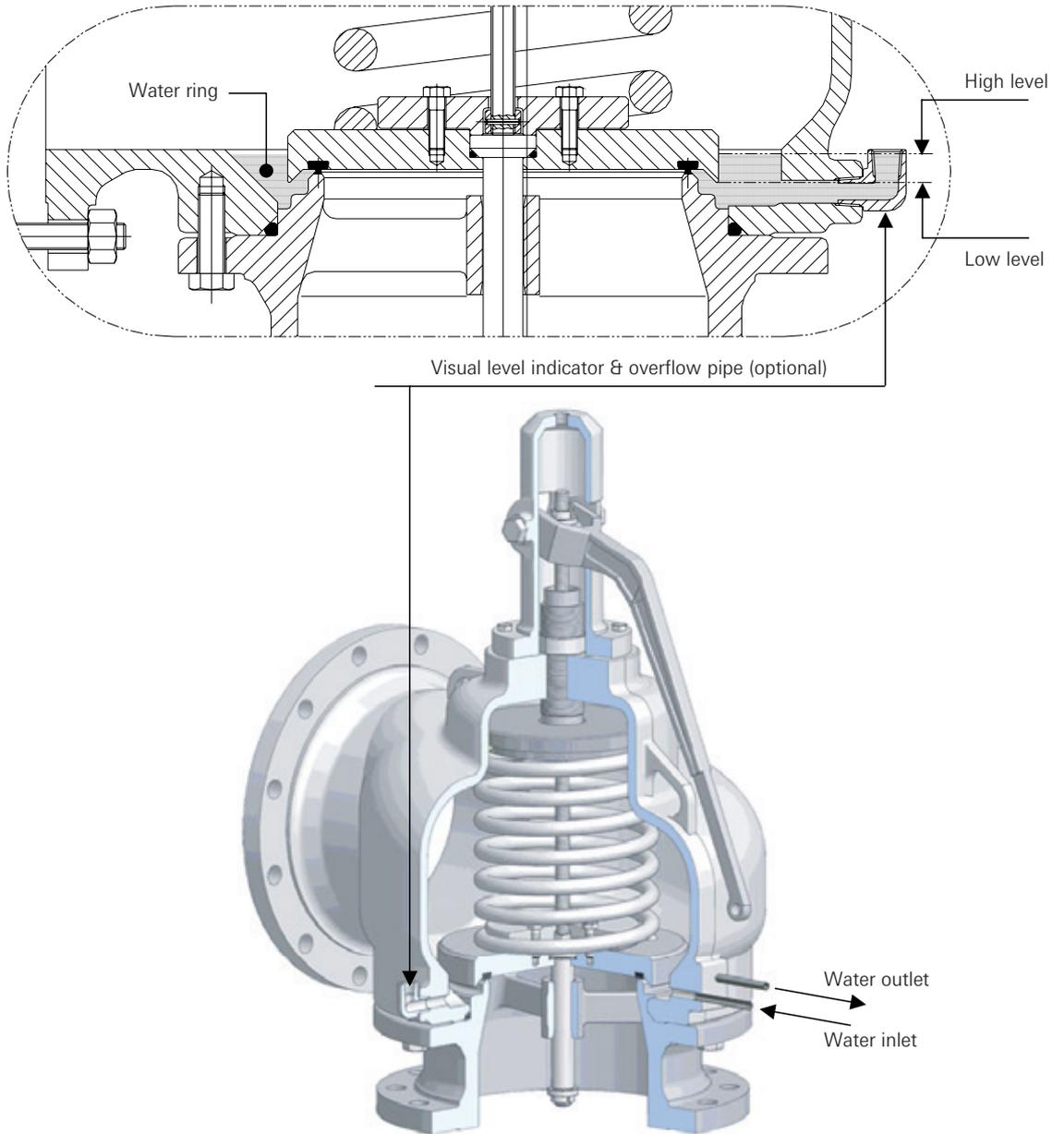


Figure 3 - Adjusting bolt setting