Válvulas Nacional

ValNac

Safety Valves

INSTRUCTION AND MAINTENANCE MANUAL

SAFETY VALVES
MODEL 6400

ISO 9001
BUREAU VERITAS
Certification

MA-64/11

OCTOBER 2026

VALVULAS NACIONAL, S. A. recommends carefully reading this Instruction Manual, which describes the minimum precautions to be observed before installing the safety valves in order to ensure their correct operation.

VALVULAS NACIONAL, S. A. guarantees its safety valves against any manufacturing defect for a period of 12 months from installation or a maximum of 18 months from delivery, whichever expires first. Likewise, it declines any liability arising from malfunction caused by incorrect installation, storage and/or handling by the purchaser.

VALVULAS NACIONAL, S. A. shall consider any safety valve to be **out of** warranty if a **non**-original spare part has been installed and/or the corresponding certification seal is **not** present.

All text shown in bold and enclosed in boxes must be observed with particular attention, as its purpose is to prevent defective installation and, most importantly, to prevent injury to operators handling the safety valves.

VALVULAS NACIONAL, S. A. reserves the right to modify all or part of the contents of this manual without prior notice.

BASIC DEFINITIONS

(UNE-EN ISO 4126-1)

Safety valve: Valve which automatically discharges a quantity of fluid, using no energy other than that generated by the fluid itself at the valve inlet, preventing a specified safety pressure from being exceeded, and designed to reclose and prevent further flow of fluid after the system has returned to its original service conditions.

Pressure: The pressure unit normally used is bar (1 bar = 10^5 Pa), gauge pressure (barg, relative to atmospheric pressure) or absolute pressure, as applicable.

Set pressure: Predetermined pressure at which the safety valve begins to open under service conditions.

Maximum allowable pressure: Maximum pressure for which the equipment is designed, as specified by the manufacturer.

Overpressure: Pressure increase above the set pressure required for the safety valve to reach the maximum lift specified by the manufacturer, normally expressed as a percentage of the set pressure.

Reseating pressure: Value of the inlet static pressure at which the disc re-establishes contact with the seat or the lift becomes zero.

Cold differential test pressure: Static inlet pressure at which the safety valve is adjusted to begin opening on the test bench.
This test pressure includes corrections for service conditions, for example back pressure and/or temperature.

Relieving pressure: Pressure used for sizing the safety valve, which is greater than or equal to the set pressure plus overpressure.

Built-up back pressure: Pressure existing at the outlet of a safety valve caused by the flow of fluid through the valve and the discharge system.

Superimposed back pressure: Pressure existing at the outlet of a safety valve at the moment the device is about to operate.

Blowdown: Difference between the set pressure and the reseating pressure, normally expressed as a percentage of the set pressure except for pressures below 3 bar; in this case, the decrease is expressed in bar.

Lift: Actual displacement of the valve disc from the closed position.

Flow area: Minimum cross-sectional flow area, located between the body inlet and the seat, used to calculate the theoretical discharge capacity.

Flow diameter: Diameter corresponding to the flow area.

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1 - INTRODUCTION

The purpose of this manual is to provide the necessary information for the correct installation, operation and maintenance of VALVULAS NACIONAL Model 6400 safety valves.

2 - DESCRIPTION

Model 6400 safety valves have been designed, manufactured and tested in compliance with the Pressure Equipment Directive 2014/68/EU Category IV and Directive 2014/34/EU (ATEX) Group II Category 2.

Model 6400 safety valves are safety accessories designed to protect pressure equipment and vessels against excessive overpressure by means of the controlled discharge of the contained fluid, whether gas, vapour, liquid or a mixture thereof.

To achieve optimum performance, the valve internals have been designed according to whether the application is intended for gases or liquids. In both cases, an instantaneous opening action (pop) occurs.

Model 64G - Designed for operation with gases and vapours

Model 64L - Designed for operation with liquids or liquid/gas mixtures.

Depending on the application requirements, they may be supplied in Conventional (C), Bellows (F), or Bellows-Piston (P) configuration.

The valve construction is of the 90° angle type between the inlet and outlet connections. The flanged body has a large internal capacity to prevent back pressure during valve discharge. Fixed full nozzle seat, easily removable. Closed bonnet. Helical spring loaded. The shut-off mechanism is carefully designed to provide good discharge performance in both gases and liquids. Perfect alignment of guided parts prevents friction and premature wear.

All safety valves are calculated and manufactured for a specific application. If an existing valve is to be reused for any other application, the technical department of Válvulas Nacional must be contacted so that the appropriate adaptation study can be carried out.

3 - SAFETY SYSTEM AND PRODUCT LABELLING

Where necessary, this manual includes appropriate safety labels within rectangular boxes in the margins. Safety labels are vertically oriented rectangles, as illustrated below, consisting of three panels surrounded by a narrow border.

These panels convey four key messages:

A. The severity level of the hazard.
B. The nature of the hazard.
C. The consequences of human or product interaction with the hazard.
D. Instructions, where necessary, on how to mitigate the hazard.

The upper panel of the format displays a signal word (DANGER, WARNING, CAUTION or NOTICE) indicating the severity of the hazard:

(1) **DANGER** — Immediate hazards that WILL result in serious personal injury or death.
(2) **WARNING** — Hazards or unsafe practices that COULD result in serious personal injury or death.
(3) **CAUTION —** Hazards or unsafe practices that COULD result in minor personal injury.
(4) **NOTICE** — Hazards or unsafe practices that COULD result in product or property damage.

The centre panel contains a pictogram indicating the nature of the hazard and the possible consequences of human or product interaction with the hazard. In some cases, involving hazards to personnel, the pictogram may illustrate the preventive measures to be taken to mitigate or eliminate the hazard, such as the use of protective equipment.



The lower panel may include instructional messages on how to avoid the hazard. In cases involving hazards to personnel, this message may provide a more detailed definition of the hazard and its consequences, supplementing the information conveyed by the image.

4 - SAFETY ALERTS: READ - UNDERSTAND - APPLY

4.1 - HAZARDS

I. **DANGER:** High temperatures and pressures can cause injury. Ensure that there is no pressure in the system before servicing or removing the valves.
II. **DANGER:** Do not stand in front of the valve outlet during discharge. KEEP CLEAR OF THE VALVE to avoid exposure to the fluid contained inside the valve.
III. **DANGER:** When inspecting a safety valve for leakage, EXERCISE EXTREME CAUTION!

4.2 - WARNINGS

I. **WARNING:** Allow the system to cool down to ambient temperature before cleaning, maintenance or repair. Hot components or fluids may cause serious injury or death.
II. **WARNING:** Always read and comply with the safety labels on all containers. Do not remove or damage the container. Do not remove or damage the labels on the containers. Improper handling or misuse could result in serious injury or death.
III. **WARNING:** Never use pressurised fluids, gases or air to clean clothing or parts of the body. Never use body parts to check for leaks or discharge rates in pressurised areas. Pressurised fluids, gases or air injected into or near the body may cause serious personal injury or death.
IV. **WARNING:** Never use pressurised fluids, gases or air to clean clothing or body parts. Never use body parts to check for leaks or discharge rates in pressurised areas. Pressurised fluids, gases or air injected into or near the body may cause serious injury or death.
V. **WARNING:** Do not allow any person under the influence of toxic substances or narcotics to work on or near pressurised systems. Workers under the influence of such substances pose a hazard both to themselves and to other employees and may cause serious personal injury or death to themselves or others.
VI. **WARNING:** Incorrect servicing and repair may result in product or property damage as well as serious personal injury or death.
VII. **WARNING:** These WARNINGS are as comprehensive as possible; however, it is not possible to foresee all types of service or assess all potential hazards.
VIII. **WARNING:** The use of unsuitable tools, or the incorrect use of suitable tools, may result in personal injury or product/property damage.
IX. **WARNING:** This type of valve is not designed for nuclear or radioactive applications.

4.3 - CAUTIONS

I. **CAUTION:** Please observe all warnings in the service manual. Read the installation instructions before installing the valve(s).
II. **CAUTION:** Use hearing protection when testing or operating the valves.
III. **CAUTION:** Use eye protection and suitable clothing.
IV. **CAUTION:** Use respiratory protective equipment to protect against toxic media.

Note: Any service query not covered in this manual shall be referred to Válvulas Nacional.

4.4 - PERSONNEL SAFETY PRECAUTIONS

Keep clear of the safety valve discharge.

During valve opening, a sudden and very high noise level is generated.
When installing the valve, sufficient clearance must be left around it to ensure safe and easy access during dismantling and maintenance operations.

It must be assumed that the valve inlet and outlet are at the same temperature as the fluid.

The drain hole in the valve body is supplied plugged at the factory before delivery. If it is unplugged at the installation site for use, it must be connected to a safe point at a pressure lower than that of the system being drained.

If the fluid is toxic, flammable or otherwise hazardous, suitable protective clothing must be worn during valve dismantling, including the use of a gas mask where required. All parts must be cleaned with suitable specific products before handling or machining; replace all O-rings after cleaning.

To avoid any risk, carry out dismantling, assembly and all maintenance operations in accordance with the instructions contained in this manual. In particular, before removing the valve from the process and separating its components, make sure that there is no pressure.

It is important to note that these instructions contain various “safety messages” which must be read carefully to minimise the risk of personal injury or the possibility of incorrect procedures that may damage the safety valve concerned or leave it in an unsafe condition. It is also important to understand that such “safety messages” are not exhaustive. **Válvulas Nacional** cannot know, evaluate or advise any customer on every conceivable way in which work may be carried out, or on the possible hazardous consequences of each method. Consequently, **Válvulas Nacional** has not performed such a comprehensive assessment and, therefore, any person using a procedure and/or tool not recommended by **Válvulas Nacional**, or departing from its recommendations, must be fully satisfied that the selected method and/or tools do not endanger either personal safety or valve safety.

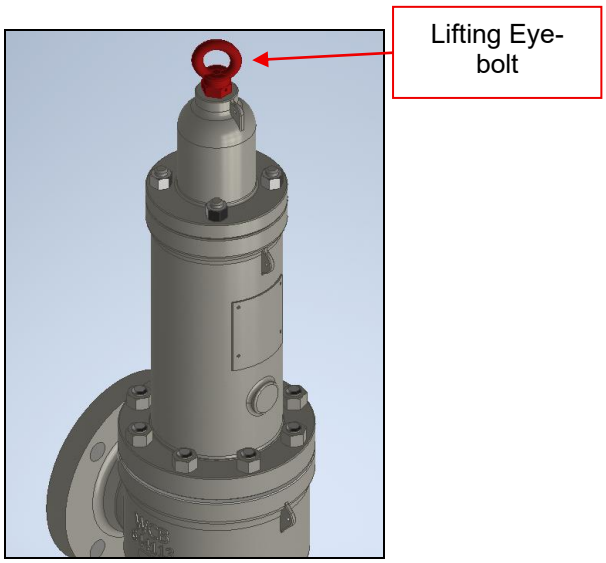
5 - HANDLING AND STORAGE

5.1 - HANDLING

1. **NOTICE:** Flanged valves, whether packed in boxes or unpacked, must always be kept with the inlet flange facing downwards, in the normal installation position, in order to prevent misalignment or other types of damage to internal components.

2. **NOTICE:** Pressure relief valves, whether packed or unpacked, must never be subjected to sudden impacts. Particular care must be taken during truck loading and unloading operations, as well as when lifting the valve into its installation position.

3. NOTICE: Valves weighing more than 20 kg are supplied with a DIN 582 lifting eye screwed into the cap plug. The lifting eye must be used when lifting or moving the valve.



5.2 - STORAGE

Safety valves often remain on site for several months before installation.

If they are not properly stored and protected, their performance may be adversely affected.

Safety valves must be handled with care to avoid damage, especially to the connections.

It is recommended to keep the valves in their original packaging and store them indoors, in a dry environment, until installation.

Spare parts must also be stored, in their original packaging, under cover and in clean, dry conditions until use. O-rings and elastomeric components are supplied packed in polyethylene bags and must be stored in a dark place, such as a drawer or box.

6 - INSTALLATION AND PRE-INSTALLATION INSTRUCTIONS

6.1 - PRE-INSTALLATION AND INSTALLATION

CAUTION: After unpacking the valve and removing the protective devices, extreme care must be taken to prevent dirt and other foreign matter from entering either the inlet or outlet connection.

6.2 - INSTALLATION INSTRUCTIONS

Correct installation is essential for proper operation of the safety valve.

Remove the adhesive protections from the inlet and outlet flanges.

Once the valve has been installed in the system, it may be necessary to inspect it in the short term in the following cases:

- When the valve has not been correctly installed.
- When contamination such as scale or other slag is present in the protected line.
- When the valve is used for a service for which it was not designed.
- When the valve is not handled correctly.

Before proceeding with installation, check the nameplate to ensure that the valve is the correct one. Check that the seal is not broken; otherwise, the set pressure and seat tightness must be rechecked. Ensure that the valve is perfectly clean and that no dirt is visible inside the seat or valve body. If necessary, carry out blowing.

The piping, connection flanges and valve supports must be thoroughly clean. It must be absolutely certain that there are no foreign bodies such as gasket particles, slag, dust, etc., which could become deposited on the sealing surface between the disc and the seat.

All bolts securing the valve to the vessel must be tightened uniformly in a cross pattern in order to avoid deformation of the valve body.

When discharge is routed through a pipe to atmosphere, make sure that no water, dirt or condensate accumulates inside the valve body.

Free discharge pipes must be properly supported so that the forces generated during discharge are not transmitted to the valve neck.

The valve must always be installed in the vertical position. The inlet piping to the valve, coming from the equipment or installation, must be direct and as short as possible. The return connection to the tank must be curved to prevent turbulence and to facilitate evacuation of the fluid discharged by the valve.

Valves fitted with bellows have a threaded hole in the bonnet (vent) which must remain open to atmosphere, Fig. 1. If the fluids handled by the valve are hazardous or pollutant and in the event of possible leakage through the bellows, this hole must be routed to a safe location at atmospheric pressure, Fig. 2.

Never plug it!

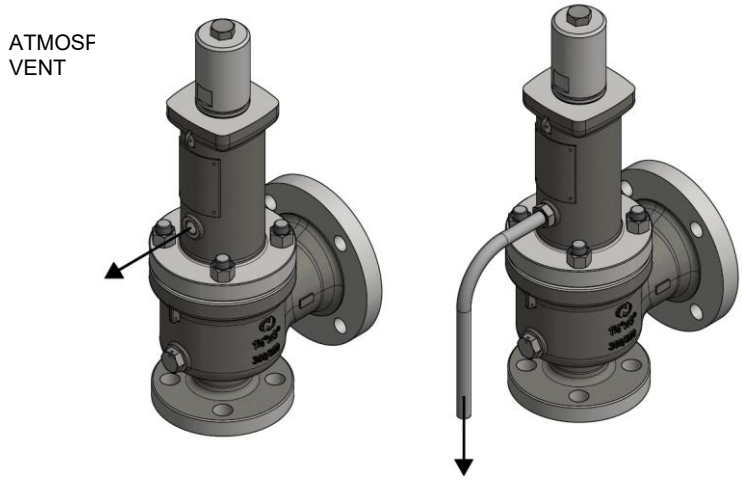


FIGURE - 1 FIGURE - 2

Under no circumstances must the pressure drop between the vessel and the valve exceed 3% of the set pressure when the valve is discharging the maximum flow rate. If the pressure drop is higher, chattering may occur.

It must be checked that the diameter of the inlet pipe to the valve is greater than or at least equal to the diameter of the valve inlet connection.

The valve body is designed to withstand high mechanical loads; however, the discharge piping installation must be carefully studied so that it does not transmit excessive stresses to the valve.

Sliding supports must be provided in the installation and excessively long pipe runs fixed directly to the valve discharge flange must be avoided.

For valves intended for gas, vapour or steam service, the discharge piping must be routed upwards and provided with suitable drainage. Conversely, for valves operating with liquids, it is recommended that the discharge piping be routed downwards to prevent the valve body from flooding.

Never orient the outlet ports of valves in gas or vapour service towards areas where there is a risk to personnel.

In gas or vapour installations, when the valve relieves, the noise level may exceed the permitted decibel limits for personnel who may be in the vicinity of the valve.

All safety valves are provided with a drain hole at the bottom of the body. Whenever necessary, connect a pipe to the drain hole and route it to a safe collection vessel, thereby preventing water, corrosive liquids, contaminants or other products from accumulating inside the valve body and damaging the valve internals. See Fig. 3.

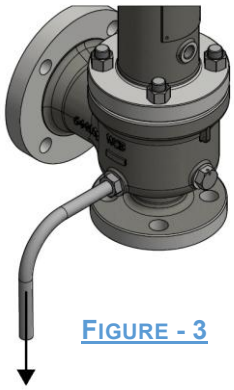


FIGURE - 3

When several safety valves discharge into the same header, the back pressure generated during the opening of one or more valves may cause indirect back pressure on the remaining valves. This may increase the opening pressure by an amount equal to the generated back pressure. In such cases, balanced bellows valves are recommended so that the back pressure does not affect valve operation.

For vessels containing saturated steam, the valve must be installed on the vapour side, as far away as possible from the liquid surface.

In any installation, avoid mounting the safety valve in positions where residues may accumulate.

It must be taken into account during installation that the valve will need to be installed and removed for maintenance; therefore, a free access area around the valve must be provided.

Vibrations in the piping or vessel on which the valve is installed may compromise valve tightness and service life. Excessive fluid turbulence and pressure pulsations at the valve inlet may cause disc chattering on the seat during discharge, i.e. rapid opening and closing of the valve, thereby reducing tightness and valve life.
In installations where vibrations cannot be eliminated, it is recommended to increase the difference between the set pressure and the operating pressure by at least an additional 10%.

For additional installation recommendations, refer to API RP 520, “Sizing, Selection, and Installation of Pressure-relieving Devices in Refineries”.

6.3 - INSTALLATION HYDROSTATIC TESTS

When a hydrostatic test is to be carried out on a vessel or installation, it must be ensured that the safety valve will not be damaged.

Before carrying out the upstream test, remove the cap plug (22) and fit the blocking screw or test gag (36), thereby rendering the valve inoperative. To prevent damage to internal parts, the blocking screw must be tightened by hand. See Fig. 4.

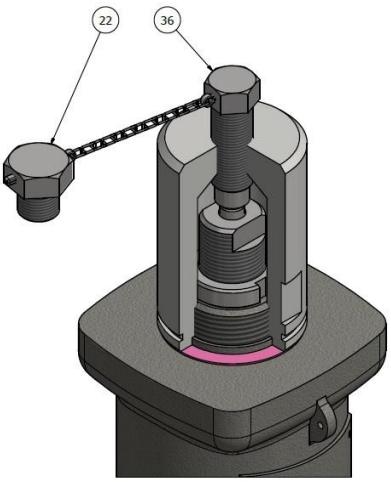


FIGURE - 4

Immediately after completion of the hydrostatic test, the blocking screw must be replaced by the plug; otherwise, the safety valve will remain completely disabled, leaving the installation unprotected against overpressure.

When the hydrostatic test is carried out downstream, it must be ensured that the pressure applied to the valve does not exceed the design limits, especially in valves fitted with bellows. If possible, it is recommended to remove the valve and carry out the test using a blind flange.

6.4 - SERVICE CONSIDERATIONS

To obtain the best possible performance, pressure relief valves must be maintained annually, unless the maintenance history indicates otherwise. They must be installed in locations that allow easy access and removal for maintenance.

6.5 - COMMISSIONING

Before commissioning, a visual inspection must be carried out to check the following points:

- The nameplate indicates the appropriate set pressure for the equipment to be protected.
- There are no blind flanges, closed valves or obstructions in the piping.
- The safety valves have been verified for set pressure and seat tightness.

7 – MODIFICATION OF SET PRESSURE AND BLOWDOWN

All valves manufactured and shipped by VALVULAS NACIONAL have been carefully assembled, tested and certified before dispatch.

Before installation, it is recommended that the valve be tested again to ensure that the closing elements, and therefore seat tightness, have not been damaged during transport and handling.
If, for any last-minute reason, it is decided to change the valve set pressure range, the instructions given in Section 5.1 must be carefully observed.

7.1 CHANGE OF SET PRESSURE

To modify the set pressure of an existing valve, it is essential to use a correctly selected spring.

Consult VALVULAS NACIONAL for verification or supply of the spring and the new nameplate.

Using a spring for set pressures higher than those for which it was designed may result in a reduced disc lift, and consequently lower discharge capacity, as well as higher overpressure in the protected equipment. Likewise, installing a spring below its set pressure range may jeopardise its mechanical strength and may increase the blowdown, which means greater difficulty in reseating the valve after opening.
Before increasing the set pressure of a valve already installed, it must be verified that the new pressure is within the pressure rating limit for which the valve has been designed. Likewise, before reducing the set pressure, it must be verified that the discharge capacity at the new pressure is sufficient to protect the vessel for which the valve is intended.

Once it is absolutely certain that the selected spring is correct for the new application, carry out the replacement as indicated in Section 6.

7.2 BLOWDOWN ADJUSTMENT

The decrease in inlet pressure relative to the set pressure at the moment the valve recloses after popping can be adjusted by means of the adjusting ring (7), mounted on the seat (4). Refer to the drawings on Pages 10, 11 and 12.

VÁLVULAS NACIONAL safety valves are designed with a standard blowdown range of 2%–7% for gas configuration and 12%–20% for liquid configuration. To adjust this range, proceed as follows:
Unscrew the blocking plug (14), which incorporates the pin (20) that secures the adjusting ring (7).

Through the blocking plug hole, use a screwdriver to rotate the adjusting ring upwards, counter-clockwise, until it contacts the disc holder (8). Then lower it by turning it in the opposite direction by the number of notches indicated in Table 1.

Table 1

ORIFICE	VALVE MODEL	
	64G (C,F,P) GAS	**64L (C,F,P)** LIQUID
E	2	2
F	3	2
G	3	3
H	4	3
J	5	4
K	7	5
L	9	7
M	12	9
N	14	10
P	17	12
Q	15	11
R	18	14
T	23	16
V	41	28
W	27	19
Correction of the number of notches from contact with the disc holder		

Once the adjusting ring has been set, refit the blocking plug, checking that the pin is located inside the notch of the adjusting ring, locking it so that it cannot rotate but remains free for self-alignment.

To increase the blowdown, meaning that the valve will reclose at a much lower inlet pressure, the adjusting ring must be raised by rotating the notches counter-clockwise, from left to right.

To decrease the blowdown, meaning that the valve will reclose at a much higher inlet pressure, the adjusting ring must be lowered by rotating the notches clockwise, from right to left.

8 - MAINTENANCE

If the valve has been operating in an installation with fluids classified as hazardous or pollutant, it must be decontaminated before handling.
It is extremely important to follow the disassembly sequence exactly as described below, as any deviation may be dangerous for the operator handling the valve due to spring load.

8.1 DISASSEMBLY AND ASSEMBLY OF CONVENTIONAL VALVES, MODELS: 64GC AND 64LC

For assembly and disassembly operations, refer to the valve sectional drawings on Page 20.

8.1.1 DISASSEMBLY

First, cut the seal. Unscrew the nuts (29) and remove the cap (3); for a threaded cap, remove it by turning it counter-clockwise.

If the valve is fitted with a lever cap, refer to Section 8.3 and Figure 7.

Before loosening the compression screw (11), **record the distance from the top of the compression screw to the end of the spindle (9)**. This will allow the compression screw to be positioned in the same location during assembly.
Loosen the locknut (13) and release the spring load (10) by unscrewing and removing the compression screw (11).

Remove the bonnet (2) by unscrewing the nuts (23).

Never carry out this operation unless it is fully certain that the spring load has been completely released.

Remove the spring (10) and the spring washers (15).

By pulling the spindle (9), remove the assembly consisting of the following parts: guide (6), strut (12), disc holder (8), and disc (5). To dismantle this assembly, unscrew the disc holder from the strut, thereby releasing the spindle-strut, the guide and the disc holder-disc assembly. To remove the disc from the disc holder, screw a suitable screw or tool into the hole provided in the disc for this purpose, allowing it to be extracted from the disc holder. See Fig. 5.

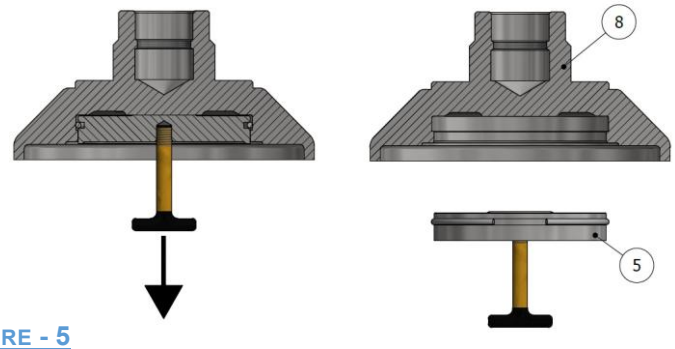


FIGURE - 5

Unscrew the adjusting ring (7) after removing the blocking plug (14), which secures it by means of the pin (19).

To remove the seat (4) from the valve body (1), properly secure the body and, using the hole located on the outside diameter of the seat and a suitable wrench, turn it counter-clockwise.

8.1.2 ASSEMBLY

The valve assembly procedure shall be exactly the reverse of the disassembly procedure.

All parts must be clean, inspected and reconditioned, especially in sliding and rubbing areas.

During assembly, it is essential to grease all threaded connections, except the thread of the adjusting ring (7), as well as the sliding areas of the guide and the various spherical contact points provided in the valve internals for self-centring. Refer to the greasing guide according to application/temperature in ANNEX 1. See Fig. 6.
(NOT SUITABLE FOR DEGREASED VALVES).

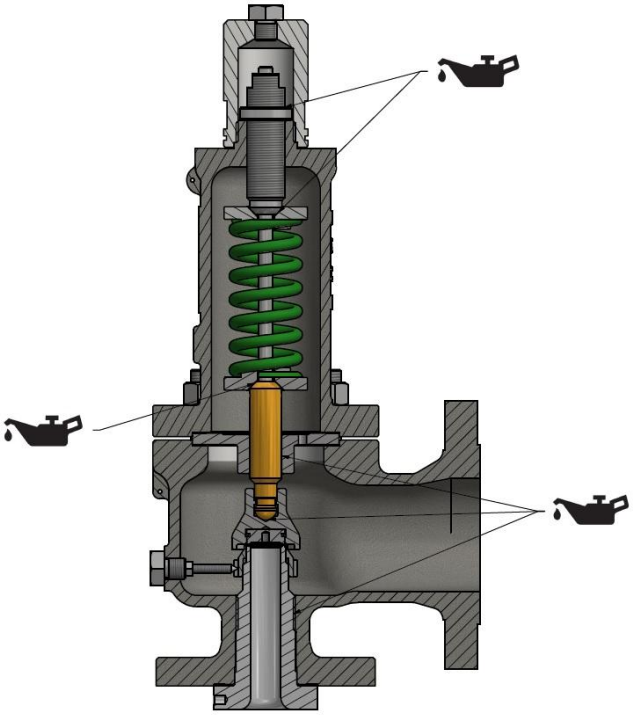


FIGURE - 6

Correct alignment of the internals is very important for proper valve operation.

All gaskets must be replaced with a completely new set. Reusing gaskets may cause abnormal behaviour, such as leakage, communication between chambers or even variations in opening lift.

The blowdown adjusting ring must be installed taking into account its position before disassembly or by consulting Table 1, turning it clockwise by the same number of notches from the point where the ring contacts the disc holder.

To fit the disc into the disc holder, position the disc holder with the bell facing upwards, place the disc with the retaining ring in its housing and press until it is inserted.

Since the sealing surfaces of the seat and disc are lapped to a “mirror finish”, assembly must be carried out with extreme care to prevent any impact; even the slightest mark could cause fluid leakage, requiring disassembly and relapping.

Tighten the compression screw until it reaches the dimension recorded during disassembly. This will prevent unnecessary popping tests, thereby reducing the possibility of marks on the valve sealing surfaces.

8.2 DISASSEMBLY AND ASSEMBLY OF BELLOWS AND BELLOWS-PISTON VALVES, MODELS: 64GF, 64LF, 64GP AND 64LP

For assembly and disassembly operations, refer to the drawings on Pages 21 and 22.

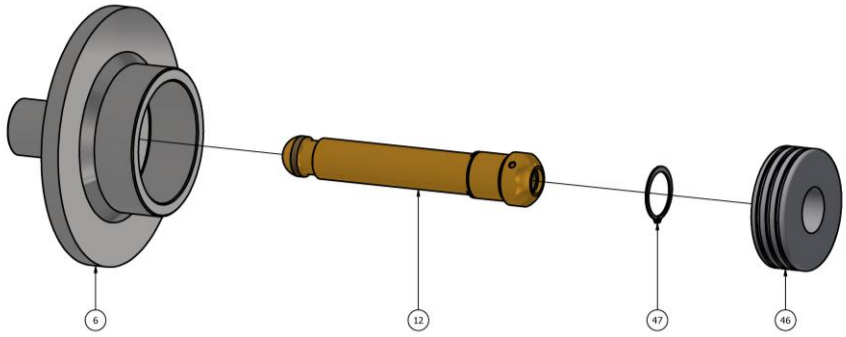
During assembly and disassembly of these valve models, special care must be taken because they incorporate a bellows (32), which is an extremely delicate component due to its construction. If handled roughly, it may become deformed and rendered unsuitable for reassembly.

8.2.1 DISASSEMBLY

Disassembly of valves 64GF, 64LF, 64GP and 64LP is performed exactly in the same way as for valves 64GC and 64LC, except for the bellows disassembly operation, which is carried out as follows:

Once the assembly consisting of spindle (9), strut (12), guide (6), disc holder (8), disc (5) and bellows (32) has been removed from inside the body, unscrew the strut from the disc holder, thereby releasing the guide. Special care must be taken during this operation because, due to the weight of the guide, incorrect handling may damage the bellows. Using the hole provided in the threaded part of the bellows and a suitable wrench, unscrew it from the disc holder (bellows for orifices "J" and smaller are welded to the disc holder, forming a single part). To remove the disc from the disc holder, see Fig. 5.

In model 64GP and 64LP valves, depending on the size, the strut and piston may be either a single part or two separate parts: strut (12) and piston (46). To disassemble the piston, remove the retaining ring (47).



8.2.2 ASSEMBLY

Assembly shall be carried out in the reverse order of disassembly, taking into account all recommendations given in Section 8.1.2 and the following points:

For bellows-disc holder assemblies of orifice "J" and smaller, which are manufactured as a single part, special care must be taken not to damage the bellows when fitting the disc into the disc holder. For the remaining sizes, first assemble the disc holder and bellows, and then fit the disc.

Make sure that the threaded hole in the bonnet (vent) remains unplugged. This is essential for proper valve operation. See Fig. 1.

8.3 DISASSEMBLY AND ASSEMBLY OF THE LEVER CAP

8.3.1 DISASSEMBLY

To dismantle the lever cap assembly, place the lever (41) in its lowest position, unscrew the nuts (24) and remove the assembly. See Fig. 7.
Before unscrewing the stop nut (38), record dimension **"h"** between the upper nut and the end of the spindle (40). This will ensure that, during assembly, the lever is correctly positioned.

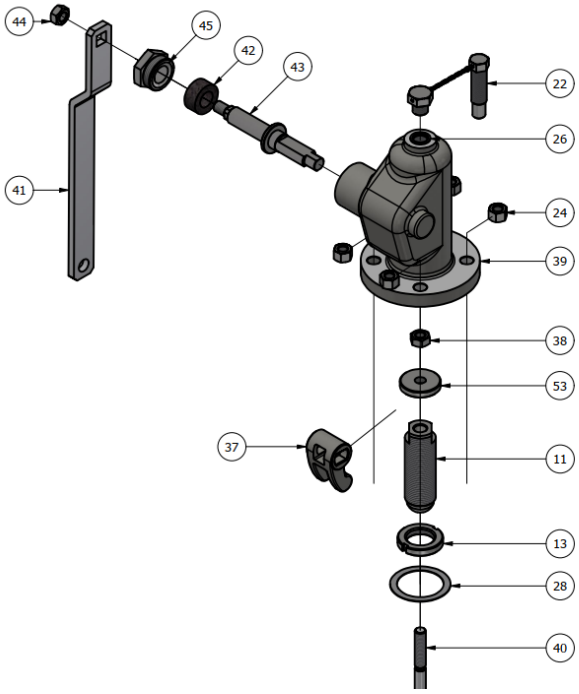


FIGURE - 7

11	COMPRESSION SCREW
13	LOCKNUT
22	TEST GAG STUD
24	HEXAGON NUT
26	PLUG GASKET
28	GASKET
37	FORK
38	HEXAGON NUT
39	TIGHT LEVER CAP
40	LEVER SPINDLE
41	LEVER
42	PACKING
43	LEVER SHAFT
44	HEXAGON NUT
45	PACKING GLAND
53	YOKE

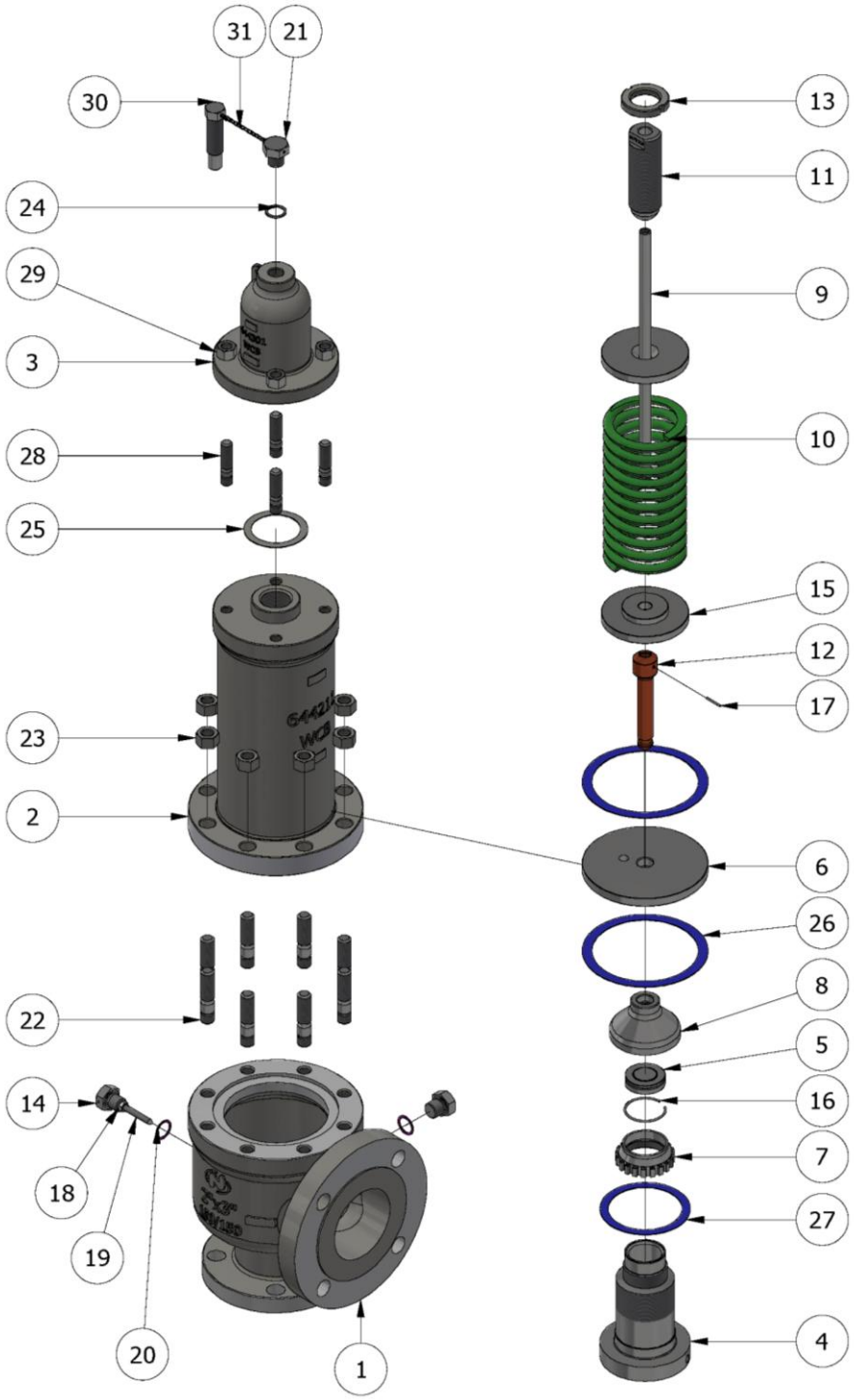
By loosening the nut (44), the lever (41) will be released from the shaft (43). Remove the packing glands (45) and extract the packing (42) from its housing. Pull out the shaft, bearing in mind that the fork (37) will remain loose inside the cap.

8.3.2 ASSEMBLY

Once the parts have been cleaned and inspected, start assembly by inserting the fork (37) inside the cap (39), making sure that the cam is positioned upwards. Fit the shaft (43) into its housing, inserting the fork. Lightly grease the packing housing to allow it to slide, and insert enough packing rings (42) so that, once tightened, the packing glands (45) do not bottom out against the cap and the shaft remains laterally locked. Once the lever (41) has been assembled, a certain friction caused by the packing contact should be felt when operating it.

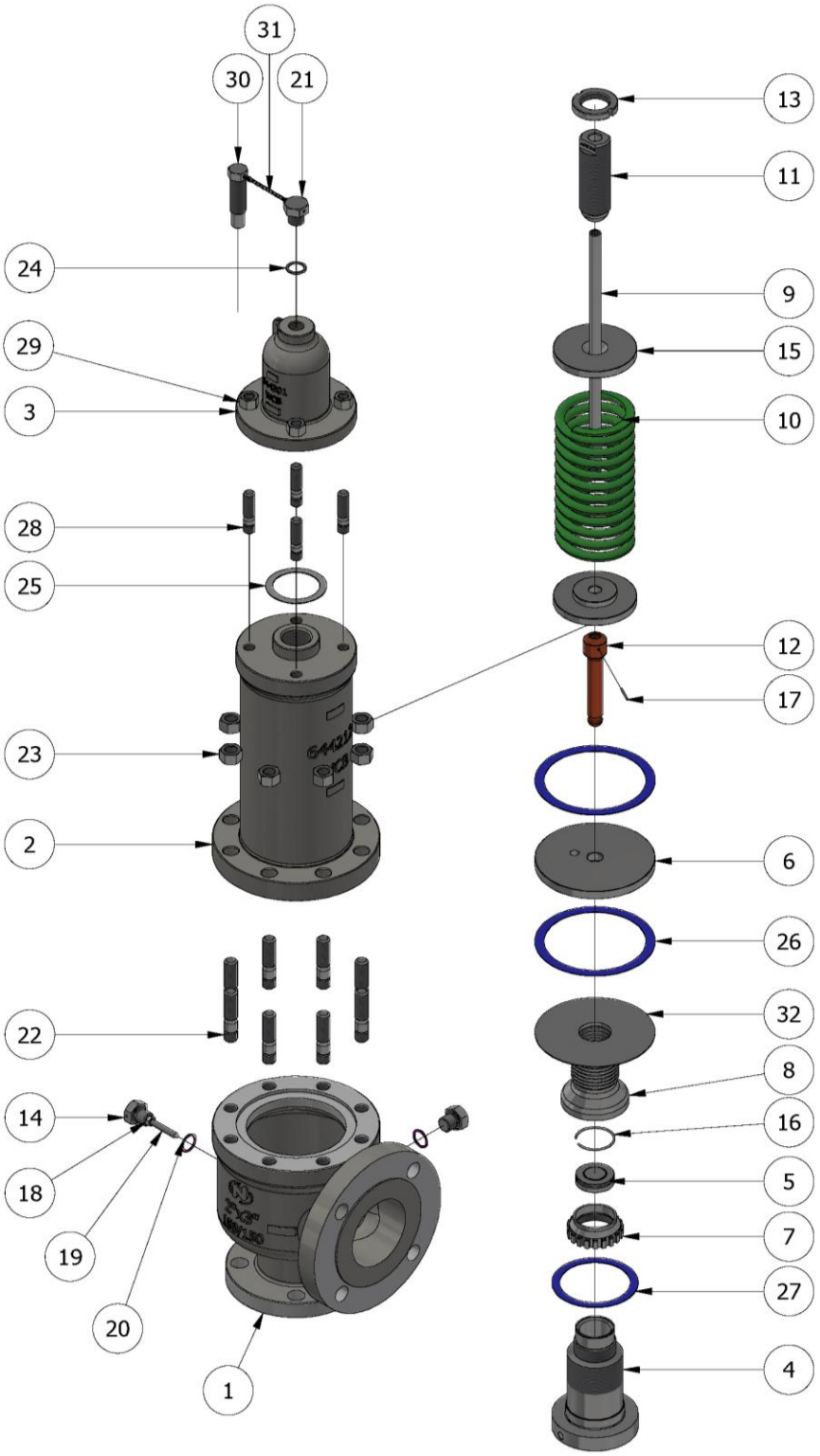
To install the assembly on the valve, proceed in the reverse order of disassembly.
Never reuse the packing rings, as once they have been compressed it is very difficult to achieve proper tightness.

CONVENTIONAL SAFETY VALVES
MODELS 64**GC** AND 64**LC**



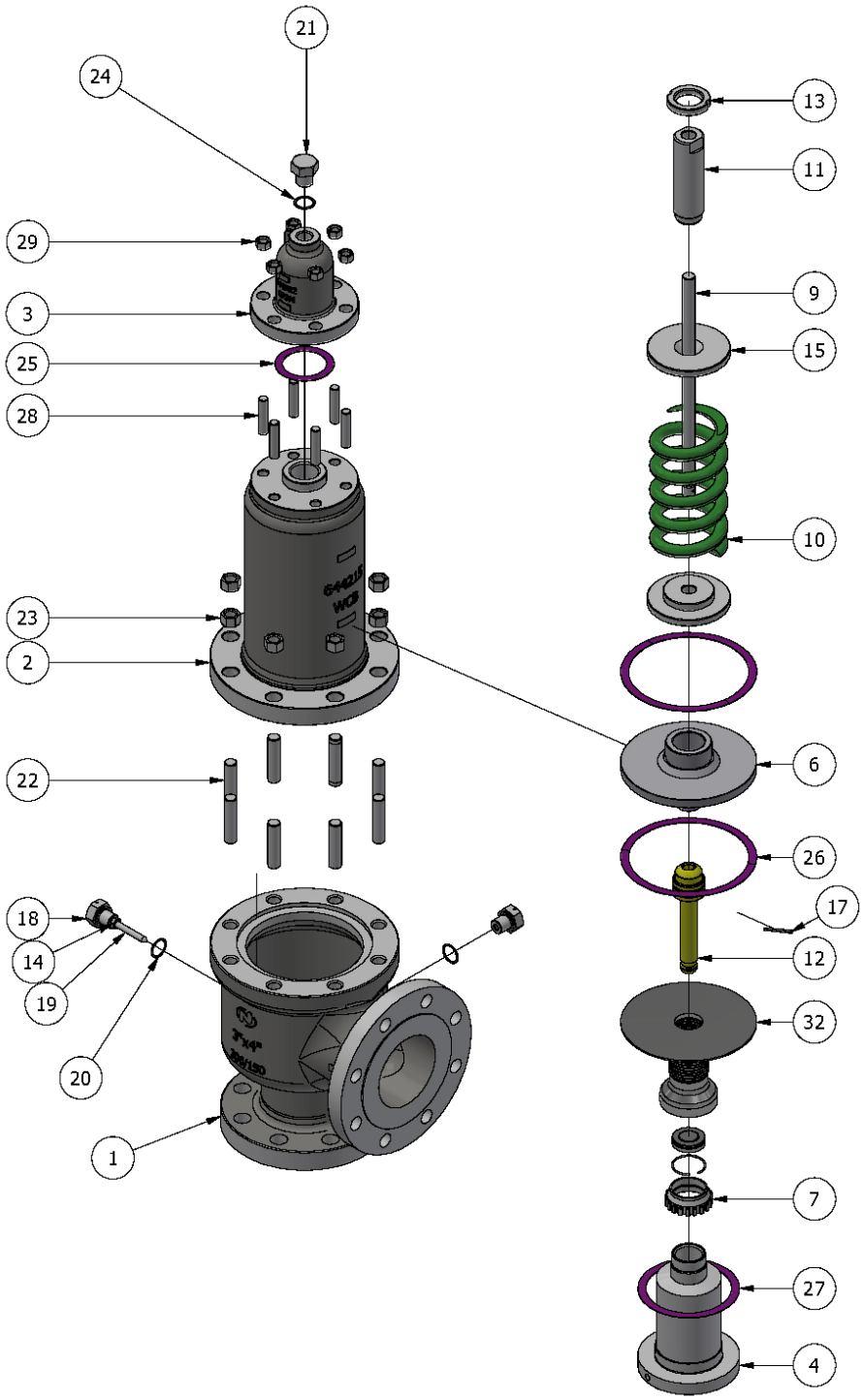
1	BODY
2	BONNET
3	CAP
4	NOZZLE
5	DISC
6	GUIDE
7	ADJUSTING RING
8	DISC HOLDER
9	STEM
10	SPRING
11	COMPRESSION SCREW
12	STRUT
13	LOCKNUT
14	BLOCKING STUD
15	SPRING BUTTON
16	ELASTIC RING
17	ELASTIC PIN
18	NUT
19	BLOCKING STUD
20	GASKET
21	TEST-GAG PLUG
22	STUDS
23	NUTS
24	GASKET
25	GASKET
26	GASKET
27	GASKET
28	STUDS
29	NUTS
30	TEST-GAG STUD
31	TEST-GAG STUD CHAIN

BALANCED SAFETY RELIEF VALVE (BELLOWS)
MODELS **64GF** Y 64**LF**



1	BODY
2	VENTED BONNET
3	CAP
4	NOZZLE
5	DISC
6	GUIDE
7	ADJUSTING RING
8	DISC HOLDER
9	STEM
10	SPRING
11	COMPRESSION SCREW
12	ROD
13	LOCKNUT
14	DRAIN PLUG
15	SPRING WASHER
16	RETAINING RING
17	SPRING PIN
18	LOCKING NUT
19	LOCKING PIN
20	GASKET
21	PLUG
22	STUDS
23	NUTS
24	PLUG GASKET
25	GASKET
26	GASKET
27	GASKET
28	STUDS
29	NUTS
30	TEST GAG STUD
31	TEST GAG STUD CHAIN
32	BELLOWS

BELLOWS-PISTON SAFETY VALVES
MODELS **64GP** AND 64**LP**



1	BODY
2	BONNET
3	CAP
4	NOZZLE
5	DISC
6	GUIDE
7	ADJUSTING RING
9	STEM
10	SPRING
11	COMPRESSION SCREW
12	ROD
13	LOCKING NUT
14	DRAIN PLUG
15	DISC BUTTON
16	ELASTIC RING
17	ELASTIC PIN
18	BLOCKING NUT
19	BLOCKING SCREW
20	GASKET
21	PLUG
22	STUD
23	NUT
24	GASKET
25	GASKET
26	GASKET
27	GASKET
28	STUDS
29	NUTS
30	BELLOWS

8.4 - RECONDITIONING OF SEALING SURFACES

Perfect tightness of the safety valve depends to a large extent on the condition of the sealing surfaces; that is, the contact area between the nozzle (4) and the disc (5).

If the safety valve shows excessive leakage and suitable means or experienced personnel are not available, we recommend sending the valve to our facilities, where the inspection will be carried out with full guarantees and the corresponding repair certificate will be issued.

8.4.1 - LAPPING OF SEALING SURFACES

Since perfect lapping of the nozzle and disc sealing surfaces is essential to prevent valve leakage, this operation should be carried out using suitable equipment and by operators with the appropriate specific training.

When the sealing surface is only slightly damaged, simple lapping will be sufficient to restore it to optimum condition. If the sealing surface is eroded or heavily marked by dirt, it must be faced on a lathe with the finest possible finish before proceeding with lapping. See Sections 8.4.2 and 8.4.3.

To perform lapping manually, a special lapping plate made of alloy grey cast iron, or a flat polished surface such as a glass disc, must be available, together with the different lapping compounds according to the required finish grade. See Table 2.

Table 2

GRIT	DIMENSION (μm)	FINISH TYPE	PRODUCT
400	15 ÷ 21	MEDIUM	SUSPENDED SILICE CARBIDE SOLUTION
800	7,5 ÷ 10,5	FINE	
1200	4 ÷ 6	MIRROR POLISHING	DIAMOND DUST SUSPENDED COMPOUND

In the standard process, after reconditioning the sealing surfaces, lapping is carried out using a medium-finish compound. Once perfect flatness has been achieved, lap on a different surface using a fine-finish compound. If the valve process conditions require a higher degree of tightness, the final finish is performed using a diamond powder suspension, leaving the sealing surface with a mirror-polished finish.

Lapping shall be carried out as follows:

Apply a thin layer of lapping paste with the selected grit, according to the required finish, onto the surface of the lapping plate where the operation will be performed. Do not use the same surface for different finish grades, and clean thoroughly after each lapping operation.

Place the part perfectly flat on the lapping surface and, applying light and uniform pressure, perform figure-eight movements until the required finish is obtained. When a lapping ring is used, the movement must be oscillating.

It is recommended to remove the nozzle from the valve body in order to achieve proper lapping. If this is not possible, or if the surface is only slightly damaged, use the lapping ring. It must be borne in mind that excessive paste on the lapping ring may round off the edges of the nozzle lip.

The most important basic conditions for obtaining a good final result in the lapping operation are:

A) A flat surface to support the lapping plate.
B) A flat and polished lapping surface.
C) Cleanliness of the lapping plate, the part to be lapped and the lapping compound.
D) Selection of the lapping compound grit type according to the required finish.
E) Uniform and smooth lapping motion, without vibration or sudden movements.
F) An operator properly trained in lapping techniques.

8.4.2 - NOZZLE MACHINING

When marks are observed on the nozzle sealing surface and their depth cannot be removed by lapping, the surface must be machined on a lathe, removing the minimum amount of material possible, just enough to clean up the surface.

To machine the sealing surface, clamp the nozzle by its flange in a chuck with at least three self-centring jaws. Using a dial indicator, make sure that the concentricity between the internal surface of the nozzle and the external surface of the flange is within a limit of 0.05 mm.

Machine the sealing surface until the damaged area has been fully restored, bearing in mind that the finer the finish, the easier the lapping operation will be. Restore the nozzle lip until the original width of the sealing area is obtained, while maintaining the distance between the sealing surface and the flange face that seats against the valve body.

Lap the sealing area until a mirror finish is obtained, following the instructions described in Section 8.4.1.

8.4.3 - DISC MACHINING

To machine the sealing surface, clamp the disc in the lathe chuck, avoiding excessive tightening so as not to cause deformation. Centre it using a dial indicator, ensuring that the outside diameter and the sealing surface are aligned within a tolerance of 0.05 mm.

Machine the sealing surface until the damaged area has been fully restored. Restore the lip until the original width of the sealing area is obtained.

Lap the sealing area until a mirror finish is obtained, following the instructions described in Section 8.4.1.

8.5 – TIGHTENING TORQUE FOR BODY/BONNET AND BONNET/CAP THREADED FASTENERS

The following tables list the recommended tightening torque values for nuts according to the material grade of the bolting elements. B8M is taken as the nominal material, as it is the most restrictive in terms of mechanical strength. The tightening torque values are calculated with an over-tightening factor that ensures gasket tightness, also taking into account the preload exerted by the spring in all possible configurations. The tightening torque value applies to each bolting element.

It is recommended to follow the bolt tightening sequence specified in Table 4 of ASME PCC-1.

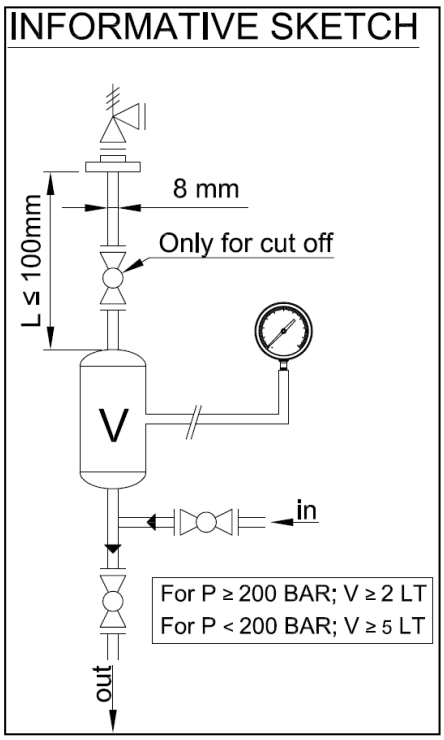
TIGHTENING TORQUE (Nm) BODY/BONNET							
INLET	OUTLET	OUTLET CLASS	THREAD SIZE	NUMBER OF BOLTS	BOLT MATERIAL	GASKET MATERIAL	TIGHTENING TORQUE (Nm)
1	2	300	M14	4	B8M	Graph+316	30
1½	2	300	M18	4	B8M	Graph+316	55
2	3	150	M14	8	B8M	Graph+316	25
2	3	150	M18	4	B8M	Graph+316	65
2	3	300	M18	8	B8M	Graph+316	40
1½	3	300	M18	4	B8M	Graph+316	55
3	4	150	M18	8	B8M	Graph+316	65
3	4	300	M20	8	B8M	Graph+316	45
3	6	150	M20	8	B8M	Graph+316	55
4	6	300	M20	8	B8M	Graph+316	100
6	8	150	M20	8	B8M	Graph+316	115
6	10	150	M20	8	B8M	Graph+316	115
8	10	150	M20	12	B8M	Graph+316	95
8	10	300	M20	16	B8M	Graph+316	70
10	14	150	M22	16	B8M	Graph+316	185
12	16	150	M24	16	B8M	Graph+316	260

TIGHTENING TORQUE (Nm) BONNET/CAP							
INLET	OUTLET	OUTLET CLASS	THREAD SIZE	NUMBER OF BOLTS	BOLT MATERIAL	GASKET MATERIAL	TIGHTENING TORQUE (Nm)
1	2	150	M10	4	B8M	Graph+316	20
1½	2	150	M12	4	B8M	Graph+316	40
1½	3	300	M12	4	B8M	Graph+316	40
2	3	150	M12	4	B8M	Graph+316	55
3	4	150	M14	6	B8M	Graph+316	50
3	6	300	M14	6	B8M	Graph+316	50
4	6	150	M14	6	B8M	Graph+316	100
6	8	150	M14	6	B8M	Graph+316	110
6	10	150	M14	6	B8M	Graph+316	110
8	10	150	M14	8	B8M	Graph+316	100

TIGHTENING TORQUE (Nm) DRAIN PLUG/CAP PLUG/TEST-GAG			
THREAD SIZE	BOLT MATERIAL	GASKET MATERIAL	TIGHTENING TORQUE (Nm)
⅜" G	B8M	Graph+316	25
½" G	B8M	Graph+316	45
¾" G	B8M	Graph+316	145

9 - SET PRESSURE ADJUSTMENT ON THE TEST BENCH

All testing and adjustment operations must be carried out by operators who have received suitable technical training on the operation of safety valves, as well as on the risks involved in testing.
Both eyes and ears must be protected with the appropriate personal protective equipment when the valve is under pressure.
When the valve is under pressure, never stand in front of the outlet flange.



9.1 - GASES AND VAPOURS

The set pressure test may be carried out, if no test bench is available, using a vessel pressurised with air or nitrogen, preferably with a good cushioning volume to prevent damage to the valve sealing surfaces when popping occurs.

The connection between the valve and the vessel should preferably be direct, through a shut-off valve. The connecting pipe must have an internal diameter of at least 8 mm.

The test may be carried out in two different ways:

A) Increase the inlet pressure of the valve until a continuous fluid leakage is detected, identifiable by an unexpected whistle or noise.

B) Increase the inlet pressure of the valve until popping occurs. To obtain this action, position the adjusting ring in contact with the disc holder bell and then lower it by one or two notches. To perform this operation, proceed as explained in Section 9.4.

If the test is carried out correctly, the results obtained by both methods are practically identical.

Test method (B) requires a larger-volume vessel to prevent damage to the sealing surfaces and requires greater attention when securing the valve.

It is essential to thoroughly blow out the test bench connections and piping before installing the valve, in order to remove any dirt that could become deposited on and damage the sealing areas.

9.2 - LIQUIDS

The set pressure test for liquid-type valves (64LC, 64LF or 64LP) is performed using clean water at ambient temperature as the test fluid.

An accumulation vessel is normally not required; however, an air/water cushioning chamber is essential when a reciprocating pump is used.

The set pressure shall be identified when a continuous, fully vertical stream of water flows from the valve discharge flange.

9.3 - TEMPERATURE AND BACK PRESSURE CORRECTION

When the valve to be adjusted on the test bench, at ambient temperature and atmospheric pressure, is intended to operate at a temperature above 100 ºC and/or with back pressure other than atmospheric pressure, a correction for temperature and/or back pressure must be applied to the set pressure adjustment for conventional valves.

For balanced valves fitted with bellows, only the temperature correction shall be applied, since the back pressure is compensated by the bellows.
The correction factor shown in Table 3 must be applied to the set pressure of valves intended to operate with fluids at temperatures above 100 ºC.

Table 3

OPERATING TEMPERATURE	SET PRESSURE INCREASE
UP TO 100 ºC	0 %
FROM 101 ºC TO 250 ºC	2 %
FROM 251 ºC TO 500 ºC	3 %
ABOVE 500 ºC	5 %

The correction factor indicated above must also be applied even if the valve set pressure has been corrected to compensate for the effect of back pressure at the discharge.

Therefore, the pressure at which the valve must be tested on the test bench, referred to as the “Cold Differential Test Pressure” (CDTP), is the inlet pressure at which the valve will open on the test bench at ambient temperature and atmospheric pressure.

To calculate the exact cold differential test pressure, the pressure at which the valve must open in service, the increase due to temperatures above 100 ºC and any back pressure other than atmospheric pressure must be taken into account.

Examples of cold differential test pressure calculation under back pressure and temperature conditions:

A) DATA: Conventional valve (without bellows), set pressure 20 bar at a process temperature of 260 ºC, with a constant back pressure of 1 bar, steam service.

Cold differential test pressure adjustment:

20 bar – 1 bar = 19 bar.

From the temperature correction table, a correction factor of 3% must be applied, as the temperature is between 251 ºC and 500 ºC:

3% of 19 bar = 0.57 bar (rounded to 0.6 bar)

Therefore, the cold set pressure at which the valve must be adjusted on the test bench will be:

19 bar + 0,6 bar = **19,6 bar.**

B) DATA: Balanced valve (with bellows), set pressure 50 bar, at a process temperature of 180 ºC, with a constant back pressure of 1.5 bar, steam service.

Cold differential test pressure adjustment:

50 bar. Since this is a balanced valve fitted with bellows, the back pressure does not affect the set pressure; therefore, the back pressure is not subtracted.

From the temperature correction table, a correction factor of 2% must be applied, as the temperature is between 101 ºC and 250 ºC:

2% of 50 bar = 1 bar

Therefore, the cold differential test pressure at which the valve must be adjusted on the test bench will be:

50 bar + 1 bar = **51 bar**

The procedure is always the same and is applicable to all valve models.

9.4 - ADJUSTING RING POSITION

In order to achieve the valve “pop” action on test benches with limited flow capacity, the adjusting ring shall be set as detailed below. Once the tests have been completed, position the ring as indicated in Table 1.

Never perform this operation while the valve is under pressure, as accidental opening may occur and cause injury to the operator handling it.

Remove the locking plug (14) and turn the adjusting ring (7) counterclockwise until it comes into contact with the disc holder bell (8). Then lower it by 1 or 2 notches clockwise to avoid such contact. This operation may be carried out through the valve outlet flange or by using a screwdriver through the corresponding hole of the locking plug.

Once the ring is positioned, install the locking plug, ensuring that the pin (32) is located between the notches of the adjusting ring. After tightening the plug, check that the ring is secured so that it cannot rotate, while remaining free for self-alignment.

The blowdown may need to be readjusted once the valve is operating in the installation, since its previous setting may vary depending on the fluid, temperature, pressure and type of installation.

9.5 - SET PRESSURE ADJUSTMENT

If the valve opens at a pressure lower or higher than the set pressure, the spring shall be adjusted as detailed below:

A) Remove the cap (3), or the lever cap (39) if the valve is equipped with a lifting lever.

B) Loosen the locknut (13) to release the adjusting screw (11). Turning it clockwise will increase the valve opening pressure, while turning it counterclockwise will decrease it.

C) Once the required set pressure has been adjusted, tighten the locknut and reinstall the cap.

The tolerance limits for set pressure adjustment are ±0.15 bar for pressures equal to or lower than 4.8 bar, and ±3% for pressures above 4.8 bar.

Never adjust the set pressure while the valve is pressurized, as the sealing surfaces of the seat and disc may be damaged if they rotate.

10 - AIR LEAKAGE TESTS

Valve leakage tests, both for valves intended to operate with gases and vapours and for those intended to operate with liquids, shall be carried out after the set pressure has been adjusted, using the same test fluid.

For valves with a set pressure greater than 3.5 bar, the pressure at the valve inlet for leakage testing shall be set at 90% of the set pressure. For valves with a set pressure equal to or lower than 3.5 bar, the test pressure shall be 0.35 bar below the set pressure..

Special care shall be taken during this test, as there is a risk of unexpected valve opening due to the fact that the valve is being operated under conditions very close to the set pressure, which may pose a hazard to the operator handling the valve.

10.1 - NOZZLE TIGHTENNING TESTS WITH AIR

Figure 8 shows the method to be used for carrying out this test on valves intended to operate with gases or vapours.

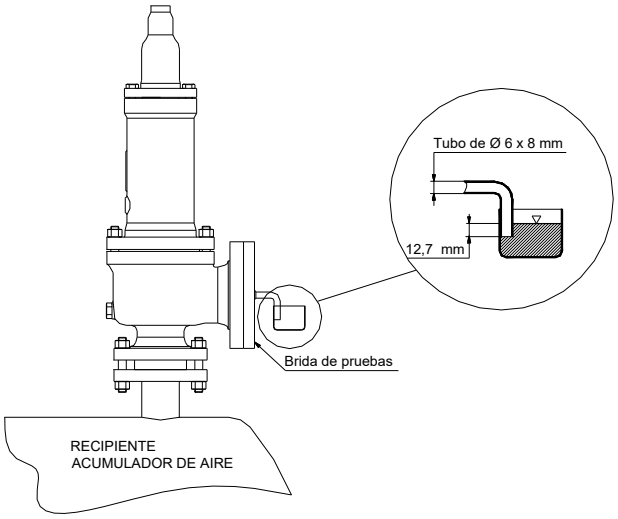


FIGURE - 8

The valve outlet shall be closed with a flange whose only outlet opening shall be a tube with an internal diameter of 6 mm and a wall thickness of 1 mm, bent at 90°, with its end submerged 12.7 mm in a container filled with water.

With the leakage test pressure adjusted as described in Section 8, and after maintaining it for 1 minute for valves of size DN 50 (2”) or smaller; 2 minutes for valves of sizes DN 80 and DN 100 (3” and 4”); and 5 minutes for valves of size DN 150 (6”) or larger, the number of bubbles produced shall be counted over a period of 1 minute.

The test shall be considered acceptable provided that the values indicated in Table 4, which are those recommended by API RP 527, are not exceeded.

Table - 4

VALVE SET PRESSURE IN barg AT 15.6 ºC	ALLOWABLE LEAKAGE IN BUBBLES PER MINUTE	
	ORIF. “C” TO “F”	ORIF. “G” TO “T”
FROM 1 TO 69	40	20
UP TO 103	60	30
UP TO 130	80	40
UP TO 172	100	50
UP TO 207	100	60
UP TO 276	100	80
UP TO 385	100	100
UP TO 414	100	100

10.2 – NOZZLE LIQUID TIGHTENNING TESTS

Before adjusting the leakage test pressure, fill the inside of the body with water. Once the water level has stabilized and water stops flowing from the valve outlet flange, adjust the leakage test pressure as described in Section 8.

With the test pressure adjusted, any dripping from the outlet shall be collected in a container for 1 minute. The amount collected shall not exceed 10 cubic centimetres per hour for each 25 mm of nominal valve diameter. (API RP 527)

10.3 – EXCESSIVE LEAKAGE

If the leakage test has been carried out correctly and results in excessive leakage, the valve shall be disassembled to verify that there is no dirt or foreign matter between the seat and the disc which may have damaged the sealing surface.

If the leakage is caused by dirt due to contamination of the test fluid, it will be sufficient to clean the sealing surface with cellulose paper or any other non-abrasive material soaked in solvent. However, if the leakage is due to marks on the sealing surface, depending on the depth of the marks, the surfaces shall be re-lapped or even restored, as indicated in Section 6. 4.

11 - TEST PRESSURE GAUGES

Pressure shall be measured using pressure gauges that are periodically inspected and calibrated, with their corresponding calibration certificate, as specified in ANSI B40.1 Grade A.

The test pressure gauge shall be selected taking into account that the test pressure must fall between 25% and 75% of the full-scale range. An error not exceeding 1% of the measuring range may be considered acceptable.

12 - ATEX-MARKED VALVES

All safety valves supplied for installation in potentially explosive atmospheres comply with Directive 2014/34/EU (ATEX). They are classified as Group II, Category 2, and shall be marked with a nameplate bearing the following inscription:

II 2G – Ex h IIC Tx G

TX / (Ty)	*TEMPERATURE RANGES (ºC)*
	T>450º
T6 … T1	300º<T≤450º
T6 … T2	200º<T≤300º
T6 … T3	T≤200º

For valves operating above 450 °C, the marking shall indicate the actual maximum valve temperature instead of the Tx temperature class. In such cases, Tx shall not be used. Example for 475 °C:

II 2G – Ex h IIC 475ºC Gb

12.1 - SAFETY RECOMMENDATIONS

To avoid the risk of ignition, it is recommended that the following points be taken into account:

a) Prevent dust from accumulating on the valve body.

b) It is essential to keep the protective paint coating on the body in perfect condition, as rust caused by impact or rubbing may constitute a high-risk source of ignition.

c) It is advisable to ensure that the valve is not isolated from the installation earthing system, as the different layers of paint applied during maintenance may create a plastic insulating layer on the valve, promoting the accumulation of static electricity which, if not properly discharged, may produce effective electrostatic discharges capable of causing ignition.

d) When valves are to be installed in or removed from the installation, do not use tools that may generate sparks during use or handling.

13 - JACKETED VALVES

INTRODUCTION:

When there may be a risk to the correct operation of the valve due to environmental or climatic factors, or directly due to the intrinsic characteristics of the flowing fluid, a protective jacket may be designed to ensure the proper performance of the assembly.

The most common cases where this type of accessory may be required are:

- If the flowing fluid may solidify, crystallise or significantly increase its viscosity.
- Risk of freezing or condensation: if the fluid may freeze or condense at ambient temperature, the valve may fail to open or may become partially obstructed.
- Dirty service, with solids, coking or polymerisation: when the product may generate deposits, scaling or polymerisation.
- Outdoor service at low ambient temperatures.

BASIC OPERATING PRINCIPLES:

The jacket is supplied through an inlet and an outlet connection, normally using steam, hot water, thermal oil or a cooling fluid, which circulates around the body to maintain the required operating temperature. This connection may be flanged in accordance with ASME B16.5 or EN 1092-1 or threaded in accordance with ASME B1.20.1. The design basis for this type of connection shall always be ASME B16.34 or EN 12516-2.

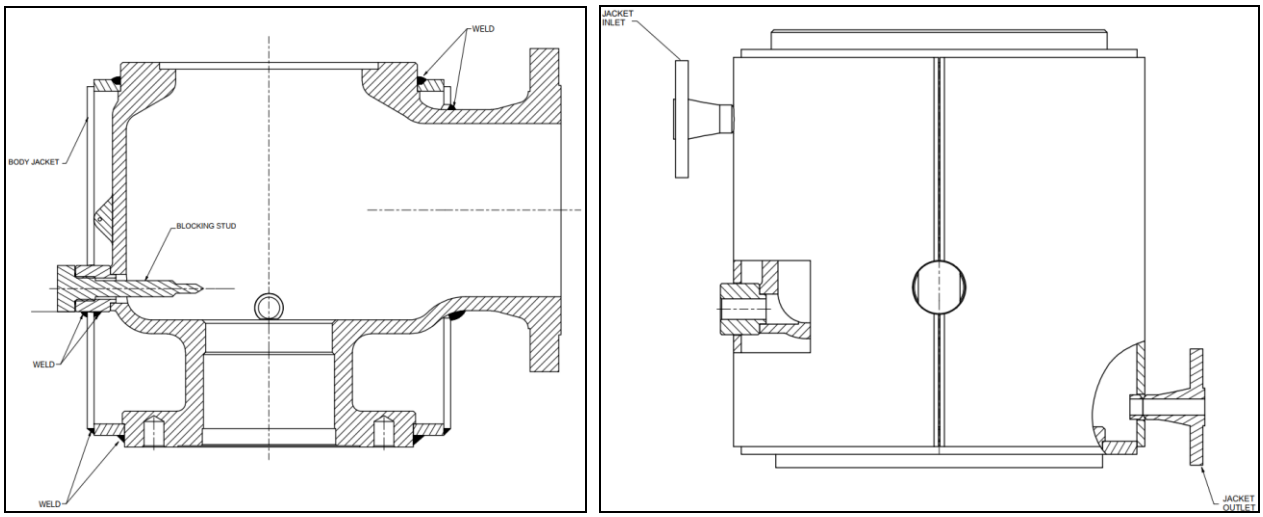


Figure 1. Sectional view of a jacketed body showing its inlet and outlet connections.

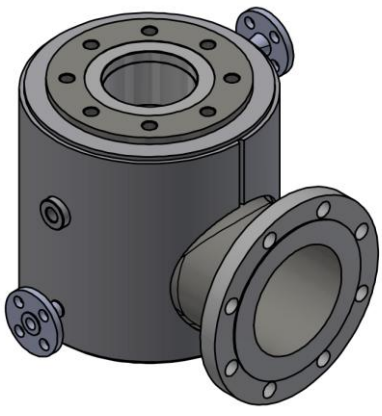


Figure 2. Model view of the jacketed body.

13.1 - SAFETY RECOMMENDATIONS AND JACKET HYDROSTATIC TESTS

SAFETY RECOMMENDATIONS.

The valve jacket shall be considered an auxiliary circuit subject to pressure and temperature. Before commissioning, check that its connections, welds, plugs, vents and shut-off elements are correctly installed and compatible with the intended service fluid.

Before supplying the jacket, verify that the pressure and temperature of the heating or cooling fluid do not exceed the maximum allowable values specified for the jacket. Pressurisation shall be carried out progressively, avoiding water hammer, thermal shock or sudden temperature increases that could generate excessive stresses in the valve body or in the jacket welds.

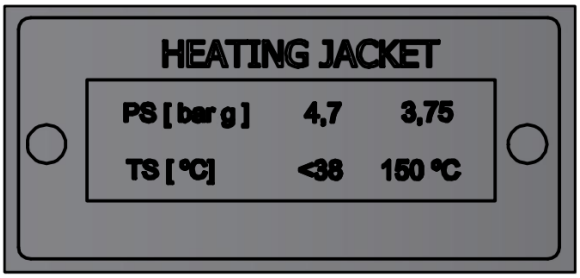
During operation, the jacket inlet and outlet must remain free from obstructions. Both connections shall not be blocked simultaneously if thermal expansion of the trapped fluid may occur. For steam service, suitable venting or drainage is recommended to prevent condensate accumulation.

The jacket shall not be used as a lifting point, structural support or element intended to withstand external loads from the installation. The supply and return piping must be installed so that no loads, vibrations or undue moments are transmitted to the valve.

JACKET HYDROSTATIC TESTS:

Before commissioning, the jacket shall be subjected to an independent hydrostatic test to verify its mechanical strength and tightness. As a general criterion, the test shall be performed after manufacture and assembly have been completed and after the necessary preliminary inspections, in accordance with the principles of ASME VIII Div. 1 UG-99 for hydrostatic testing of pressure-retaining parts.

The test pressure shall be determined from the maximum operating pressure shown on the jacket nameplate and indicated on the valve customer drawing.



Jacket Hidrostatic Test Pressure
PH = 4,7 x 1,5 = 7,05 bar

The pressure shall be increased gradually until the test pressure is reached. Once reached, it shall be held for sufficient time to allow stabilisation and visual inspection. ASME VIII Div. 1 UG-99 states that no leakage shall be permitted during the pressure-holding period and that, after the test, the pressure shall be progressively reduced to atmospheric pressure.

During inspection, no leakage shall be accepted at jacket welds, threaded connections, plugs, flanges or accessories. Permanent deformation, bulging, cracks, sweating or unexplained pressure loss shall not be observed. If any leakage is detected, the jacket shall be depressurised, repaired and the complete test repeated.

The test fluid shall be compatible with the jacket materials and shall not leave harmful residues. After testing, the jacket shall be properly emptied, drained and dried, especially if subsequent service does not allow water, moisture or internal contamination.

TROUBLESHOOTING		
DEFAULT	**POSSIBLE CAUSE**	**SOLUTION**
Excesive Leakage	Presence of dirt between the seat and the disc..	Perform one or two valve openings and check again. If leakage persists, the valve shall be disassembled and the internal components cleaned.
	Marked or scratched sealing surfaces.	Disassemble the valve and lap the seat and disc.
	Use of the valve with a fluid for which it was not designed.	Lap the seat and disc with a very fine finish. This is typical behaviour of valves designed for liquid service and used in gas service
	The valve is not installed in a vertical position.	Correct the installation. The valve shall always be installed in a vertical position.
	The set pressure is too close to the operating pressure. Leakage may occur when the operating pressure exceeds 90% of the set pressure.	Increase the set pressure to obtain a minimum differential of 10%. If this is not possible, modifications shall be made to the sealing surfaces, such as Stellite hardfacing, extra-fine lapping, etc
Valve discharges at a pressure different from the set pressure	Variable back pressure	For conventional valves, verify that the discharge manifold is the same size as, or larger than, the safety valve outlet, and/or that there is no obstruction. The appropriate solution is to install balanced valves equipped with a bellows.
	Back pressure different from that initially specified.	The valve shall be set taking into account the actual back pressure value for conventional valves.
	Loose adjusting screw locknut.	Firmly tighten the locknut after readjusting the valve.
	Misalignment of the valve internal components.	Perform 2 or 3 valve openings so that the valve can self-align.
Valve chattering, with rapid and cyclic opening and closing	Excessive turbulence at the valve inlet.	Modify the valve installation
	Adjusting ring / blowdown ring incorrectly positioned.	Verify that the adjusting ring is correctly positioned; otherwise, adjust it as indicated in Section 5.2.
	Oversized valve.	Recalculate and install the correct size.
	Excessive pressure drop at the valve inlet.	Increase the blowdown by positioning the adjusting ring as close as possible to the disc holder bell.
	Accumulation is too low.	Move the adjusting ring away from the disc holder.

NOTES

For valves with welded connections, the provisions of this document shall apply, with the exception that wherever inlet or outlet flange is indicated, it shall be understood as inlet or outlet welded connection, respectively.

ANNEX 1

LUBRICATION SCHEME FOR ASSEMBLY / MAINTENANCE OF SAFETY RELIEF VALVES

LUBRICANT TYPE	
3	WEICON Anti-Seize (Nickel) High-Tech Assembly Paste or equivalent
4	MOLYKOTE® D-321 R Anti-Friction Coating (spray) or equivalent
5	WEICON PTFE Spray or equivalent
6	No lubrication (couplings or joints with self-lubricating steels or specific anti-friction treatments)

LUBRICATION POINTS	
A	Joints tightened by rotation and all threaded parts, excluding the blowdown adjustment thread and bolt heads.
B	Parts that slide against each other, e.g.: mating and clearance surfaces between the guide, spindle, strut, and spherical surfaces

LUBRICATION SCHEME FOR STANDARD SERVICE

Lubrication Point	Set Pressure	Operating Temperature		Relief Temperature	LUBRICANT
	bar_g	T min [°C]	T max [°C]	T max [°C]	
A	All ranges				3
B	> 0.1	-180	≤ 450	≤ 450	4
			≤ 250	≤ 250	5
		< -180	All ranges	All ranges	6

LUBRICATION SCHEME FOR CLEAN / OXYGEN SERVICE

Lubrication Point	Set Pressure	Operating Temperature		Relief Temperature	LUBRICANT
	bar_g	T min [°C]	T max [°C]	T max [°C]	
A	All ranges				5
B	> 0.1	-180	≤ 250	≤ 250	5
		All other ranges			6

Lubricant Application

Application of lubricating greases.

Lubrication Point A: Apply a thin, uniform layer of grease, preferably using a brush, ensuring complete coverage of the entire thread surface.

Application of dry lubricant spray.

Lubrication Point A: All threaded parts must be degreased beforehand to prevent organic contamination (avoid the presence of other greases or oils). Once the surface is properly degreased, apply the spray evenly and allow it to dry completely (5 min. at room temperature) before assembling the components.
Lubrication Point B: All sliding parts must be thoroughly degreased in the same manner as

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