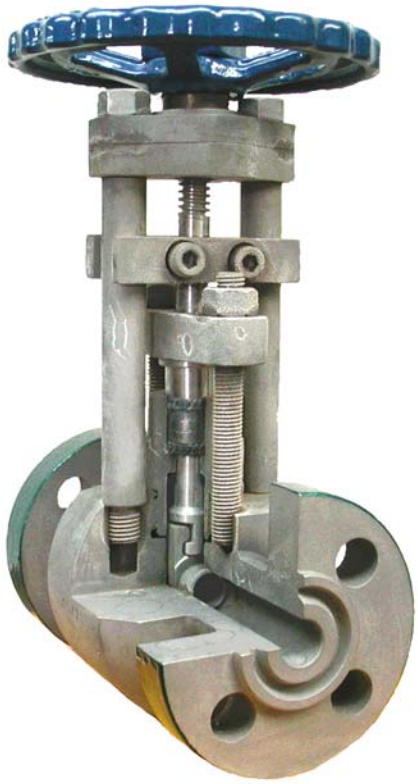


INDEX

GENERAL

This manual covers receiving, identification, installation, operation and maintenance manual for valves from ½" to 2", classes 150 to 2500 and for all kinds of service, manufactured by the following processes: forging, casting (green sand, no bake, shell, investment) and bar stock.

Speciality Valves manufactures xanik valves, with materials and working conditions requested in order by the Customer or by International Standards that can applied (API, BS, ASME, MSS, etc.)

This manual recollects the indications given by BS 6683: Installation and Use of Valves

Xanik valves are manufactured with materials of high quality to permit a long use without interventions, a minimum attention and a correct maintenance can make longer their life and use. For most of the cases an intervention on the working place for the maintenance and repairs instructions indicated in this manual is sufficient. For mayor repairs we suggest to send the valve(s) back to our factory.

Speciality Valves can modify without previous notice the contents of this manual.

RECEIVING

Unless other wise specified, valves are shipped in wood cases with cardboard between layers of valves. This kind of packing permits to satisfy normal transport needs. AII **Xanik** valves have an adequate protection to storage in a closed environment for a maximum period of 6 months.

This protection, if not requested in a different way, is primary polyurethane coating (not for stainless) and plastic or wooden plugs on body's ends. Valves are shipped in closed position to protect parts during transportation.

As soon as received, valves should be inspected to verify if there are no problems due to transportation. If for any reason protection or for inspection plugs are removed, and your are not going to install the valve immediately, make sure to put them again to maintain the valve clean inside.

If the plugs were lost during transportation, please inspect the valve inside, and remove all foreign material that can be present. If it is required an inside cleaning, make sure that the kind of solvent used will not affect packing and that will not represent a welding problem.

When receiving the valves please check that you receive the following documents:

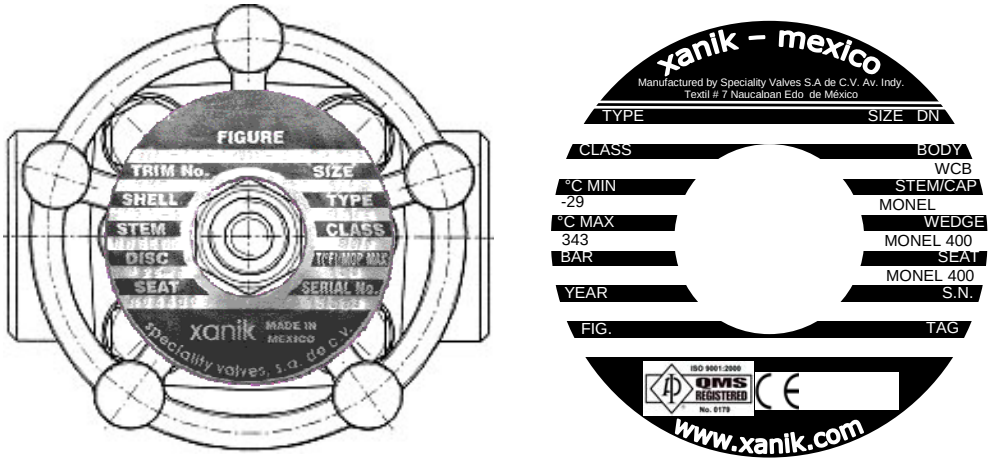
- Packing List
- Copy of the Invoice
- Receiving, identification, installation, operation and maintenance manual for valves from ½" to 2", classes 150 to 2500
- The certificates will be attached with the shipment, unless other instructions are requested in the order

IDENTIFICATION

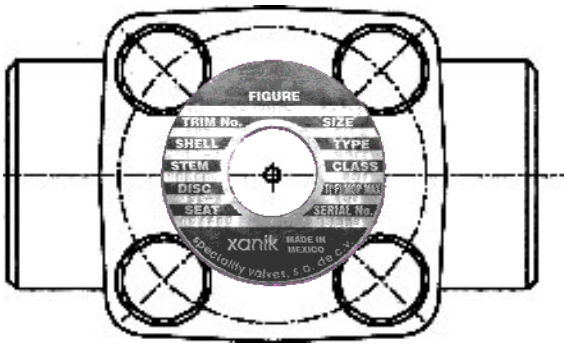
3.1. - Identification Plate

The valve identification plate is positioned on the top side of the Hand wheel (in gate and globe valves) and on the top side of the cover (in check, piston and swing).

Before installing, the minimum and maximum working temperatures and the maximum working pressure must be checked.



Identification Plate for Europe

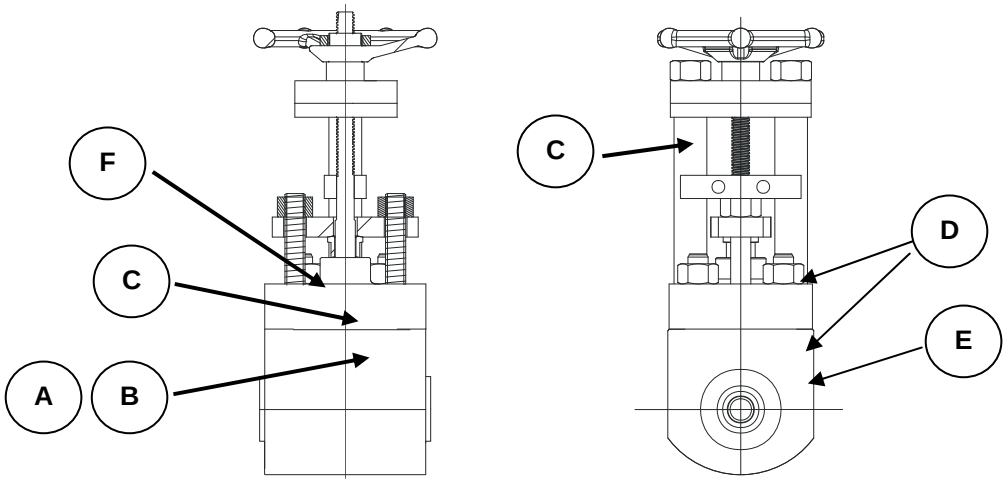


3.2. - Identification on the Valve

The marking on the valve can have a different position depending on type and construction. In general, the following information is part of the marking of the valve:

a. - VALVE CLASS
b. - NOMINAL DIAMETER in inches
c. - X**anik** LEGEND
d. - FOUNDRY LOGO
e. - TYPE OF MATERIAL on Body and Bonnet
f. - SERIAL NUMBER on Body and Bonnet

These legends can be marked as cast or stamped with low stress stamp numbers.



INSTALLATION

4.1. - Valve Installation
Before installing the valve on the line, please check:

Proper tools
Make you sure that the valve-line connection is correct
Make you sure that the direction of the arrow, coincide with the fluid flow in the line (not necessary for gate valves)
Verify that there is enough space around the valve, for an easier operation.
Consider also the necessity of space for possible repairing and/or substitutions.
Make sure that you have removed the protection's plugs and verified that the valve is clean inside.
When ever it is possible clean the part of line near to the valve with compressed air (free of moisture), to take away possible traces of dust or dirt.
After the installation remove any foreign material from the line.

4.2. - Gate and Globe Valves installation

These valves should be installed, when ever it is possible, on horizontal line, with the stem towards up. It is accepted any position between vertical and horizontal, which guarantee a correct drainage.

If stem position is below the horizontal line, some material could remains in the bonnet cavity and affects the valve correct function.

The flow on the Gate valves can go in any direction.

For globe valves, we recommend that pressure always comes from the bottom hole passage, in this way pressure will not be applied on the packing, when the valve is closed.

4.3. - Check Valves installation

These valves should be installed along horizontal lines with cover towards up side; possible variations along the vertical axis should not be over 5°.

The installation of Swing or piston valves with return spring can be installed in other positions, for example in vertical position with the flow going upward.

Never install check valves along vertical lines with the flow direction towards down or along horizontal lines with cover bent with angles not bigger than 5° on the vertical. Install always check valves in the direction indicated by the flow arrow on the body.

4.4. - Valve's Type of End Connections

4.4.1. - Welding end connection

SW ends (according to ANSI B 16.11)
BW ends (according to ANSI B 16.25)

These connections must be welded appropriate to guarantee resistance to pressure. Valves, pipes and fittings and any other accessories welded along the line must be of compatible materials and welder should be qualified.
Be sure to left always 1.5 mm of space between the end of the line pipe and the bottom valve SW end to be welded; this permits a correct expansion of the material during the welding.

Remember that the body valve is compact and there is a short distance between ends, **a long welding time could cause that the valve gets too hot and causes damages and/or distortion of the components**. To avoid this problem we recommend waiting until the temperature goes down, alternating with two near valves, or just wait until the welding area cools down.

If the valve is going to be welded directly on the line, be sure that the valve is in the nearly closed position. Immediately after welding verify that the valve works in a correct way and detect any possible distortion of the internal parts (seat rings, disc and stem).

a. - Welding and Heat Treatment of Socket and But Weld End Valves

Speciality Valves recommend the following guide lines for Welding and PWHT, but the responsibility of having these procedures is of the user. Many piping and construction codes requires that valves welded to pipe lines, the welds and heat affected zones be heat treated after welding. The reason is that post weld heat treatment reduces residual welding stresses and softens hard micro constituents that forms in weld and base metal heat affected zones

Before welding the valves must be in the semi open position

Depending on the alloy, Post Weld Heat Treatment temperatures are in the range of 595°C and 730°C. Most PWHT is done below the lower critical AC1 temperature for base and weld metal. The critical temperatures for plain carbon steel (WCB, A105) and alloy steels (WC6, WC9, C5, F11, F22, F5) used in valve manufacture are shown in Table 1**. For Stainless Steel and Nickel alloys follow the procedures established in ASME B31.1&B31.3.**

TABLE 1 CRITICAL HEAT TREATING AND WELDING TEMPERATURES (ºC)

GRADE	Critical Temperatures (ºC) (a)				Martensite (b)	Preheat & Interpass Temperatures
	Heating		Cooling			
	AC1	AC3	AR3	AR1	Start	
Carbon Steel (0.20%) ASTM A216 WCB ASTM A105	738	832	782	704	800	95-180
1.25 Cr – 0.5 Mo ASTM 182 F11 ASTM 217 WCC	776	890	843	726	660	150-315
2.25 Cr – 1 Mo ASTM 182 F22 ASTM 217 WC9	804	871	821	721	740	150-315
5 Cr – 0.5 Mo ASTM 182 F5 ASTM 217 C5	818	882	785	718	865	205-370

(a) Heating rate 120°C/hr : Cooling rate 10°C/hr	(b) Martensite starts temperature on cooling from temperatures above the AC1 temperature.
Critical temperatures: On heating are	AC1 — Lower critical start of transformation
	AC3 — Upper critical end of transformation
Critical temperatures: On cooling are	AR3 — Upper critical start of transformation
	AR1 — Lower critical end of transformation

Hardenability of these alloys is relatively high; their low carbon (0.05-0.20%) after preheating for welding develops an extremely high as welded hardness. WCB (A105), WCC (F11), WC9 (F22) and C5 (F5) (ASTM A217 & A182) respond well to stress relieving temperatures: 595, 620, 675 and 715°C, respectively.

Post Weld Heat Treatment increase as carbon level increases and as the valve and pipe wall thickness and diameter increase. To assure that all hard micro constituents have formed, the weld should be allowed to cool from the recommended minimum preheat temperature shown in Table 1, before starting the post weld heat treatment.

b. - Effect on Valve Trim (Seat Rings, Disc and Steam)

Post weld heat treatment of valves is difficult because valves contain internal parts whose properties can be modified or deformed with post weld treatment. The effect of PWHT depends on the Type of Trim (see API 600). For example Trim 1 (13% chromium - 410 and 416) Martensitic stainless steel, is more corrosion resistant in the fully hardened condition, PWHT (Tempering – Stress Relief) reduces corrosion resistance. The lower the tempering temperature, the greater the corrosion resistance and the higher hardness and strength. Conversely the higher the tempering temperature, the lower the corrosion resistance, hardness and strength.

When gate valve seat rings are hard surfaced with either cobalt or nickel based hard surfacing material the hard surface deposits retain their wear and corrosion resistant qualities even after exposure to high stress relieving temperatures. Seat ring distortion has not been a problem.

Globe valves with 13% chromium trim are subject to the same thermal influence as in gate valves with respect to discs and stems. Globe valve seats are generally integrally hard surfaced and are, as in the case of the gate valve seat ring, virtually unaffected by post weld heat treatment. When the valve trim is of the type of the unstabilized 300 series stainless steel, some sensitization of the parts may be encountered during post weld heat treatment.

Depending upon application of the system, this may or may not be a trouble. The higher the alloy content in the valve body, the higher the post weld heat treating temperature. The higher the temperature the greater the influence on the hardness, strength and corrosion resistance of the stainless trim parts. Standards recommend Carbon Steel post weld heat treatment temperatures of 590°C minimum, 620°C minimum for WC6 (F11), 675°C minimum for WC9 (F22) and for C5 (F5). Heat treatments above 535°C can result in softening 410 stems, gates and discs, Figure 1. Therefore, preparation for post weld heat treatment should be well planned and implemented to specific procedures.

c. - Post Weld Heat Treatment of Socket Weld and Bolted Bonnet Valves

Bolted bonnet valves can be disassembled prior to heat treatment; seal weld bonnet valves cannot. To eliminate thermal change of Trim components (other than seat rings) for bolted bonnet valves, the bonnet sub assembly can be removed from the valve body prior to post weld heat treating. Orientation is not a factor in globe valves but it is necessary that body and bonnet sub assembly be reassembled to its original position after heat treatment

PRECAUTION FOR GATE VALVES gates are seated in during factory assembly to create a match between gate and seat rings. It is important that the pair of seat rings and orientation of the gate be re-established during reassembly on completion of post weld heat treatment. Please, when disassembly mark one side of the body/bonnet (or cover) and wedge so that you can return to the original position when you reassembly the valve

When heat treating weld ends of assembled valves, we recommend that the gate or disc be in the retracted position so that there is as much distance as possible between the gate or disc and the welded joint during heat treatment. This will minimize the temperature reached by the steam and gate or disc.

Maximum attention should be paid to not ever heat the body/bonnet of Bolted Bonnet Valves in order to protect the gasket and packing in the Stuffing Box.

For seal weld bonnet valves, please verify always that the packing and gasket material are suitable for temperature reached during welding and post weld heat treatment.

Take as a guide Table 2 for the maximum temperature to which the gaskets and packing can be subject on the basis of the material used. For more information regarding to other materials not include in this, please call Speciality Valves.

TABLE 2 Maximum Temperature for Gaskets and Packing by Type of Material

Material	Packing	Gasket	
	Max. Temperature	Max. Temperature	Type
PTFE	200°C	200°C	316+PTFE
PTFE	200'C	200°C	Monel+PTFE
Graph oil	650°C	900°C	316+Graphoil
Graphoil	650°C	800°C	Monel+Graphoil

If the valve packing or gasket are subjected to temperatures above those shown in the table they should be replaced. For carbon steel valves this is not a problem. For alloy valves the packing or gasket may reach these temperatures easily then the temperature of the packing chamber and gasket area should be monitored during post weld heat treatment.

d. - Post Weld Heat Treating Equipment.

The most common method for heating in post weld heat treatment is electric resistance heating elements. These elements come in various shapes, sizes and construction (See Figure 1). These can be designed for specific sizes and shapes and can be made or purchased in any configuration. Care must be taken in powering the pad as the resistance of a reduced size pad will be significantly reduced and the pad current dramatically increased.

FIGURE 1 Electric Resistance Heating Elements

It is convenient to connect the various element combinations to a multi outlet power transformer such as the shown in Figure 2. The on and off action is controlled by a programmable logic controller. An alternative is to attach to a constant current welding machine controlled by a tong ammeter. Care in both set ups must be taken to prevent overheating and burnout of the elements. It is important that the power recommendations of the heating element manufacturer be followed.

FIGURE 2 Multi Outlet Power Transformers and Controller for PWHT

To minimize mechanical changes in the heat sensitive trim material, a ceramic fibber blanket insulation material should be used to confine the heat of the weld joint being treated (see Figure 3). CAUTION: Do not encapsulate heating elements with insulation; this condition will result in an element overheating and burnout. Always provide a surface to which the element can dissipate heat.

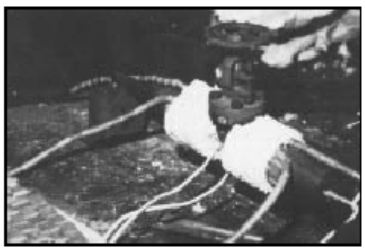


FIGURE 3 Insulation of a ½" Valve Body for PWHT

e. - Temperature Control during Post Weld Heat Treatment

The mass of the valve body and the weld joint normally exceed that of the pipe welded into the body. This can be a problem because improper placement of the heating elements results in overheating of the lighter wall pipe, while the more massive valve body has not reached stress relieving temperature. Post Weld Heat Treatment requires careful placement of the electric heat treating elements, control and monitoring thermocouples.

To avoid pipe overheating, split carbon steel sleeves were attached to the line piping and butted up to the valve (Figure 4). This assembly simplified attachment of the heating pads and insulation and also lowered the temperature of the pipe section to acceptable stress relieving temperatures.
When post weld heat treating a 1/2 inch gate valve (Figure 4) the gate invariably reached temperatures of 535°C. Such temperatures result in significant tempering of the gate. In ½" valve there is no advantage to heating one end at a time. The gate, even when fully retracted from the gate seat ring slot, reach temperatures in excess of 535°C

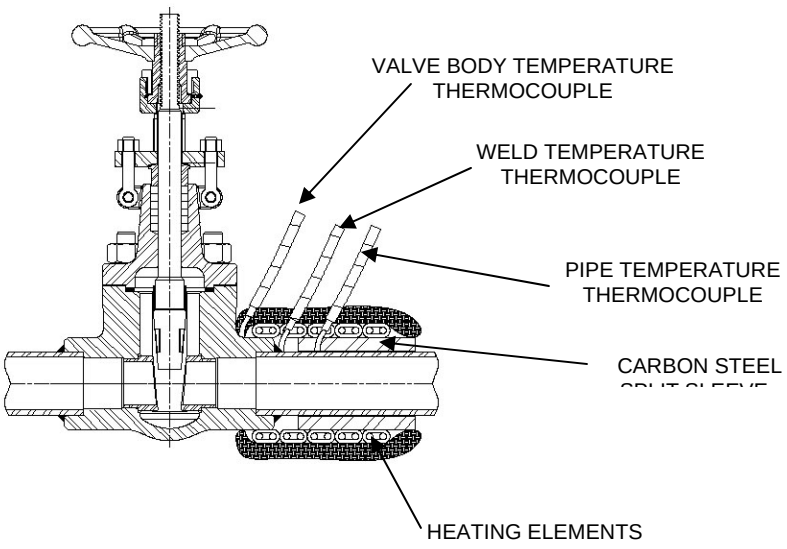


FIGURE 4: Typical Post Weld Heat Treat Arrangement

4.4.2. - Threaded connections

Threaded NPT ends - NPT (according to ANSI B1 20.1)

Before assembly, make a carefully inspection of threads. If you are going to use any thread lubricant, Teflon or other thread material, verify first the compatibility with the fluid on the system. Apply it always on the outside thread, never on inside thread.

Using too much material on the outside thread will be expulsed outside by the valve; meanwhile in the inside thread this will be expulsed in the cavity, making the elimination difficult.

During valve assembly with NPT ends on the line, do not turn the valve by holding the bonnet. Use a proper tool to turn pipes, one for move the body valve and other for move the pipe.

4.4.3. - Flanged connection

Raised Face Flange - RF (ANSI B 16.5)

Valve with Raised Face Flange must be installed with equal RF flanges as the line.

Joint Ring Flange - RJ (ANSI B16.5)

Valves with Joint Ring Flange must be installed with equal RJ flanges as the line.

Before assembly, make sure that valve/line flanges are of the same type.

For assembly of flanged valve joints use the following procedure:

Tight with a few force the nuts with cross action. This first tightening will be repeated more times to avoid flanges deformation and irregular pressure on the gasket.

Repeat the instructions of the previous paragraph using more locking force until you have the proper torque of all nuts. It could be necessary to repeat this procedure several times, because, when you lock a nut, there is normally a traction reduction on the next nut to it.

In applications where high pressure and/or temperature are used, Specialty Valves recommend to torque again 24 hours after installation, to correct possible elongation.

4.5. - Tightening and test operation in line

After completed the installation, operate the valve permitting or stopping the flow to eliminate the possible of having traces of foreign material.

Verify, when it can be applied, the correct tight of body/bonnet connection and the correct tight of the glands nuts.

Verify that the valve is operating in the correct way. The pressure test assures the whole joints integrity.

The backseat on the stem indicates the complete opening of the valve. You should not apply too much torque in opening.

If the valve remains long time in the same position, the operation maybe difficult, because of packing deformation and lack of lubrication in the stem threads. We suggest scheduling periodic opening/closing operation.

5. - OPERATION

5.1. - Gate valves

Gate valves are designed to close off or open up the flow in a pipeline. Gate valves are not recommended for throttling use.

Gate valves are commonly installed in horizontal pipe runs with the stem in vertical position. They can also be installed in any position with the stem other than vertical, but may require adequate construction depending on valve size and service conditions. When requiring valves for other than normal position, the valve orientation should be specified.

5.2. - Globes valves

Globe valves are designed to close off, open up or throttle the flow in a pipeline. The disc is designed to completely stop flow and form a tight seal with pressure under the disc.

Continuous throttling at less than 10% open may cause cavitations, noise, and wear and discs and seats destruction. While not designed as control valves and not recommended for continuous modulation, globe valves are often used successfully for manual or automatic control during limited periods of system operation (start-up, shutdown, etc.). Continuous severe throttling applications may require a control valve.

Globe valves can also be used with over-seat flow and pressure ("flow to close"), but such applications require careful consideration. In systems with dirty line fluids, this arrangement could lead to trapping foreign material in locations where it would interfere with opening. With over-seat pressure, the effort to close the valve is low, because closure and sealing are pressure-assisted.

5.3. - Check valves

Swing check valves are designed to open by the system pressure in a line, and any attempt by the flow to reverse will close the valve completely. Check valves allow flow in one direction only.

Correct sizing of swing check valves is required, because too low or too high velocity can cause disc vibrations and damage valve internals. Applications involving severely unstable flow, like rapid and frequent flow reversals or pulsating flow should be avoided. Relocating swing check valves within the piping system can often minimize or eliminate problems. **Speciality Valves** will be glad to advise you on your application.

Lift check valves are opened by the flow of system pressure in one direction and close automatically when the system flows in the opposite direction.

Lift check valves have lower flow coefficients and produce pressure drops comparable to globe valves.

They are sometimes preferred in systems where pressure drop is not critical. Lift check valves are generally the most practical types for small sizes, and they generally provide the best seat tightness. Lift check valves should be used in horizontal pipes.

MINOR MAINTENANCE

Ordinary maintenance of a valve consists generally in the stem/stem nut lubrication, in packing replacement and gaskets substitution (if there are any).

6.1. - Stem lubrication

Stem nut and stem threaded parts must be lubricated periodically considering job conditions, a least once a year. We recommend using a liquid lubricant. A graphite powder can also be applied (spray or apply with brush).

6.2. - Gasket substitution

The next procedure to replace a gasket (if there's one) is referred to gate valves, but can be used for globe and check valves too):

a. - Before disassembly any valve, ensure that all pressure has been removed from the line and from any cavities within the valve by operating the valve to a mid travel position. In the check valves ensure that there is no pressure in the inlet and outlet sides of the valve.

b. - Mark one side of the body/bonnet (or cover) so that you can return to the original position when you reassembly the valve. This operation is very important because guarantees the tightness. Screw off and remove body nuts.

c. - Take the assembly of the bonnet off and mark one the side of the wedge and one side of the body so you can reassembly the wedge to the original position.

d. - Remove and eliminate the old gasket.

e. - Inspect the gasket surfaces to verify a possible damage or deterioration. Clean the areas and take away any foreign material. Clean the gasket surfaces with a rough cloth. Any possible damage in the gasket surfaces can cause a leak. To obtain a good seal, the matting surfaces have a roughness between 1.6 and 3.2 Ra.

f. - Install the new gasket without using any sealing material during replacement.

g. - Reassembly the valve, assuring that the disk has been assembled to its original position. Torque values for body nuts are indicated in table 3.

TABLE 3 BOLT TORQUE

BOLT DIAMETER (in)	THREADS PER INCH	TORQUE (ft/lb)	TORQUE (Nm)
5/16	18	21	28.5
3/8	16	30	40.7
7/16	14	45	61.0
½	13	65	88.1
9/16	12	95	128.8
5/8	11	135	183.0
¾	10	230	311.0
7/8	9	360	488.0
1	8	535	725.3

6.3. - Packing Ring replacement

When a valve is open to permit the passage of a fluid at high temperature, there could be a leak through the packing. Do not torque the gland bolts immediately; wait until the valve reaches the operation temperature. Generally the leak stops in few minutes.

If the leak continues, follow the next instructions:

The leak through the stuffing box, not always indicates a defective valve. It could be necessary to retighten the packing gland.

A very high torque can cause the valve difficult to operate.

If the gland is at the end of run, or if a very high torque on gland bolt has been performed and this does not stop the leak a packing change is necessary.

Before you do this, make you sure that you have depressurize the line. Make all the safety precautions according to the fluid that you are handling

Removing the gland nuts and making the largest space between the gland and the stuffing box flange. Take the old packing off using a proper tool. Any remaining material of the old packing has to be eliminated from the stem. Clean the stem and the stuffing box, verifying if there's any damage. Install new packing rings, one at a time, 90° turned one from the other. Each new ring must be correctly pushed in seat before putting the other one. Put down the gland and the flange against the packing, reassemble and torque correctly the gland nuts.

7. - MAJOR MAINTENANCE

Procedures described in this chapter have to be used only if there is absolute necessary. If the following repairs are not required due to an immediate emergency, please return the damaged valve to the factory.

7.1. - Body/bonnet disassembly

In the following lines it is described how to disassemble body/bonnet. Remember that the following operation must be done only if the valve has a problem, that you could not correct by minor maintenance and it must be done by experienced trained personnel.

For bolted body/bonnet valves: Back to paragraph 6.2 Gasket replacement.

For welded body/bonnet valves welding needs to be removed with a cutting disc or a similar tool. Welding elimination will be as reduced as possible. At the end, screw offs the bonnet assembly, trying not to damage the disk. Remember that the bonnet bolts will be screw off counter clockwise.

7.2. - Seat repair and/or replacement

Valve configuration makes it necessary to take the valve off the line, before doing this operation. That is why we recommend to return the valve back to the factory (where it is possible) for replacement or repair. In case of emergency follow the next procedure on how to replace and/or how to repair seat rings.

7.2.1. - Seats and/or disk repair

For valves with a diameter between 1" and 2", if seats are too damaged, repair can be done directly on body, by polishing. Bottom dimensions can be repaired too, but it is difficult, we recommend, in this case, replacing the seat. Seats can be polished in body using a tool composed by a circular plate and a T-pin. The following picture shows the type of tool that should be used.

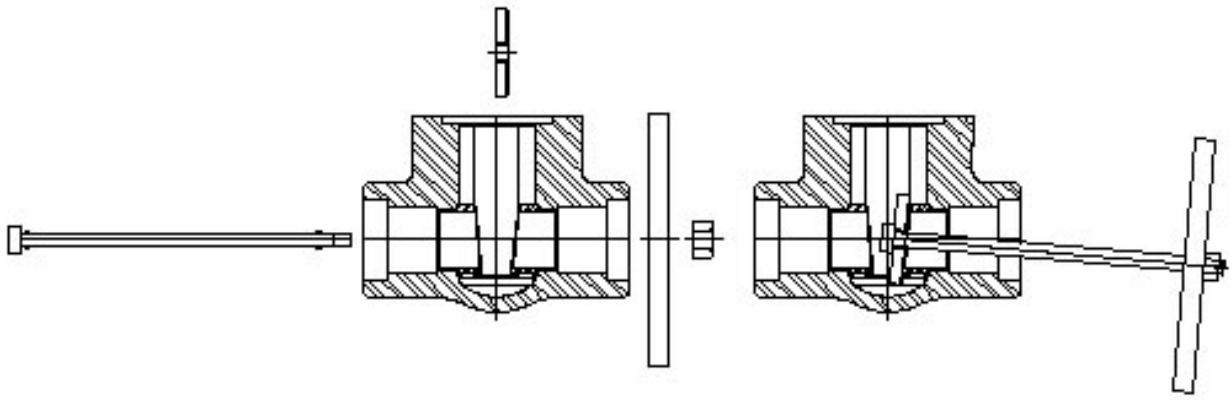


FIGURE 5: Seat Rings Lapping

Disks can be polished on every plane surface, but trying to keep the correct wedge (10º at the axis).

7. 2. 2. - Seats replacement

Seats should be removed by a proper chisel. Work with the chisel alternatively between the central hole and the body ends, as it is showed in figure 6.

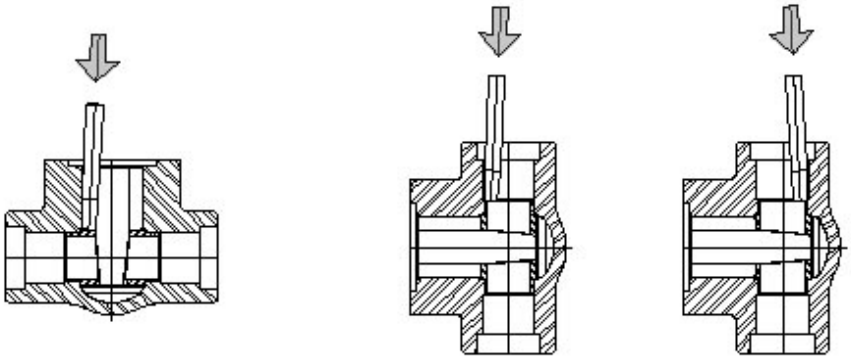


FIGURE 6: Seat Removal

Before starting with seat removal, make you sure that body and seats surfaces are clean and without foreign materials. Then seats must be introduced by the top opening of the body, with the top part (smallest) with the center upward (see figure 7). It is necessary to have enough space to work without problem around the valve body.

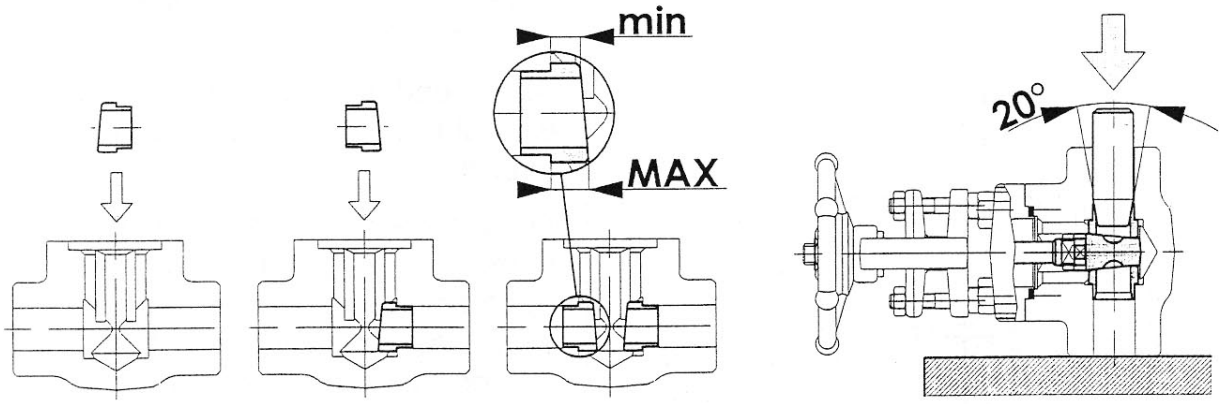


FIGURE 7: Seat Replacement

Place on seat connection surface a small quantity of grease for easy sliding on the bore. Insert a disk with a stem.

Seat ring placement on valve can be done hammering the end of special punching pin (see figure 7).

Control that the disk and seats are in line and that the stem is centred in the body bore.

With the stem force the disk in position.

Now it is ready for verifying contact between the jointing surfaces; this test can be done using the necessary force on the disk, to leave its impression on seats.

Remove the disk and, check that you have a uniform impression; the valve is ready to be reassembled.

Do not remove seats after this test.
Assemble the valve with a new gasket, and then force the disk in closing position. So the valve is ready for seats expanding.

When you use the punching pin, put the valve on something stable; lubricate the expansion punching pin center to avoid seizing up.

Push the punching pin in the ends hole up to the complete expansion of the seats border. Repeat the operation on the other side taking care not to expand them too much.

Set the disk free and then verify the job, and if expansion has been correct, the valve is ready for the pressure test.

7. 3. - Seat/Disc repair on Globe Valves

The following description normally concerns globe valves. For check and piston ball valves we suggest the substitution of the damaged parts, if a simple seat and/or piston polishing is not enough. If the defect on the disk conic part is high, disassemble the assembled stem.

Put the assembled stem on the jaws of a lathe and center the exterior surface of the disk. Block the jaws to assure that the conic surface is centred with the axis. Machine the cone for a minimum depth necessary to eliminate the defect. Polish, if necessary, with abrasive paper/cloth.

When the defect on the surface has been reduced, the contact surfaces can be taken to the original size by lapping. Apply a small quantity of an abrasive product among the parts that both turn in alternative direction. Repeat this operation until the defect is completely disappeared. At the end verify with Methylene blue, the perfect adjustment of parts.

For a correct use of the jointing parts, we suggest to do the operation described above, with seat installed in the body, turning the stem/disk by means of the assembled Hand wheel.

8. - WORKING LIMITS

For safety reasons, the working limits pressure/temperature for each class of valve and for each material are stated by contract and on the Identification Nameplates attached to the valves, In every case, the limits stated, must be mandatory followed. No exception is allowed. The Manufacturer will not be liable if the stated limits will not be followed by the User.

9.-VALVES TESTING

The valves were tested following the procedure of API 598 at the pressure established in ASME B16.34 according with the valve class and valve material. The customer can repeat this test or other pressure test according with his requirements.

Use a pressure gage compatible with the pressure test. Use the following table as a guide.

TABLE A TEST PRESSURE GAGES	
RANGE USED (PSI)	**PRESSURE GAGE RANGE (PSI)**
50-100	200
125-375	500
250-750	1000
375-1125	1500
750-2250	3000
1250-3750	5000
1875-5625	7500
2500-7500	10000
3500-10500	14000
5750-17250	23000