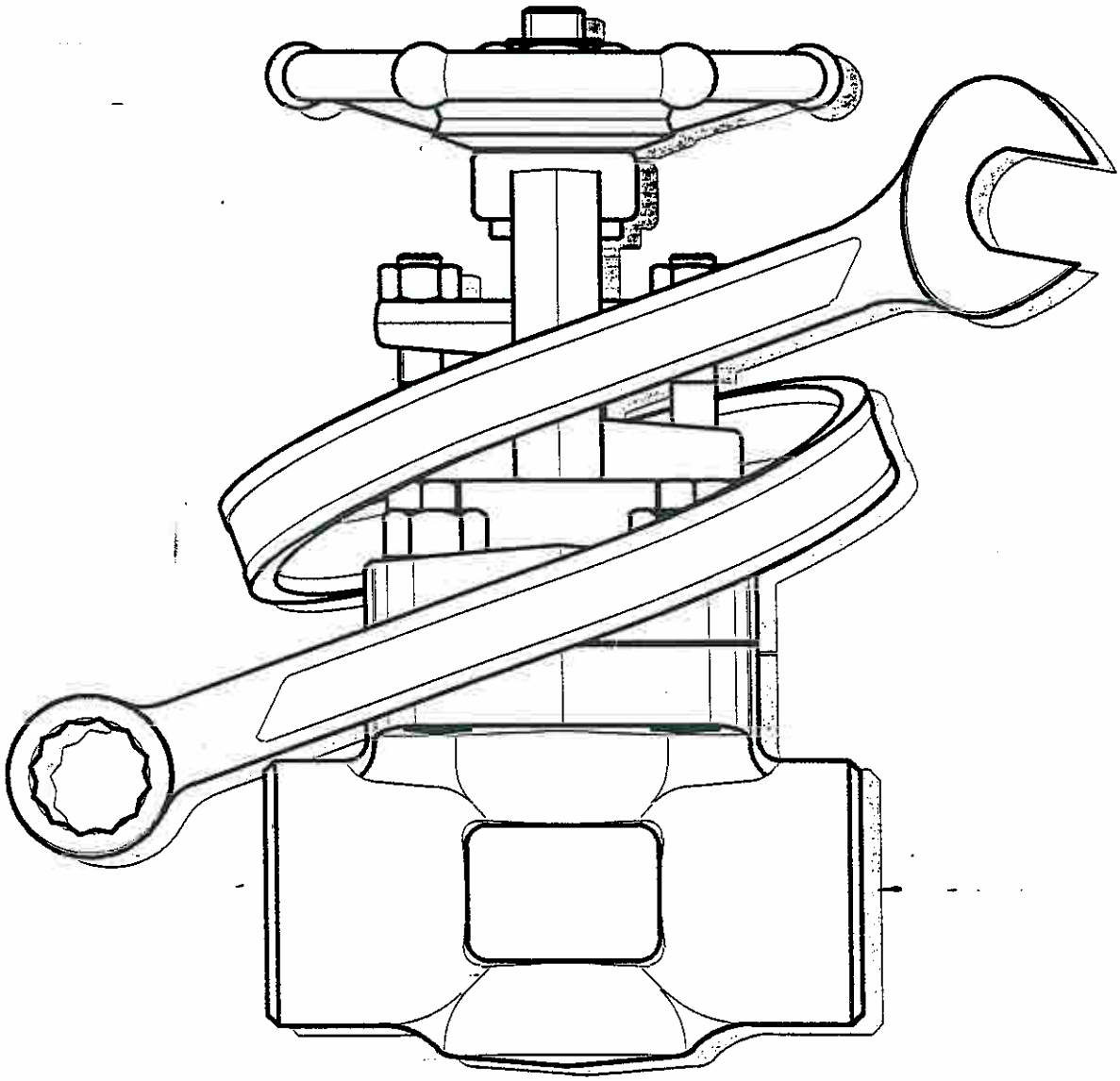
Powell Valves Forged Steel Valve Instruction Manual



REMARKS FOR READING:

Where this symbol is indicated we advise to read the section involved before performing the relevant operation

Where this symbol is indicated the reading of the section MUST BE done before performing any operation

INDEX..... Sheet

2) RECEIVING

If it's not asked in a different way, shipped material is packed in wood cases inside provided with tared paper between a layer of valves and another, undulate pasteboard. This kind of packing permits to satisfy normal transport needs, guaranting a good resistance against humidity.

All kinds of valves have an adecuated protection to storage in a closed enviroment for a maximum period of 6-8 months.

This protection is, if it's not asked in a different way, an against rust of phosphatizing treatment on forged parts (not stainless) and plastic plugs on body's ends.

Valves are shipped in closed position to protect parts during the transport.

As soon as received, valves should be controlled to verify if there are any problems because of the transport. If protection plugs are taken off for inspection necessity, make yourself sure that you put them in to mantain them clean inside.

If plugs should be missing we suggwst you to control the cavity.

All stranger material possibly present will have to be removed.

If it's asked an inside cleaning, make yourself sure about the kind of solvent used, especially if the valve has to be attached at the line by welding.

At receiving you have to check that there are the following documents:

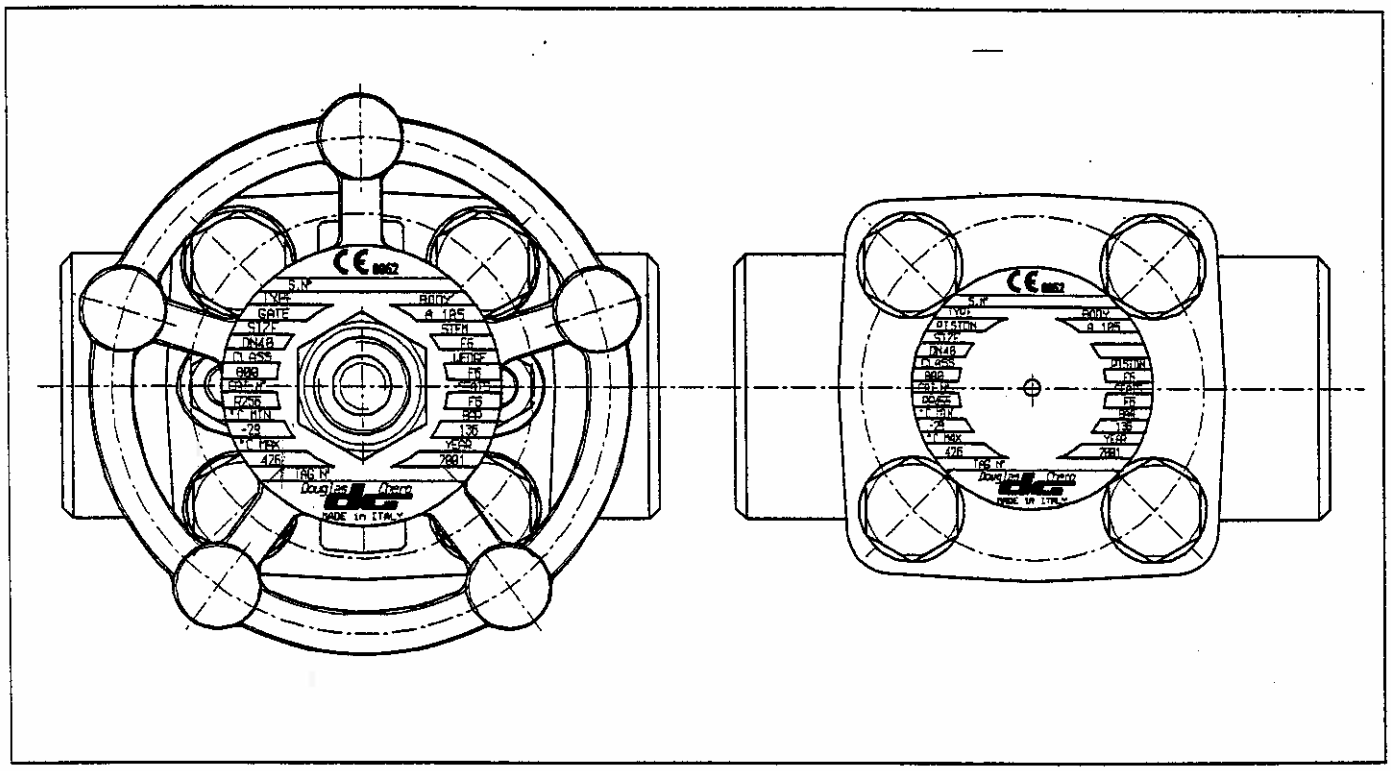
- The Packing List
- The Instruction Manual
- The certificates, if not expressly requested do not atthach they to the material

3) IDENTIFICATION

3.1) Refering on the plate

The valve identification plate is positioned, as in the picture, on the handwheel top side (in in gate and globe valves) and on the cover top side (in check and piston/ball and swing).

The valve's class (rating), the minimum and maximum working temperatures and the maximum working pressure must be check befor installation.



3.2) Referings on the valve

Referings on the valve can assume a different position, that depends on type and construction.

In general we can indicate the following rules (see the following picture):

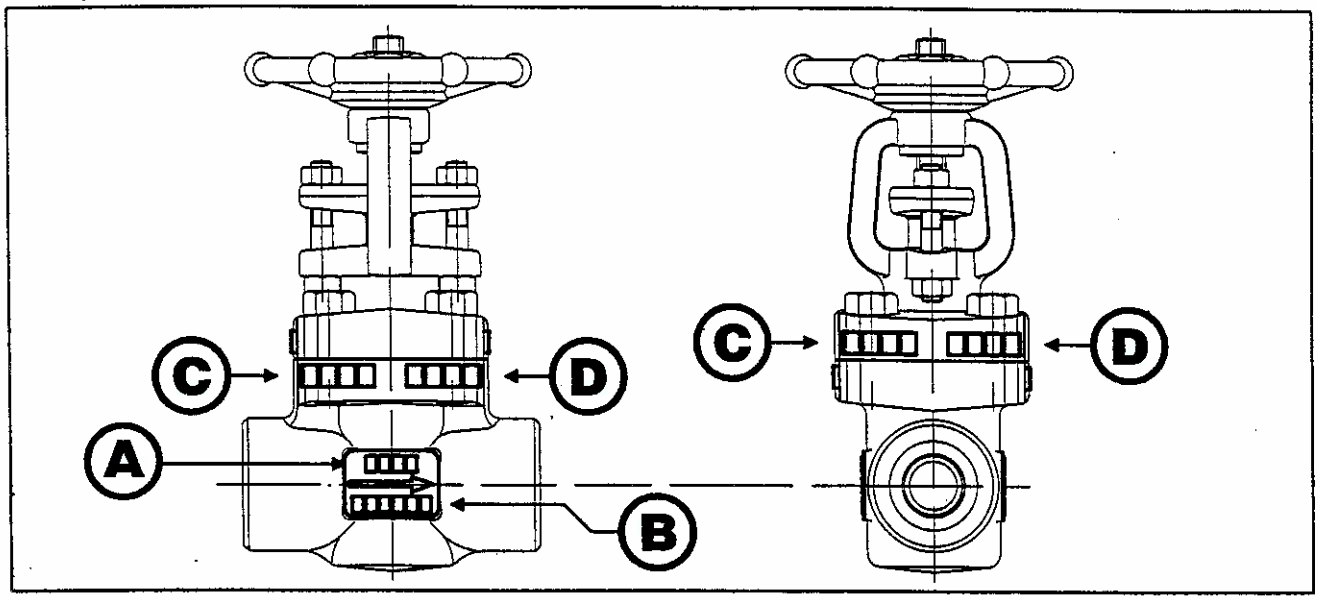
A) Number indicating the **Primary Working** pressure in Lbf/in² (ex.: **800**)

B) Symbol indicating the **Nominal Dimension** of the valve (ex.: **Ø 1.1/2**)

C) Symbol indicating the **Rough Supplier Code** and the **Rough Casting Code** normally separated by a space or a dash (ex.: **FA-CC** or **FA CC**)

D) Symbol indicating **Body/Bonnet/Cover Material's Quality**: by symbology ASTM (ex.: **F316L**)

All the above description are normally taken from forging during the pressing.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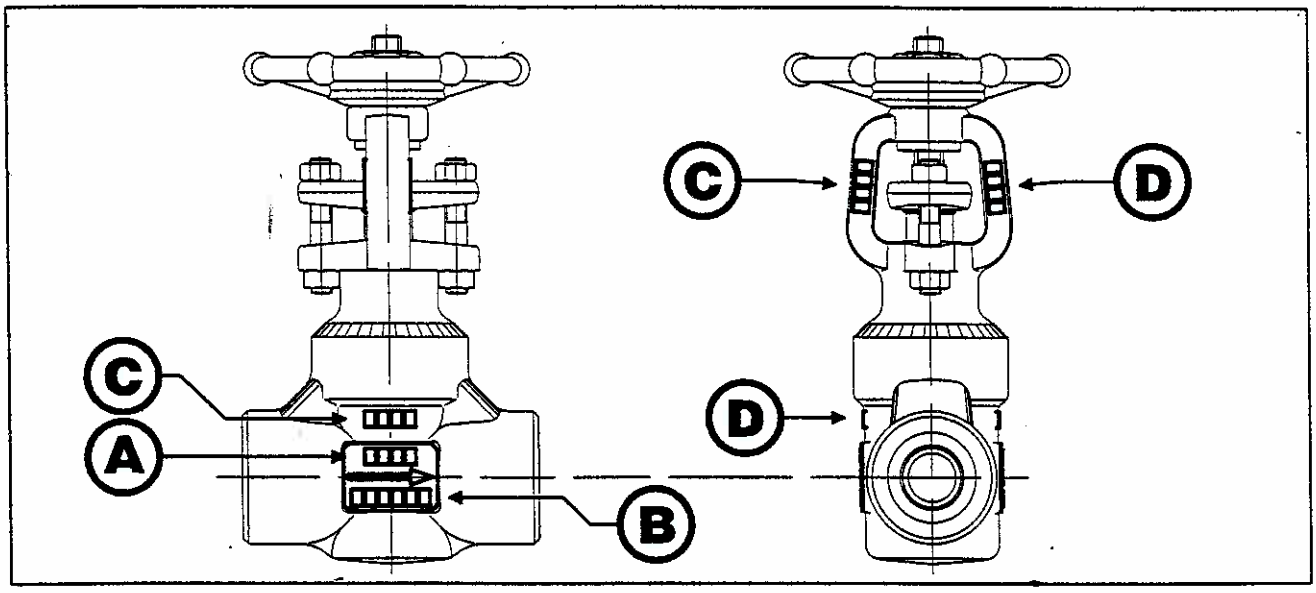
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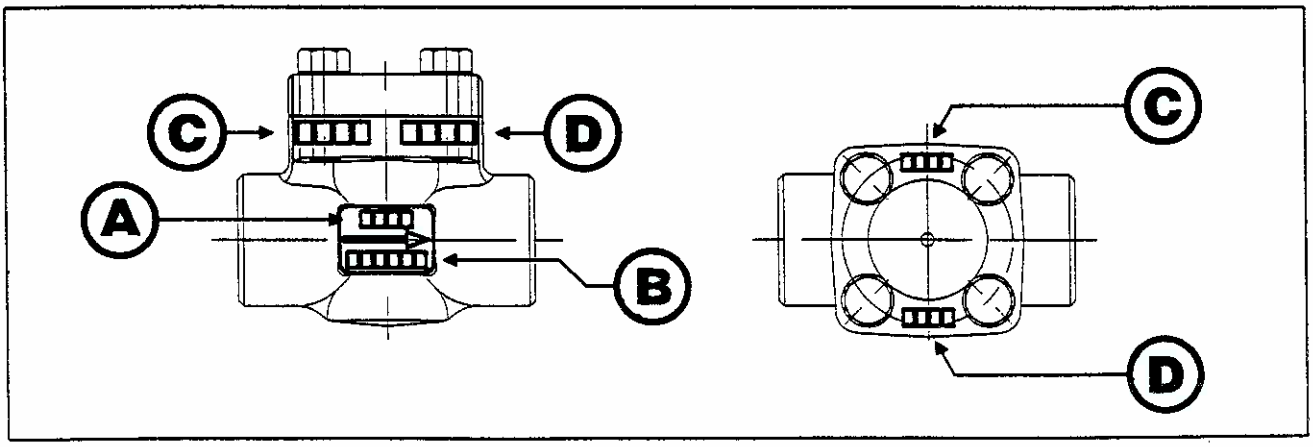
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4) INSTALLATION

Some necessary condition for installation:

- ⇨ use proper tools
- ⇨ make you sure that the connection valve-line is correct
- ⇨ make you sure that the direction of the arrow, pressed on the body valve, coincide with flowing of the fluid in the line (not necessarily for gate valves).

4.1) Valves removal from packing

Before removing the valve please verify the wheight shown on the drawings. If necessary use a suitable lifting equipment.

The valve should be taken out from the packing only at the stage of the installation on the line, to avoid damage.

Please do not drop the valve to avoid damages at the connections and on the stem, which can be subject to deformation.

In the event of these circumstances pls ask for the replacement of the valve, since it should be no more suitable for a proper usage at the maximum safety.

4.2) Installation of the valve

Before you do the installation, verify that there's enough space around the valve, for an easier operation.

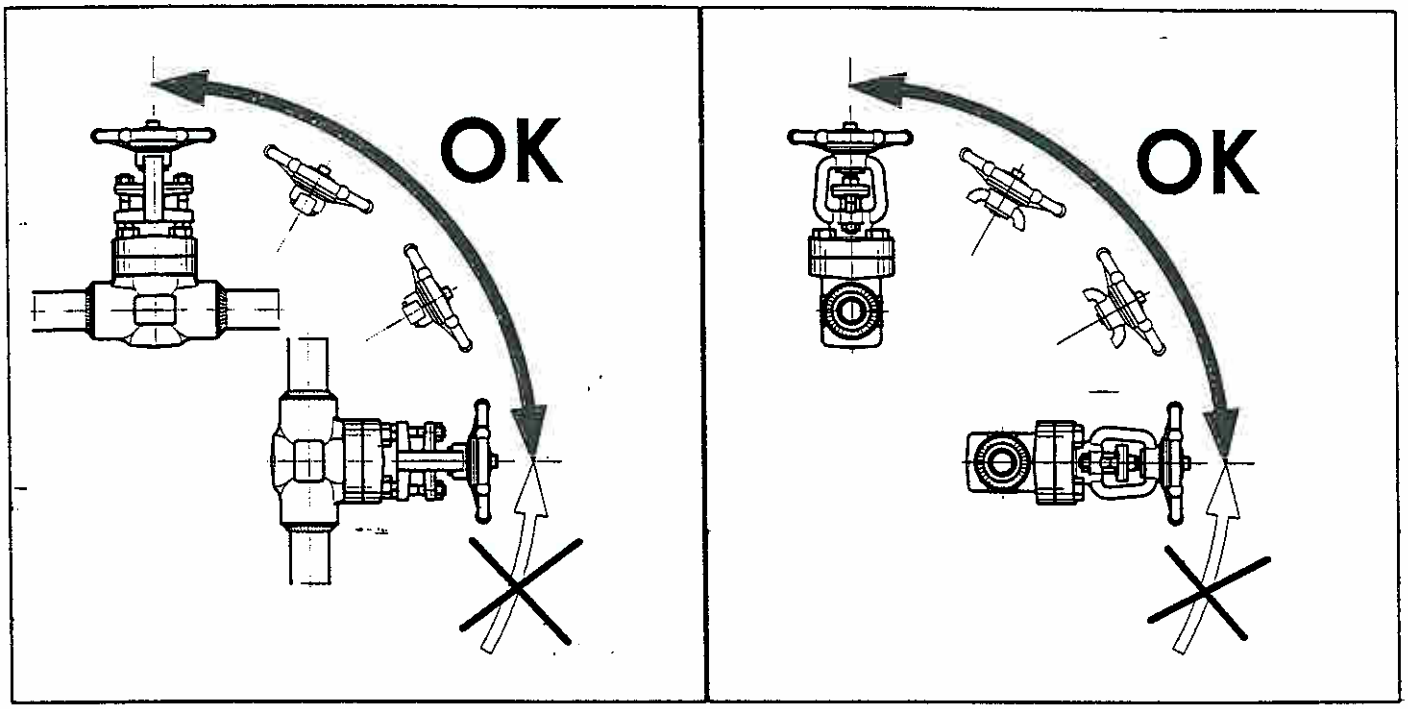
Consider also the necessity of space for possible repairing and/or substitutions.

Make you sure you have removed the protection's plugs and you have verified that the valve is clean inside.

Anywhere it's possible clean the part of line connected with the valve by compressed air (or water) to take away possible traces of dust or dirt.

After the installation remove any foreign material from the line.

4.3) Gate and globe valves positioning



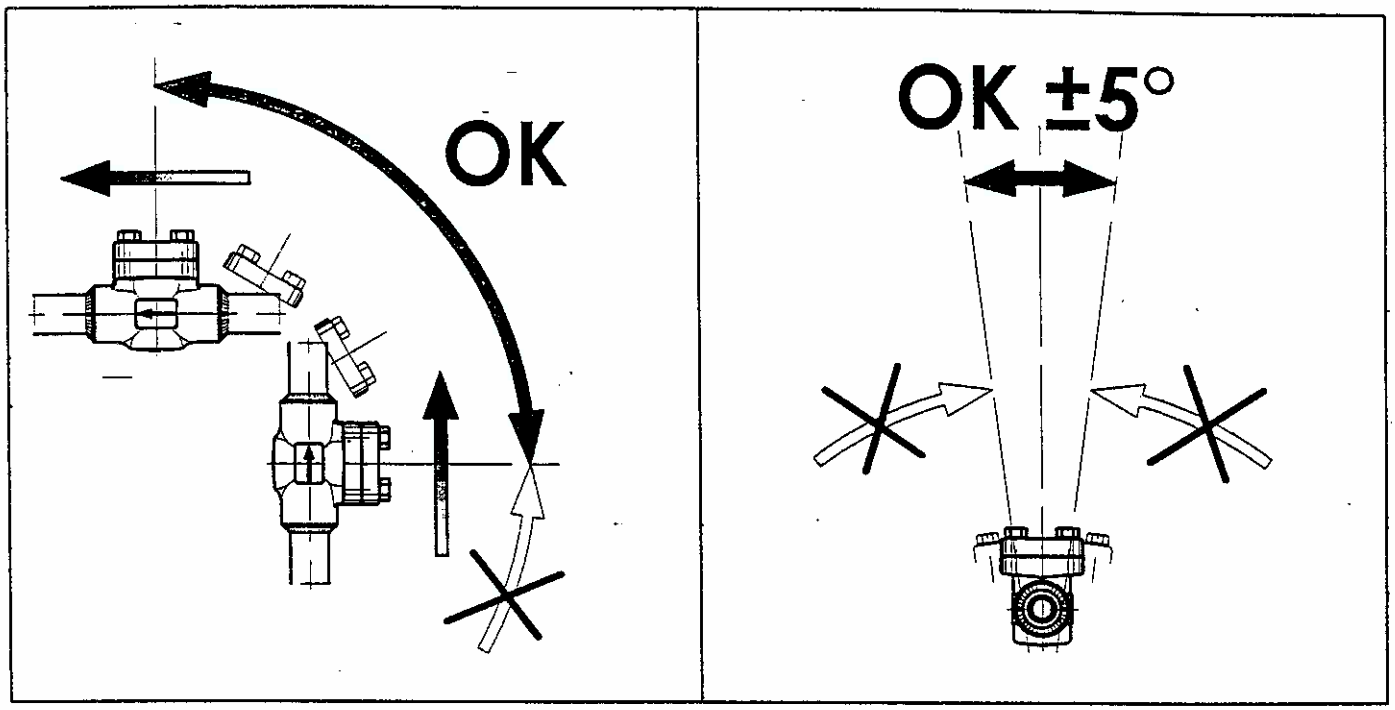
These valves should be installed, where it's possible, on horizontal line, with the stem towards up. It's anyway accepted a position between vertical and horizontal, which guarantees a correct drainage.

If stem position is below the horizontal line there will be settings of material in the bonnet cavity that could have effects on the valve correct working.

It's also possible putting it on vertical lines. Gate valves can be put without worrying about the flow direction.

As far as it concerns globe valves, we recommend you that pressure always comes from the bottom hole passage, in this way pressure doesn't work on the packing when the valve is closed.

4.3) Check valves positioning



These valves too should be put along horizontal lines with cover towards the up side.

Possible variations along the vertical axis shouldn't be over 5°.

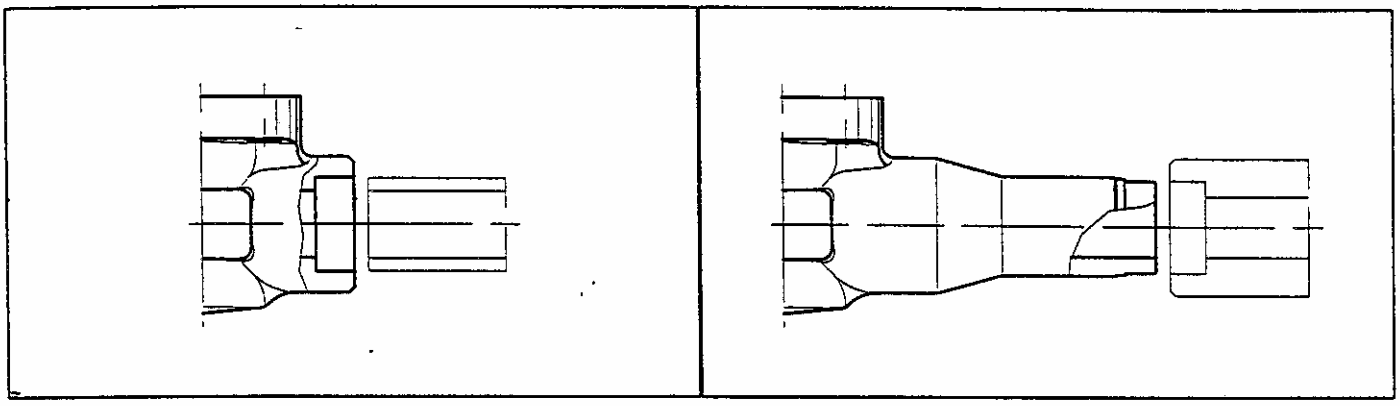
Swing or piston/ball executions with return spring can be adjusted to other installations, for example in vertical position with the flow going upward.

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

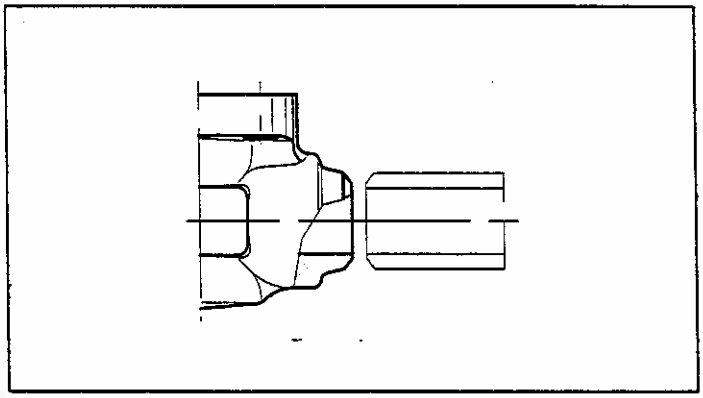
4.5) Kinds of valve's connections

4.5.1) Welding connection (standard)

- SW ends groove and tongue - SW (according to ANSI B 16 11)



- BW ends to be welded of the head - BW (according to ANSI B 16.25)



These connections must have an appropriate welding that could guarantee resistance at pressure.

Remember that valves, pipes and junctions and any other accessories inserted by welding along the line must be in compatible material and the person doing the welding must be qualified.

Make you sure you have left 1,5 mm of space between the end of the line pipe and the bottom valve SW end or the head end to be welded; this permits a correct exspansion of the material during the welding.

Remember that the body valve is compact and there's a short distance between extremities, any long welding could cause that the valve gets too warm and this causes damages to joints parts and/or distortion of the areas.

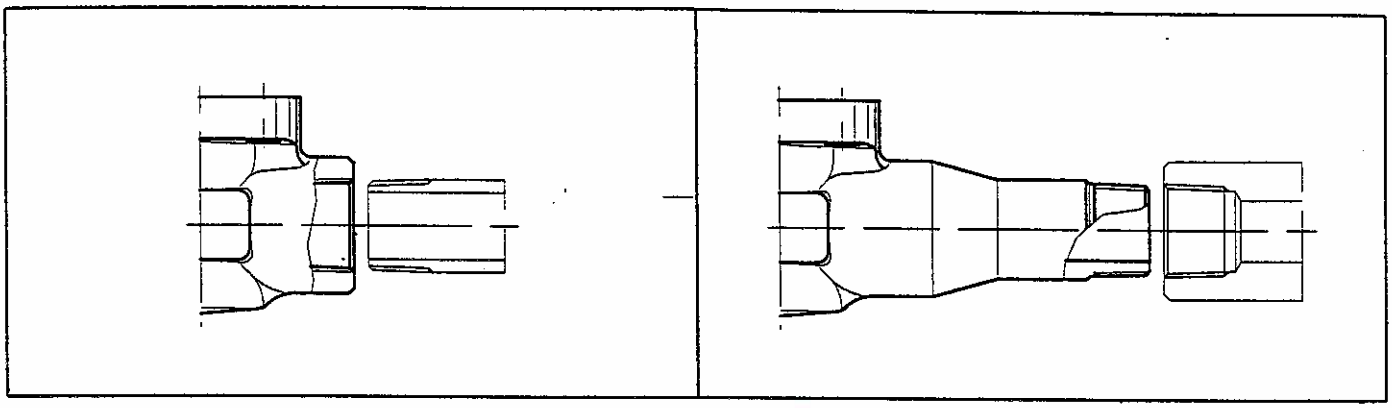
To avoid this problem we suggest you to let the parts to get cold, alternating it with two near valves.

When you are welding directly on the line make you sure that the valve is in position nearly closed.

Immediately after the welding make you sure that the valve works in a correct way, to prevent a possible sizing of the joint parts.

4.5.2) Threaded connection (standard)

- Threaded NPT ends groove/tongue - NPT (according to ANSI B1 20.1)



A particular care must be given to this kind of connection too. Make an inspection of all the threads before assembling.

Use a proper material for threads. Put it always on the thread that is outside, never on the one that's inside.

Too much material on the outside thread would be expulsed outside by the valve, meanwhile in the inside thread would be expulsed in the cavity, making the elimination difficult.

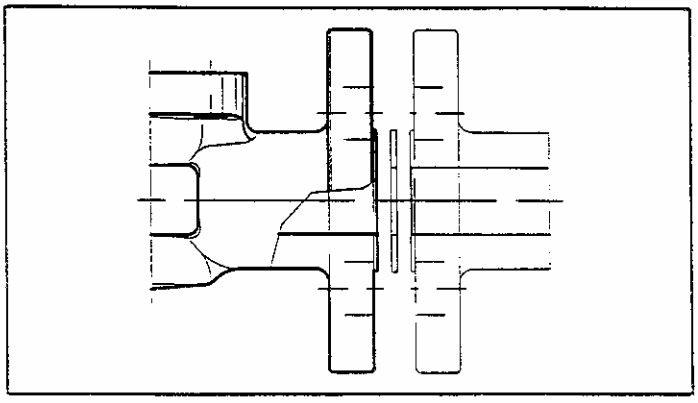
When you assemble valves with this kind of NPT ends on the line, don't bolt forcing on the bonnet.

Use a proper tool to turn pipes, one to move the body valve an another for the line pipe.

4.5.3) Flanged connection (standard)

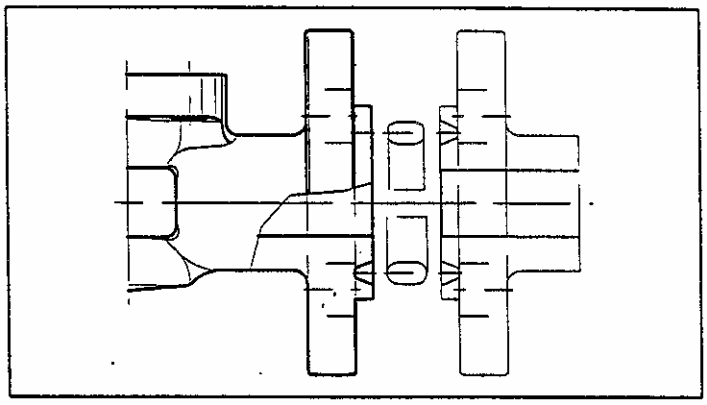
-Raised Face Flange - RF (ANSI B1 6.5)

Must be installed with equal RF flanges as the line.



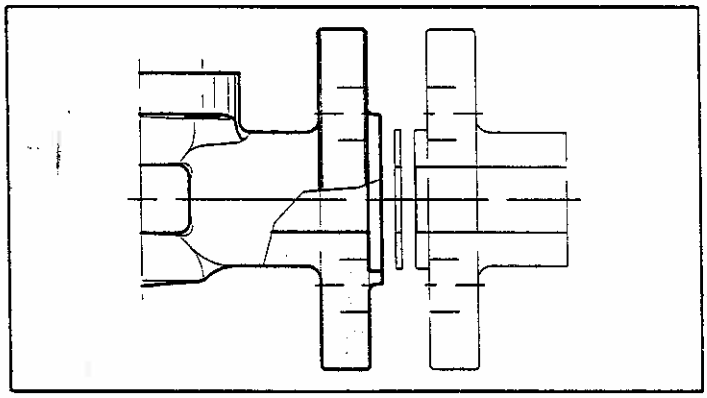
- Joint Ring Flange - RJ (ANSI B16.5 and ANSI B16.20)

Must be installed with equal RJ flanges as the line.



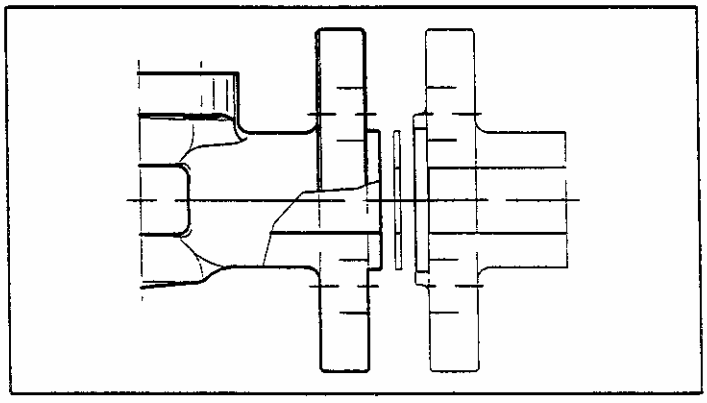
- Small Female -SF / Large Female LF (ANSI B16.5)

Must be installated with complementary flanges SM or LM on the line.



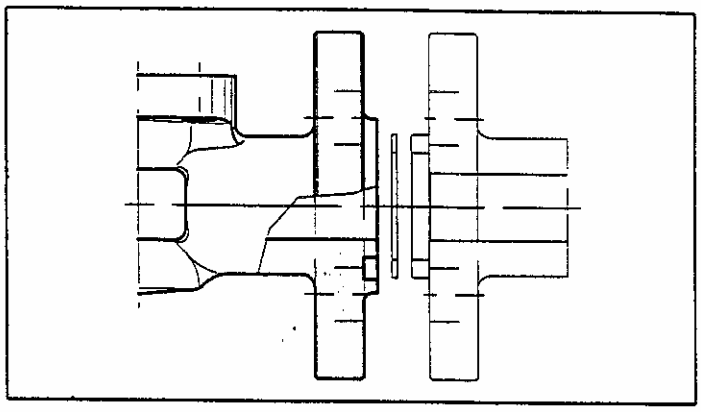
- Small Male flange SM / Large Male LM (ANSI B16.5)

Must be installed with complementary flanges SF or LF on the line.



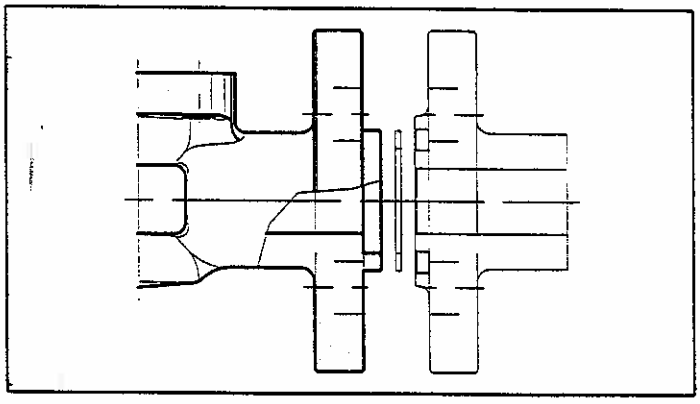
- Small Groove Flange -SG / Large Groove LG (ANSI B16.5)

Must be installed with complementary flanges ST or LT on the line.



- Small Tongue Flange -ST / Large Tongue -LT (ANSI B16.5)

Must be installed with complementary flanges SG or LG on the line.



Before the assembly, make you sure that the flanges valve/line are JK of the same type or, in any case, complementary.

Do the assembly of the flanged joint as specified here:

① Tight with 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.

① Repeat the previous passage using more locking force until you have the correct locking of all nuts. It could be necessary repeating this passage more times, because, when you lock a nut, there's normally a traction reduction on the nut next to it.

① In applications where high pressure and/or temperature is used, we recommend to control again the correct locking joint 24 hours after installation just to correct possible settlements.

4.6) Final closing and test operation in line

After having completed the installation, handle the valve permitting or stopping the flow, to eliminate every possible trace of foreign material.

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

Control that you handle the valve in the correct way. The test under pressure guarantees the whole joints integrity.

The backseat on the stem has to be considered as a mean of determination for the complete opening of the valve. As there's less surface of contact in the untightiness area, you shouldn't apply too much force in opening.

Consider that valves with stem, kept for long in the same position, can make the handling worse, with sizing of packing and loss of lubrication in the stem thread. That's why we suggest to skedulate opening/closing operations.

4.7) Welding and Post Weld Heat Treatment

The valves must be semi-opened in case of weldings.

The maximum attention should be paid not to overheat the body/bonnet coupling of Bolted Bonnet valves in order to protect the gasket and the packing in the Stuffing Box (both for Welded and Bolted Bonnet valves).

Where post weld heat treatment for the relieving of welding should be performed, the same have to be localized only on the welding area, for the reasons stated at point above.

Anyway, the heating of the body valve should not be over 600°C, in order not to damage the body and disk seat.

The valve must be semi-opened.

Please always verify that the material of packing and gasket is suitable for the temperature reached during the operations.

As far as the post weld heat treatment, please take as guide line the table of the maximum temperature to which the gasket and packing can be subject on the basis of the material used.

The following table shows the more common materials.

Further information regarding materials not included in the said table, are available upon request to Douglas Chero S.p.A.

Material	Packings		Gaskets	
	Max. Temperature	Type	Max. Temperature	Type
PTFE	200°C	PT5504/S	200°C	316+PTFE
Graphoil	900°C	V48/E+GR8800	700°C	316+Graphoil
Flexna	400°C		300°C	316+Fiber

Please note that the maximum temperature applicable to the gasket, are always the same, irrespectively from the material used for the metallic spiral.

5) OPERATION

5.1) Gate valve

The flow through this type of valve is controlled by the movement of the disk (**13**) between two seats (**14**).

The bottom stem end (**12**) is jointed with the top part of the disk (**13**); that permits the necessary dragging for the manoevre.

The disk (**13**) is guided in all its run by a groove in the body valve (**10**).

Seats (**14**) are locked in their position by a rolling.

The stuffing box, containing the packing rings (**23**), is in the bonnet (**11**).

The packing (**23**) is pressed in the stuffing box by the gland (**15**) and by the flange gland (**16**) that exerts the necessary pressure by two tight rods (**20**) by four gland nuts (**21**).

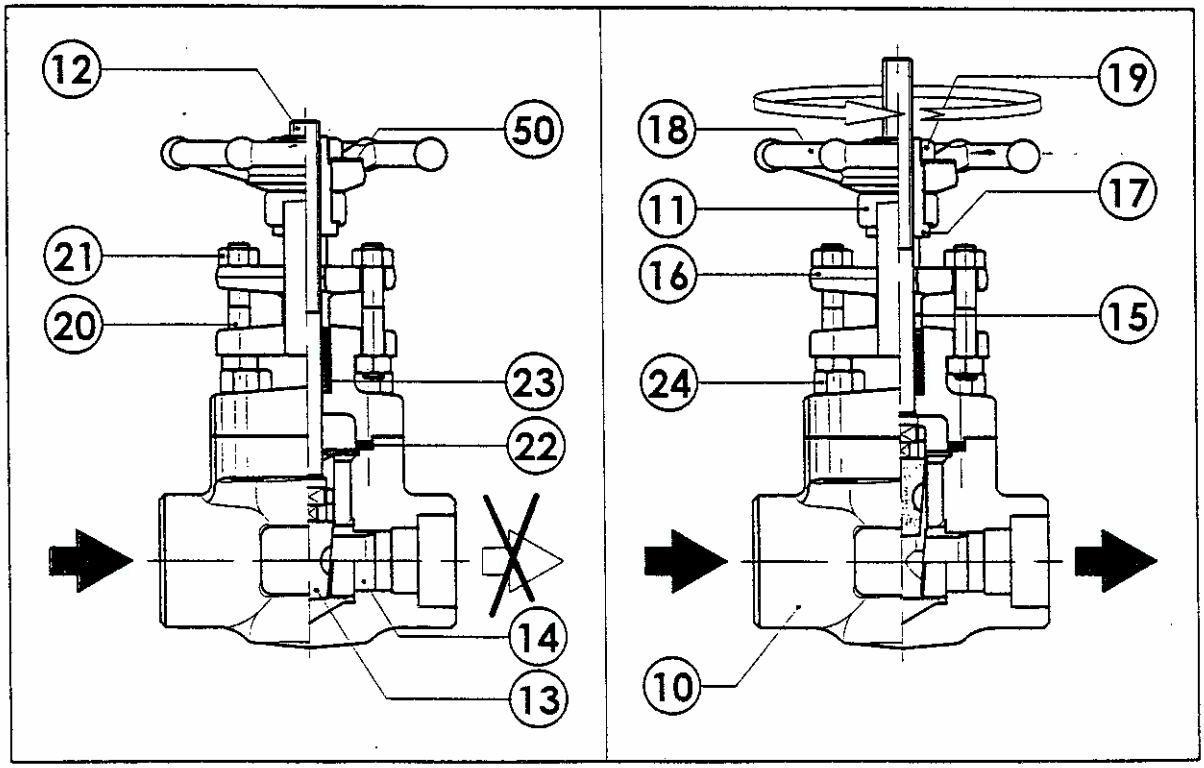
The threaded top part of the stem (**12**) is united with the stem nut (**17**), which is locked in its seat by the stem nut (**19**).

The valve opens itself turning the handwheel (**18**) in counterclockwise.

After the valve has been completely open, turn of one quarter towards the closing point, so that the valve doesn't remain in backseat position.

Never act with too much effort on the handwheel, the stem and the tight surface could be damaged (if there were foreign material).

The following picture shows a gate valve in normal operation, but the way of working can be applied, with few operations, to all other variants.



5.2) Globe valve

Globe valve construction is similar to the gate valve one, and the operation way is in general the same.

The difference consists in the different flow's control system, which in globe valve is applied by a disk (**13**).

Other executions , can be given if asked, consider a parabolic form, needle with inserts of Teflon.

The disk (**13**) is normally in couple with stem (**12**), by an elastic ring which guarantees the adecuance to the seat without permitting the separation of the stem (**12**).

As the fluid hasn't a straight course, the globe valve has a considerable loss of load.

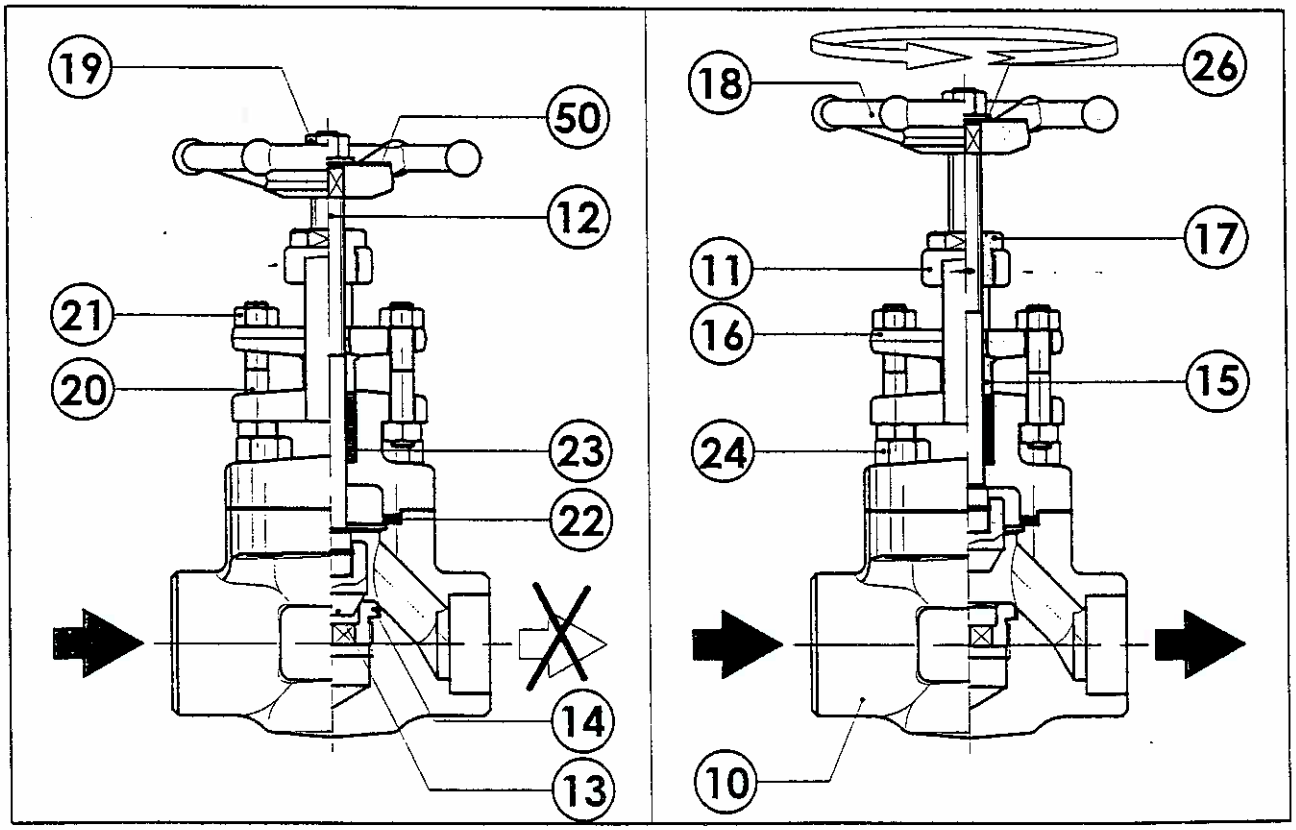
It's however an excellent mean of regulation, especially in the control of moderate-full passage.

As gate type, these valves too can be open turning the handwheel (**18**) counterclockwise.

After the valve has been completely open, turn of one quarter towards the closing point, so that the valve can't be in backseat position.

Never apply too much force on the handwheel, because stem and tight surfaces could be damaged (in case there would be foreign material).

The following picture shows a globe valve during normal operation, but the working way can be applied, with few exceptions, to all other variants.



5.3) Piston check valve

The piston check valve body (**10**) is the same as the globe valve one. in this case it's a piston (**13**) guided in the body valve, which controls the fluid acting against the seat (**14**).

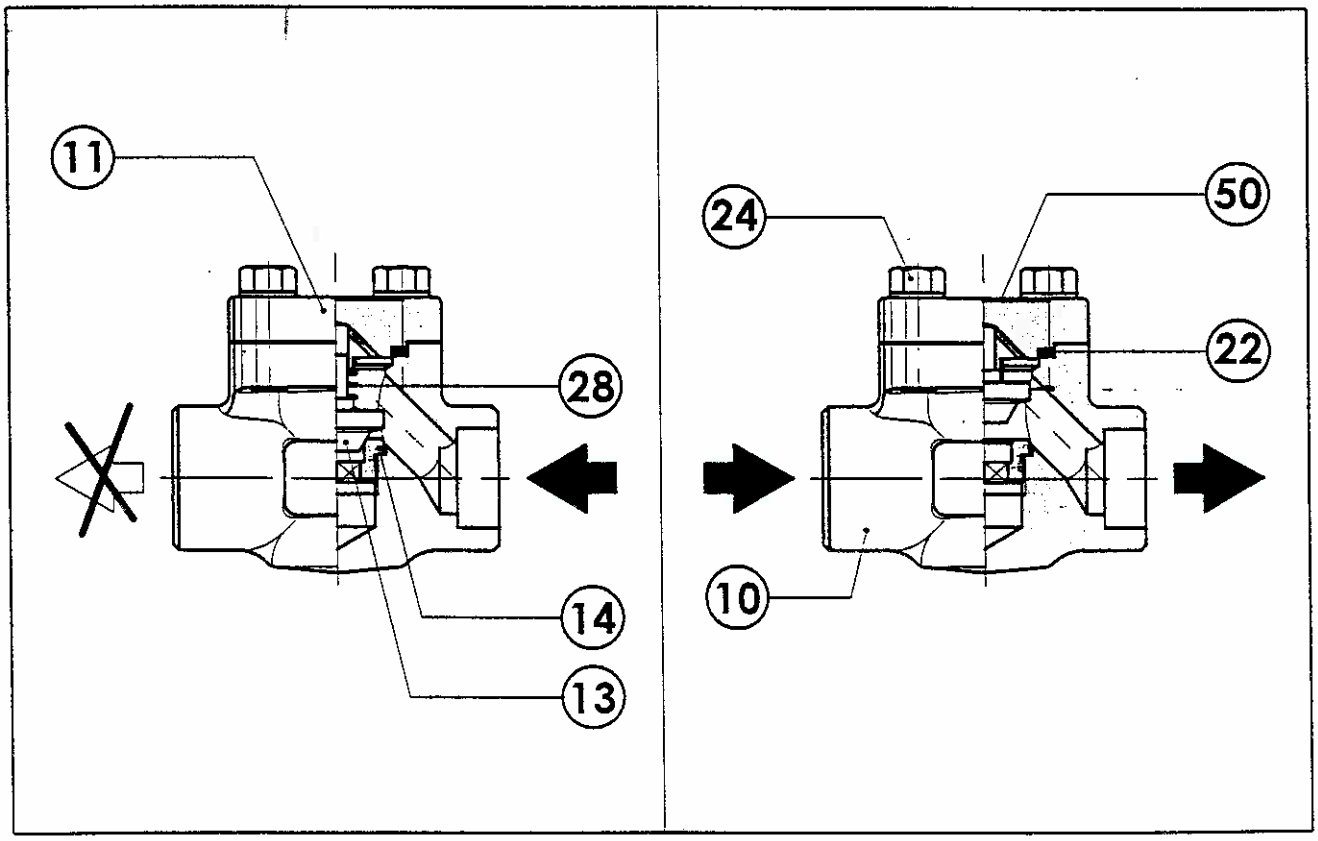
The piston (**13**) remains in touch with the seat (**14**) for gravitational force and open itself when the fluid passes through the bottom part.

The fluid entering in the opposite sense, instead, forces the piston (**13**) against the seat (**14**), stopping the passage.

The piston check valve is mainly used on horizontal lines.

It can be however used on vertical lines, by putting a return spring (**28**) on the piston (if not specified in a different way, the return spring is always put).

The following picture shows a piston check valve in normal operation, but the way of operation could be applied, with few exception, to all other variants.



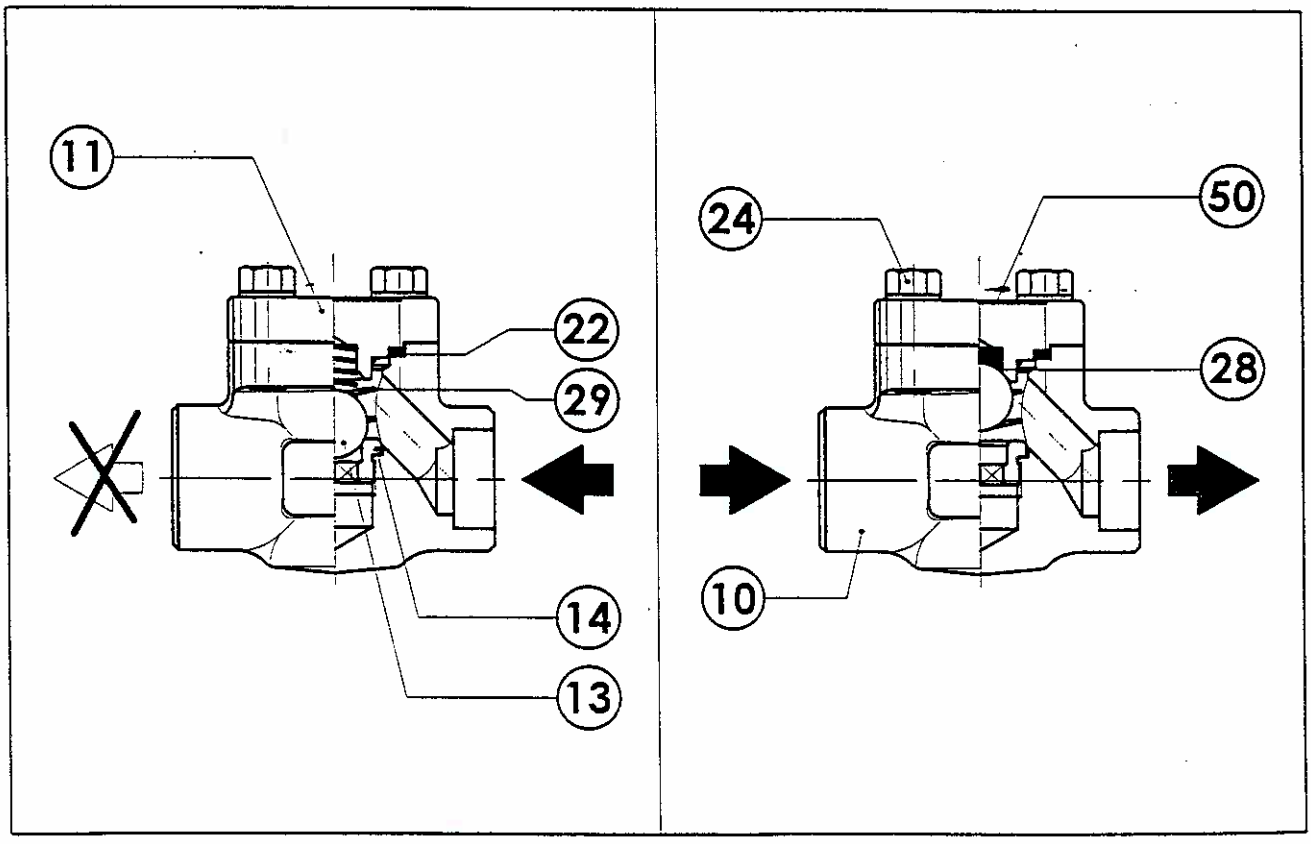
5.4) Ball check valve

This construction is the same of the type described right now, only the piston is substituted by the ball (**13**).

The cover form, with a proper guide system, limitate the ball (**13**) movements giving it a direction towards the seat (**14**).

As for the piston type, the ball check valve too can be used on vertical lines, using a return spring (**28**) if not specified in a different way, the return spring is always installated).

The following picture shows a ball check valve in normal execution, but the working way can be applied, with few exceptions, to all other variants.



5.5) Swing check valve

This type of check valve with straight passage is composed by a swing (**13**), which remains against the seat (**14**) in resting condition.

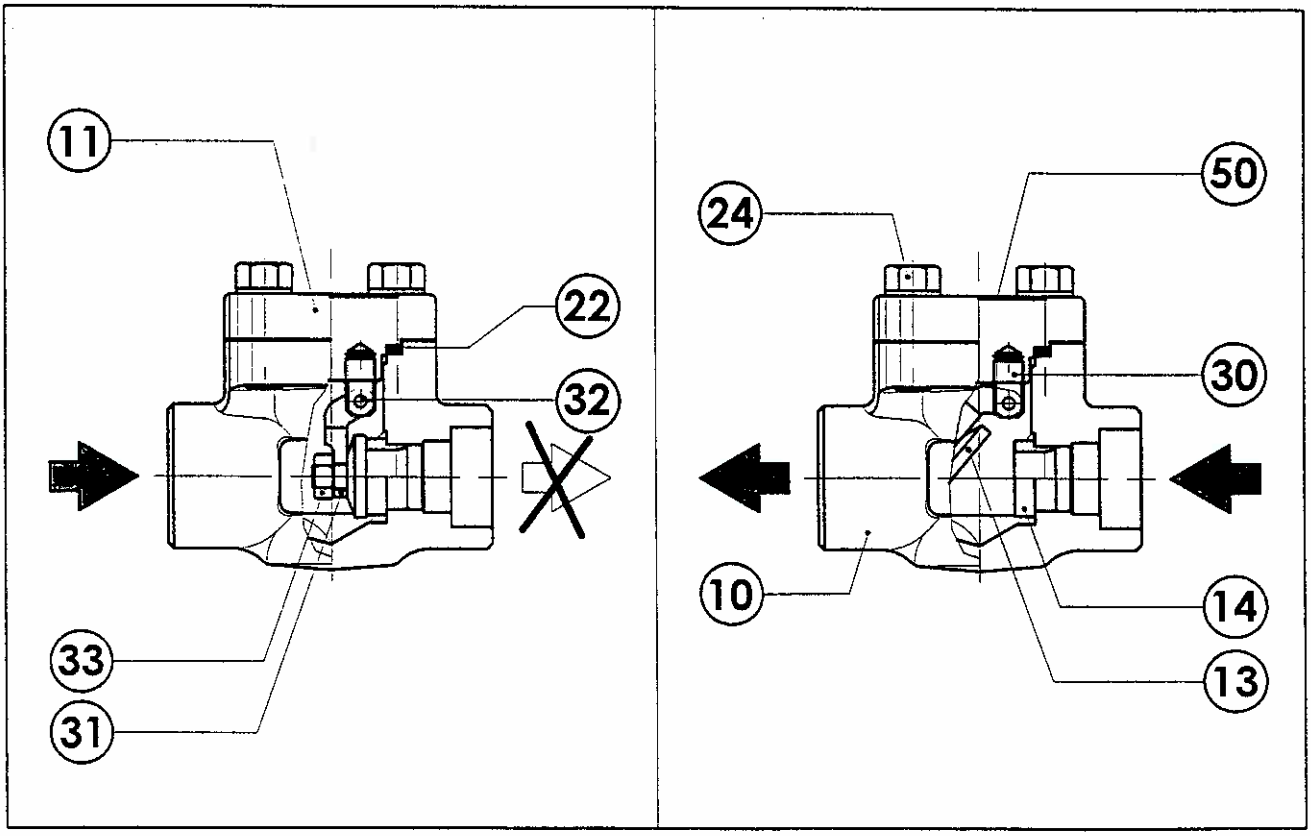
The swing is fixed at another hinge (**31**) which is fixed by a pin (**32**) at a rod (**30**) bolted at the cover (**11**).

When the flow passes in the direction indicated by the arrow, the pin permits the swing/hinge group (**13/31**) to turn leaving the seat (**14**).

An opposite direction passage makes the swing (**13**) going towards the seat (**14**) locking the flow.

The swing check valves are preferred to be installed on horizontal lines, but they can be, however, used on vertical lines with the flow arrow upward.

The following picture shows a swing check valve in normal execution, but the working way can be applied, with few ecception, to all other variants.



6) ORDINARY MAINTENANCE

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

6.1) Stem lubrication

Stem nut and stem threaded parts must be lubricated periodically considering job conditions, however not less than once a year.

We recommend to use a lubricant liquid or in any case very fluid.

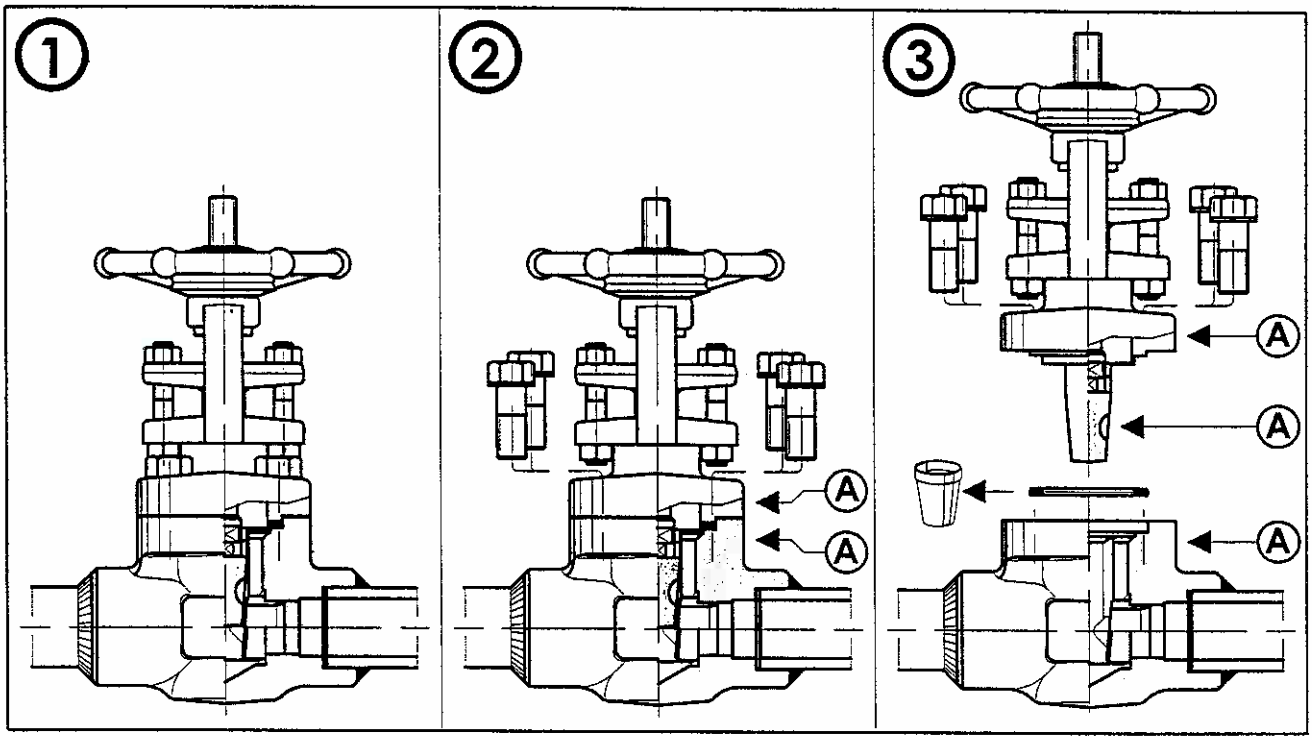
Graphite dust can be applied by spray or, if not available, by a common brush.

6.2) Gasket substitution

The procedure that has to be followed to substitute the gasket (where there's one), is indicated in the following lines. The phases indicated in the pictures are referred to gate valve, but this application can be done on globe valves as well. For check valves it can be done substituting the picture of the bonnet with one of the cover:

1) Isolate or depressurate the part of line, working with the valve in nearly-open position;
2) Sign a side of the body/bonnet (or cover) so that you can return at the beginning position where you do the final assembly. This operation is very important because guarantees the tightness among the same surfaces. Screw off and remove body's nuts.
3) Take the assembled bonnet off and sign the side of the disk (not on the tightness side). Remove and eliminate the old gasket.
4) Control the gasket surfaces that are in touch, just to verify a possible damage or deterioration. Clean the areas and take away any foreign material and/or residual. Clear the gasket seat with a rough cloth. Every possible ruling on the tightness gasket surface can cause a loss. To obtain a good tightness, the surfaces in touch must have a roughness between 1,6 and 3,2 Ra.
5) Installate the new gasket without using any sealing material during this substitution.
6) Reassemble the valve, making you sure that the disk isn't in touch with the seat. Locking values of the body nuts will have to follow in general this list:

1/2"R	1/4"F	3/8"F	M10	**40 ÷ 45 Nm**
3/4"R	1/2"F		M10	**40 ÷ 45 Nm**
1"R	3/4"F		M12	**50 ÷ 55 Nm**
1.1/4"R	1"F		M12	**55 ÷ 60 Nm**
1.1/2"R	1.1/4"F		M14	**65 ÷ 75 Nm**
2"R	1.1/2"F		M16	**85 ÷ 95 Nm**
2"F			M20	**130 ÷ 145 Nm**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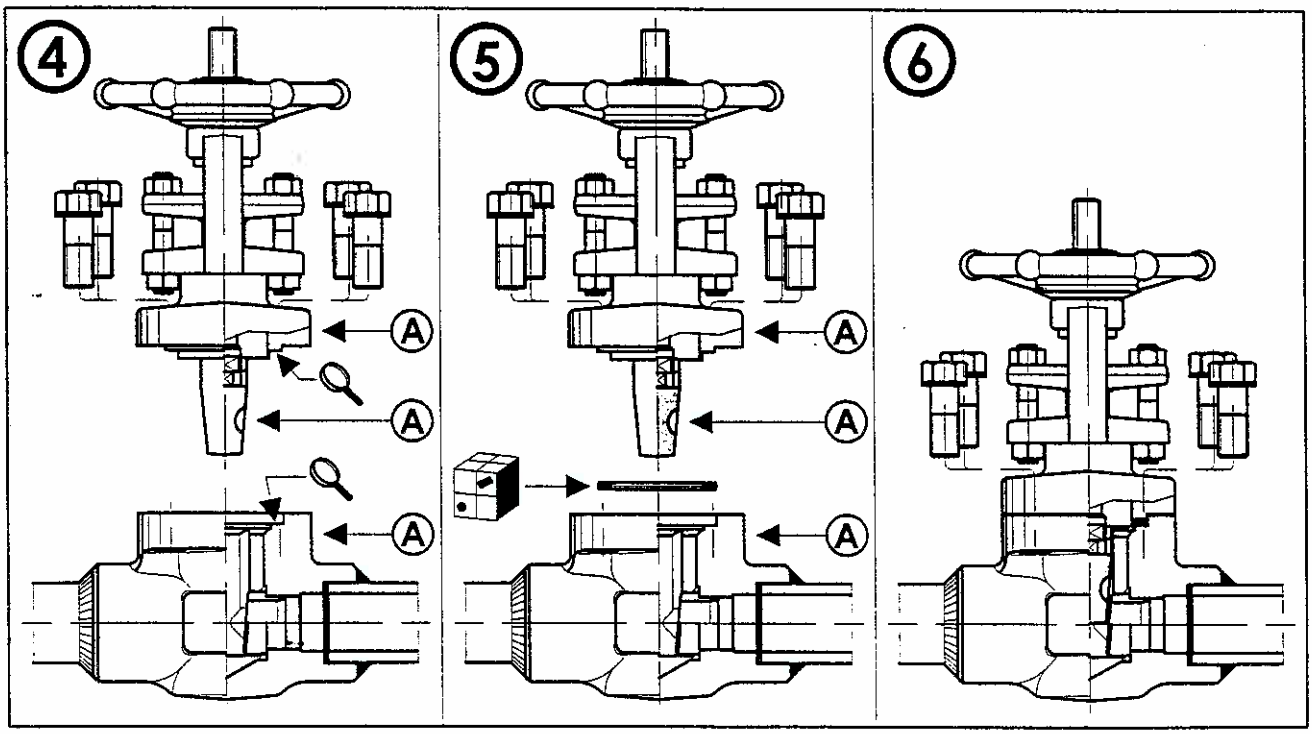
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6.3) Packing ring addition

When a cool valve is being open to permit the passage of vapor or anyway a fluid/gas at high temperature, there could be a loss through the packing. Don't lock immediately the bolted gland, but wait that the valve can reach the temperature of operation. Generally the loss stops in few minutes time.

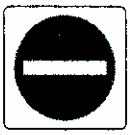
If the loss goes on, consult the following part of this section.

The loss through the stuffing box not always indicates a valve with defects: it could be necessary a higher pressure on the packing, acting on bolted gland.

A too high locking can cause difficult in handle and a possible damage at the stem.

If the gland is at the end of run, or if a too high locking on bolted gland doesn't block the loss, isolate it and under pressure the valve to re-packing it.

It's not necessary to take the valve off the line for this operation, it's however essential that the valve isn't working and that the stem is in backseat position.



Before you do this, make you sure that you have really depressured the part of line, especially if you are working on dangerous flows.

Take the packing off, 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 part of the old packing has to be eliminated from stems. Clean the stem and the stuffing box verifying if there's a possible damage. Installate new packing rings, one at a time, 90° far 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 lock correctly the gland nuts.

7) EXTRAORDINARY MAINTENANCE

Procedures described in this chapter have to be used only if there's absolute necessity. If repairs below mentioned don't answer at an immediate emergency, please return the damaged valve to the factory.

7.1) Body/bonnet disassembly

In these following lines is described how to disassemble body/bonnet. Remember that the following operation must be done only if it works bad 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 will be removed by a portable wheel or something similar. Welding elimination will be as more reduced as possible. At the end, screw the bonnet group off, trying not to damage the disk. Remember that the bonnet will be screws off in counterclockwise.

7.2) Seat repair and/or replacement

Valve construction and seats repair/installation make it necessary to take the valve off the line, before doing this operation.

That's why we recommend to return the valve back to the factory (where it's possible) for replacement or repair. In case of emergency we show in these following lines, how to replace and/or how to repair where it is.

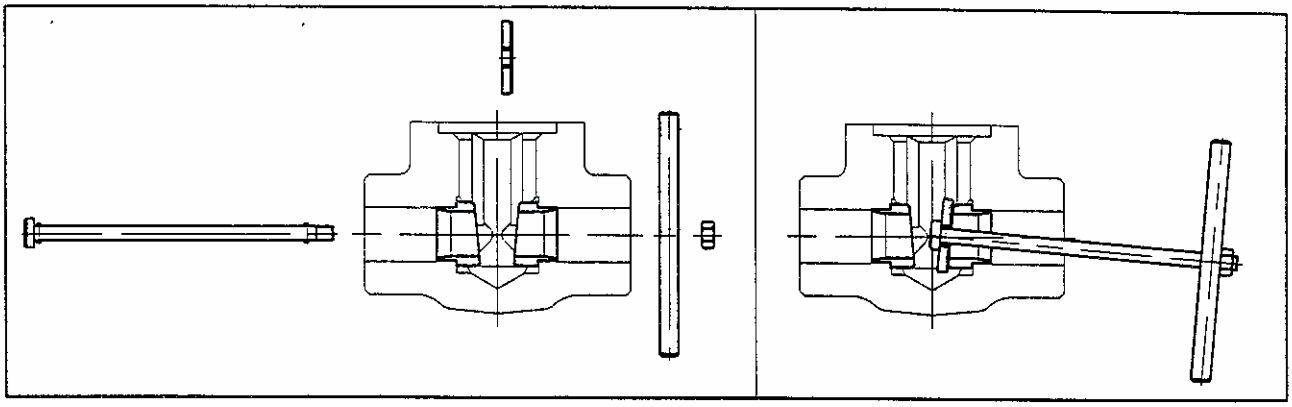
7.2.1) Seats and/or disk repair

For valves with a diameter among 1" and 2", if seats are too damaged, repair can be done directly on body, by polishing.

Bottom dimensions can be repaired too, but with difficult, we recommend, in this case, to replace the seat.

Seats can be polished in body using a tool composed by a circular plate and a T-pin.

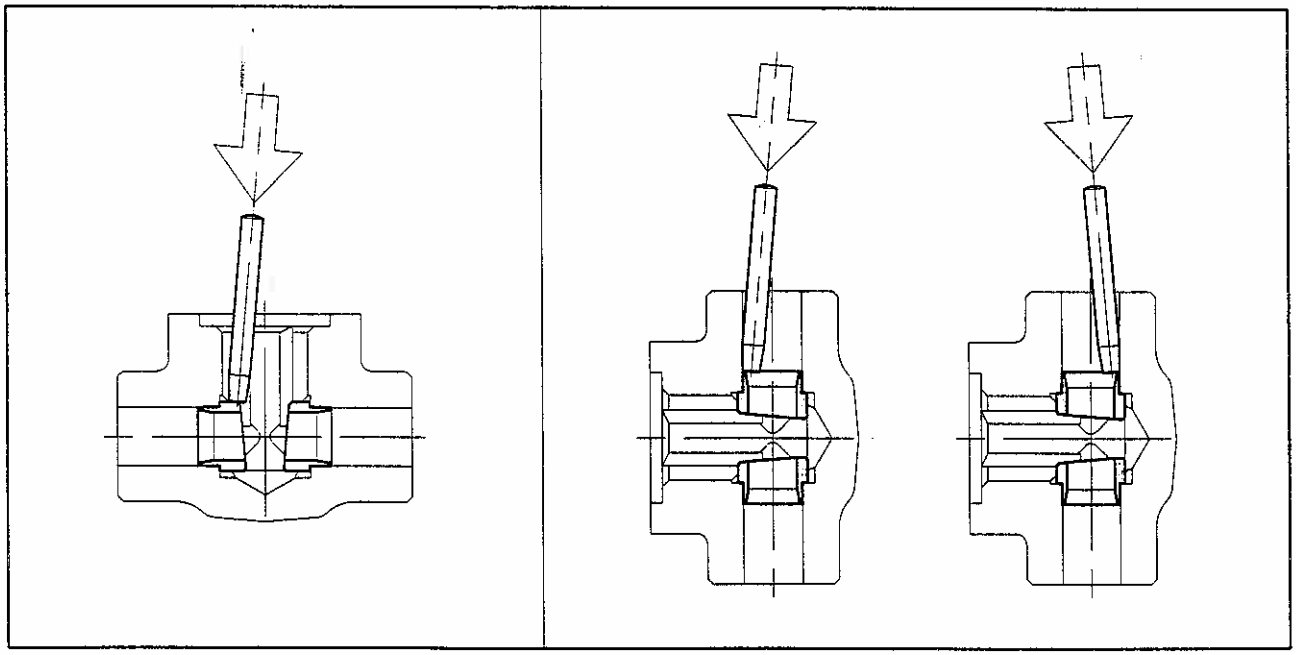
The following picture can show, more or less, the type of tool that should be used.



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

7.2.2) Seats replacement

Seats should be removed by a proper chisel. Act alternatively between the central hole and the body ends, as it's showed in the following picture:



Before going on with the operation, make you sure that body and seats interested surfaces are clean and without foreign materials.

Then seats must be introduced by the top opening of the body, with the top part (thin) in the center upward (look at the picture at the end of the paragraph).

It's necessary to have enough space to work without problem around the valve body.

Put on seat connection surface a small quantity of grease, to help to be adjusted. Insert the disk a false-stem.

Disk-seat group bond can be done hammering the end of the false-stem.

Control that the disk and seats are in line and that the false-stem is centrated in the body hole.

Keep the false-stem to force the disk in position.

Now it's ready for a new test of 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, if you have a uniformed impression, the valve is ready to be reassembled.

Don't remove seats after this test.

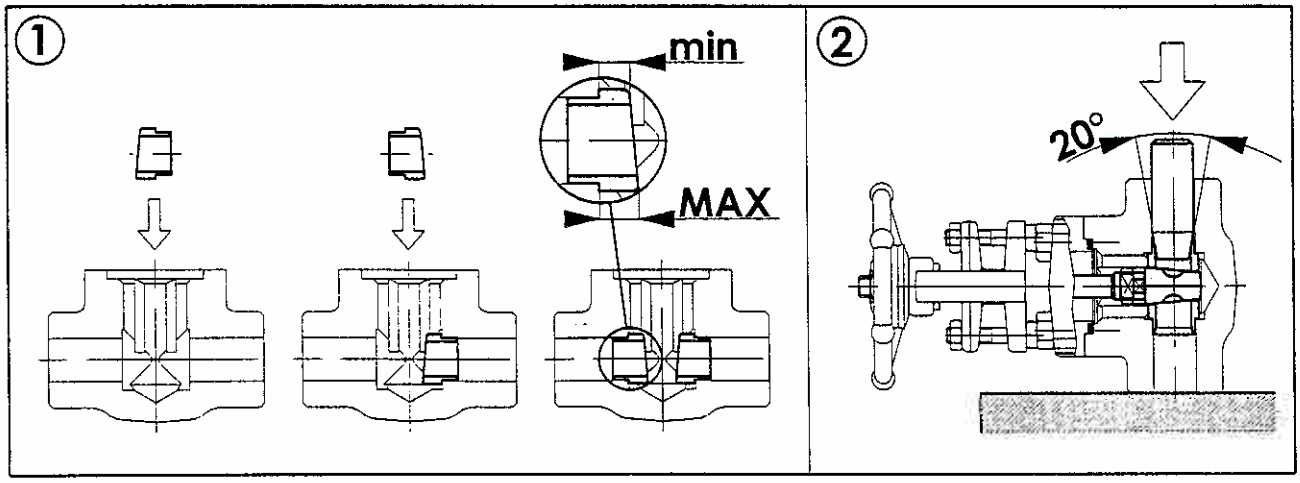
Assemble the valve, with gasket, then force the disk in closing position. So the valve is ready for seats rolling.

When you use the pin, put the valve on something stable, lubricate the pin expansion cone to avoid seizinmg-up.

Push the 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 repair and/or substitution

This notes can be applied both on bolted seat and stell. integrated seat.

Both can be repaired (bolted seats can be easily substituted too).

7.3.1) Seat/disk repair

The following description normally concerns globe valves.

For check and piston ball valves we suggest the substitution of the interested parts, if a simple seat and/or piston polishing isn't enough.

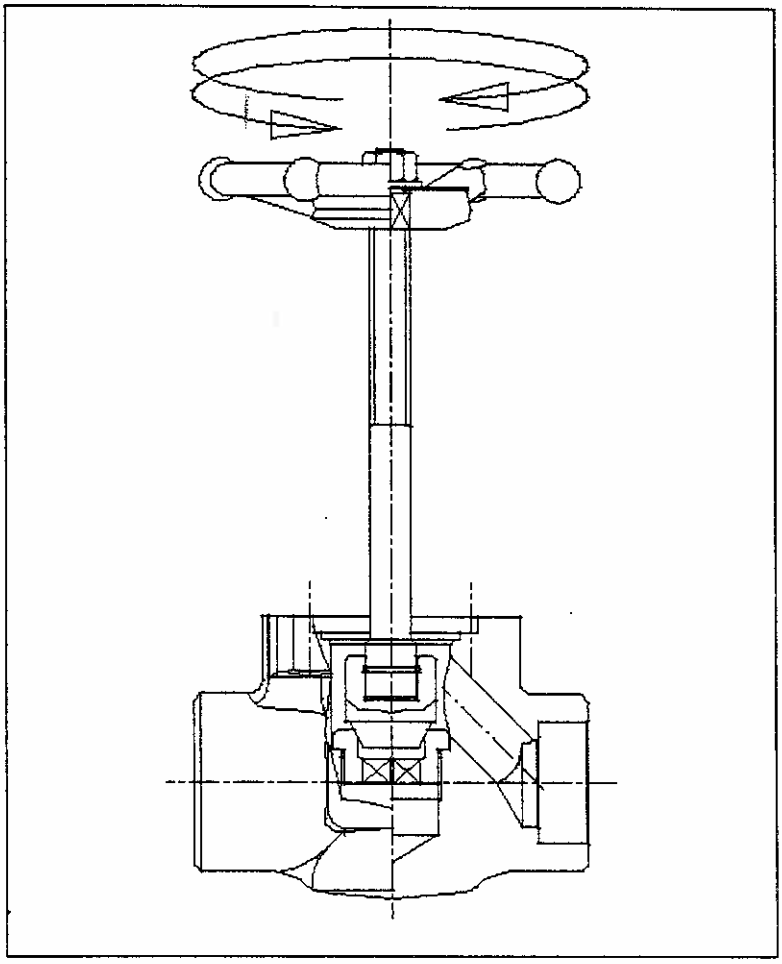
If the defect on the disk conic part is high, disassemble the assembled stem.

Put the assembled stem on the roll of a turning table, centering the jaws on the exterior surface of the disk.

Block the jaws to assecure that the conic surface is centrated with the roll axis. Turn the cone for a minimum depth necessary to eliminate the defect.

Polish, if necessary, with sandpaper.

Then pass at the following operation described below.



When the defect on the the surface has been reduced, the surfaces in touch can be taken to the origin by lapping.

Apply a small quantity of an abrasive product among the parts that both turn in alternative direction.

Do this operation until the defect is completely desappeared.

At the end we suggest to verify with blue color, the perfect grip of parts.

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

7.3.2Seat/Disk replacement

Bolted seat can be replaced with valve body in working position, but isolated from the line.

The inside area of the seat is hexagonal and needs a proper wrench for replacement, as described in 9.6 paragraph Seat/body assembly/disassembly.

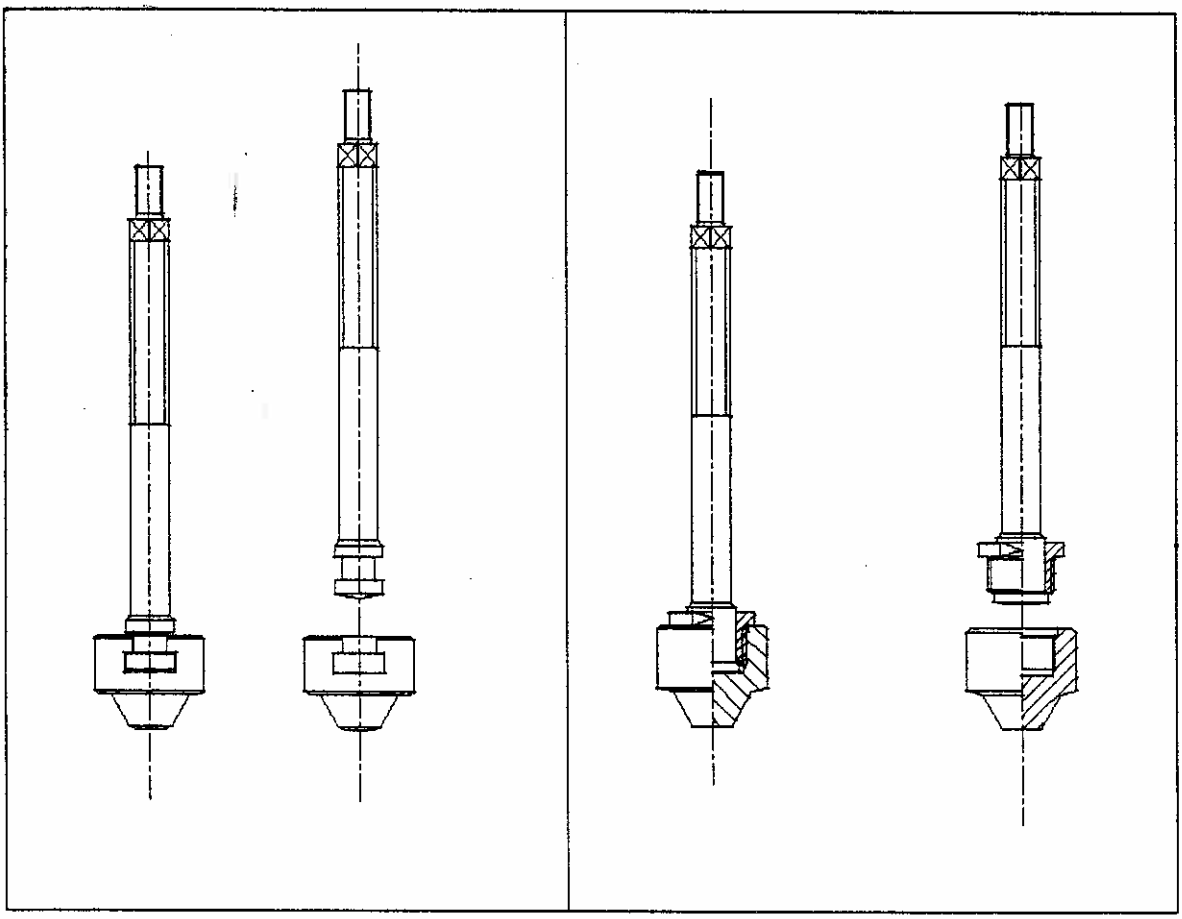
Take off the seat that has to be replaced and control carefully the body thread, to see if it's in good conditions.

After having bolted the new seat into the body, take it away to verify the support surface contact.

Then bolt it.

In globe valves the disk must be substituted with the stem, because it's not possible their separation.

The disk only, instead, can be replaced if there are previous executions as a "T" attach and a threaded nut attach as in the picture.



In ball and piston check valves the damaged disk can be easily taken off to be replaced.

8) SPARE PARTS REQUESTS

Normally replacement parts are packings and gaskets,that can be more easily damaged during the valve service, because of their material composition.

If they concern normal production they can be normally shipped form stock. Where it's allowed by production, many parts of the valve are interchangeable.

When there's an order of replacement parts, we ask you to make reference to the identification plate for the following features:

- ⇨ catalogue number,
- ⇨ type, dimension, series,
- ⇨ material,
- ⇨ your code, if possible.

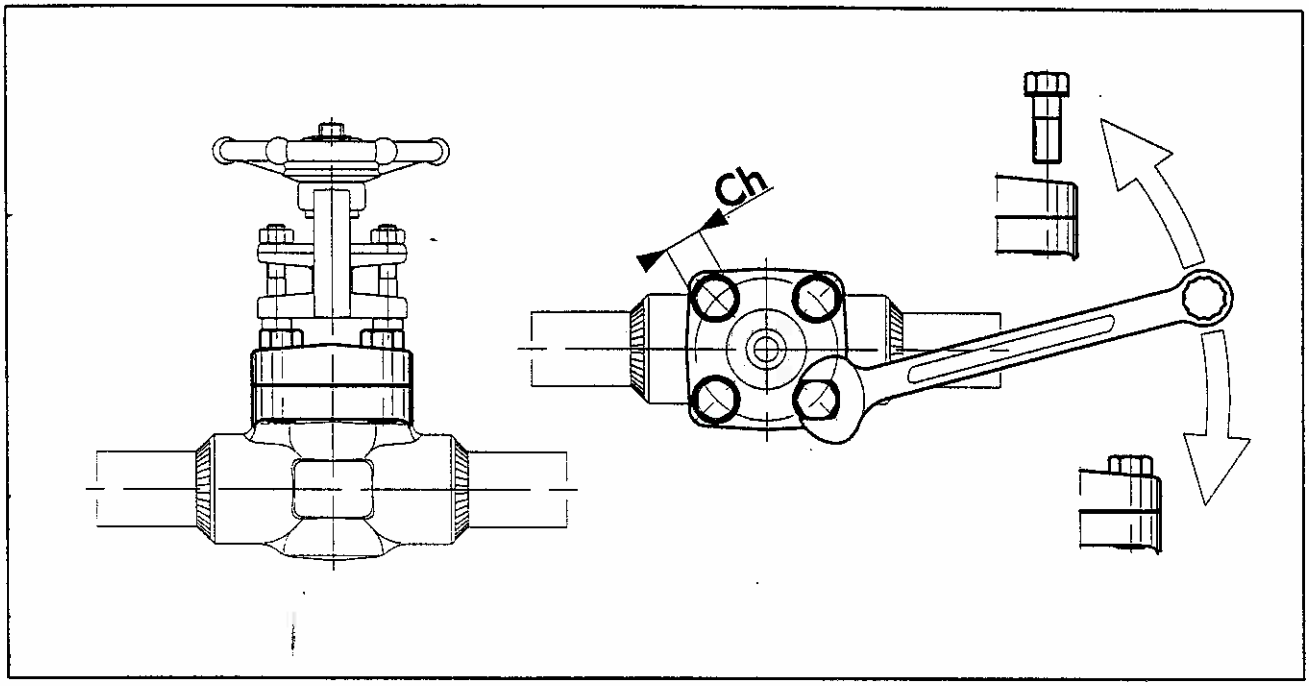
Where it's possible the original order and its date can help the material identification, especially for special valves.

Consider that in many cases, it can be asked an offer for replacement parts, transmitted with order technical documents, which contain those necessary information.

9) RESUMING TOOLS LIST

9.1) Assembly/Disassembly Body screws (Class 150÷1500c)

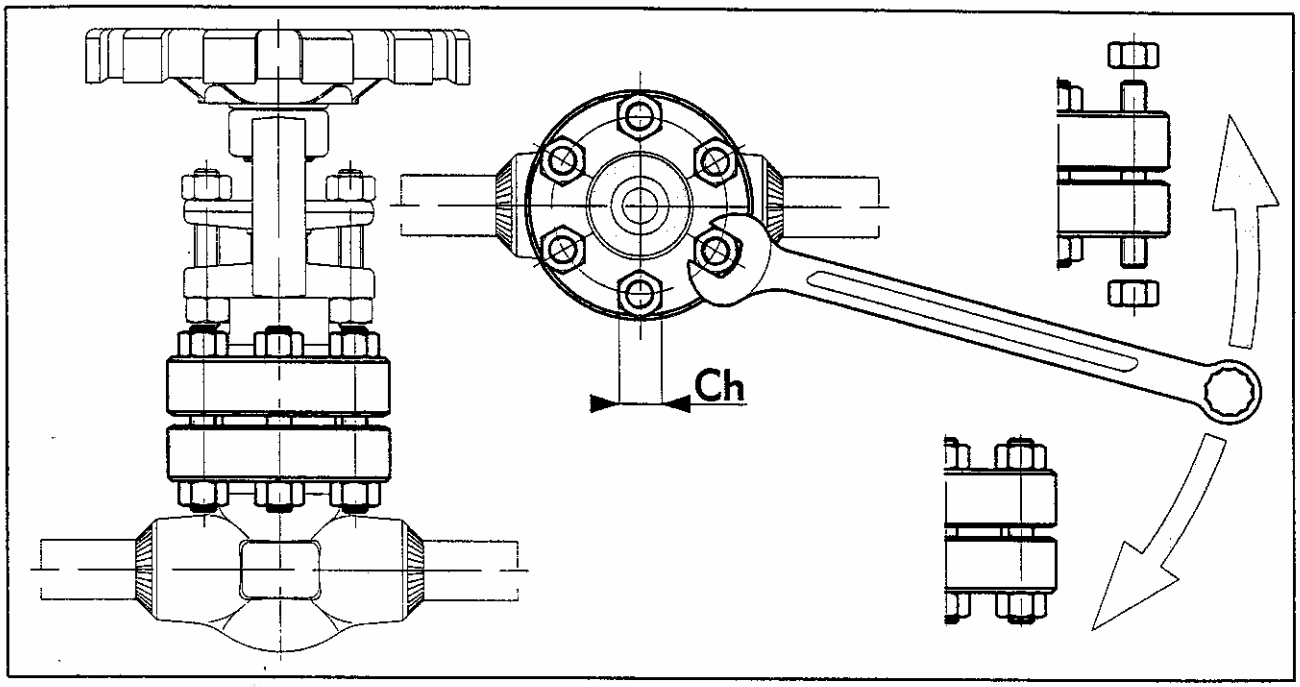
The wrench can be open or close type



	Ch (mm)			
	150÷800		1500c	
1/2"R	**14**	*17 (*)*	**14**	*17 (*)*
3/4"R	**14**	*17 (*)*	**17**	*19 (*)*
1"R	**17**	*19 (*)*	**17**	*19 (*)*
1.1/4"R	**17**	*19 (*)*	**19**	*22 (*)*
1.1/2"R	**19**	*22 (*)*	**22**	*24 (*)*
2"R	**22**	*24 (*)*	**27**	*30 (*)*
1/4"F	**14**	*17 (*)*	-	-
3/8"F	**14**	*17 (*)*	-	-
1/2"F	**14**	*17 (*)*	-	-
3/4"F	**17**	*19 (*)*	-	-
1"F	**17**	*19 (*)*	-	-
1.1/4"F	**19**	*22 (*)*	-	-
1.1/2"F	**22**	*24 (*)*	-	-
2"F	**27**	*30 (*)*	-	-

9.2) Assembly/Disassembly Body stud bolts (Class 1500-2500)

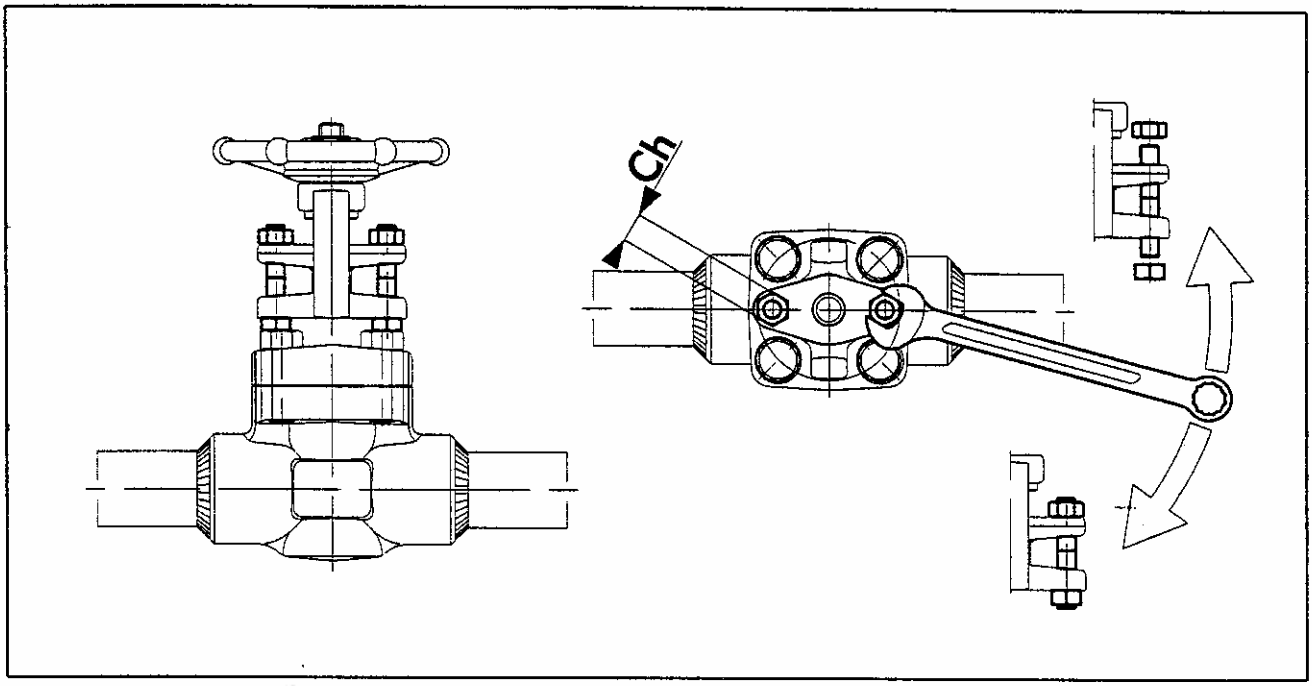
The wrench can be open or close type



	Ch (mm)	
	1500	2500
1/2"R	-	-
3/4"R	-	-
1"R	-	-
1.1/4"R	-	-
1.1/2"R	-	-
2"R	-	-
1/4"F	-	-
3/8"F	-	-
1/2"F	17	17
3/4"F	19	19
1"F	22	22
1.1/4"F	-	-
1.1/2"F	27	27
2"F	27	27

9.3) Assembly/Disassembly Gland nuts (all class)

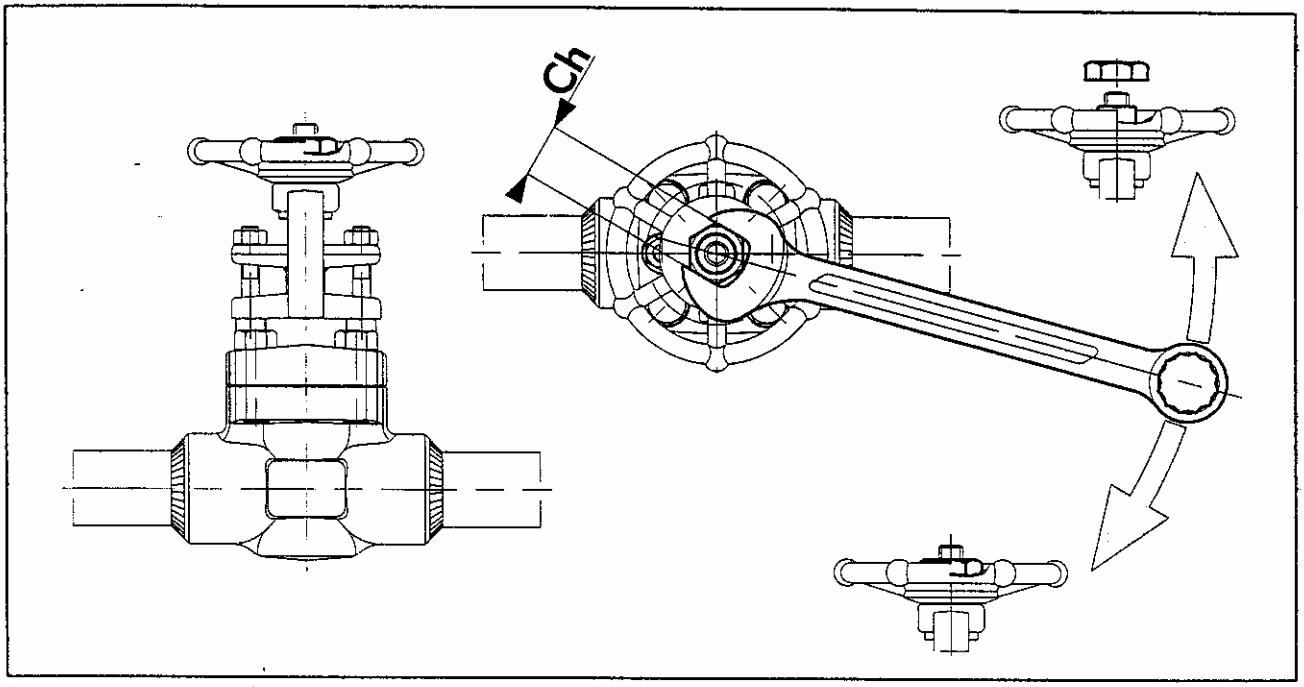
The wrench can be open or close type



	Ch (mm)			
	150÷800	1500c	1500	2500
1/2"R	13	13	-	-
3/4"R	13	13	-	-
1"R	13	17	-	-
1.1/4"R	17	17	-	-
1.1/2"R	17	17	-	-
2"R	19	19	-	-
1/4"F	13	-	-	-
3/8"F	13	-	-	-
1/2"F	13	-	13	13
3/4"F	13	-	17	17
1"F	17	-	17	17
1.1/4"F	17	-	-	-
1.1/2"F	17	-	24	24
2"F	19	-	24	24

9.4) Assembly/Disassembly Handwheel nuts (Gate Valves)

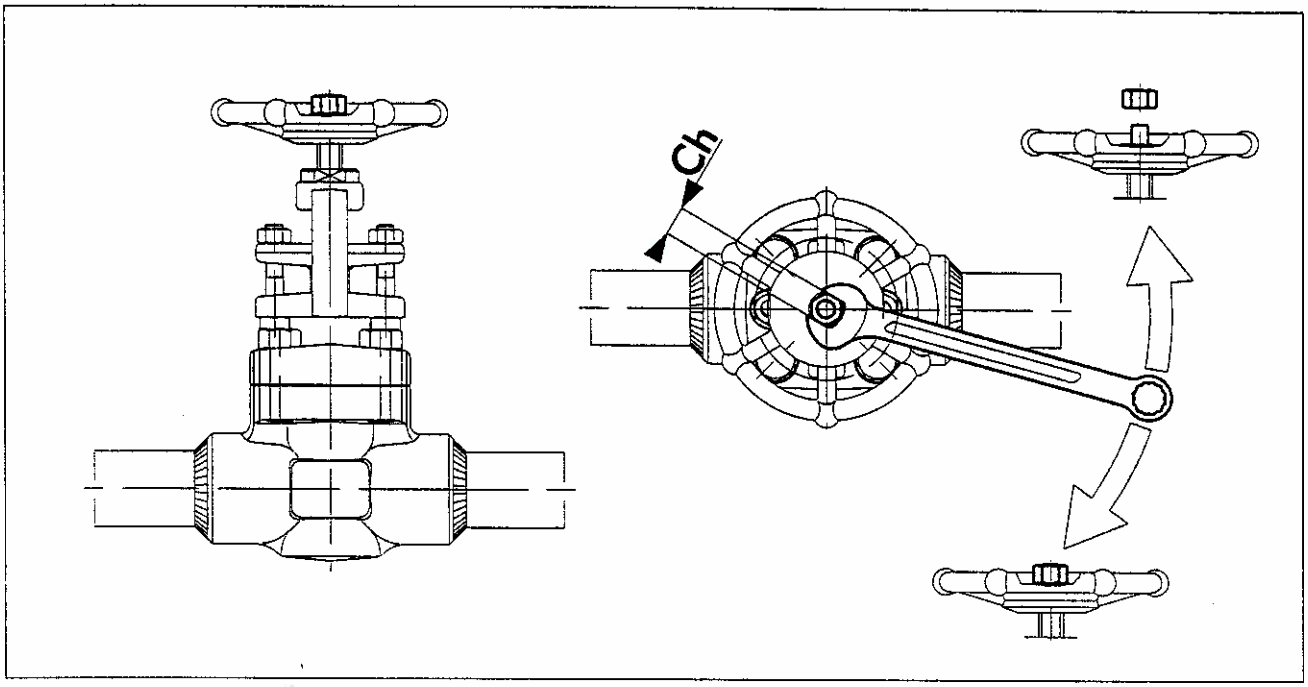
The wrench can be open or close type



	Ch (mm)			
	150÷800	1500c	1500	2500
1/2"R	19	24	-	-
3/4"R	19	24	-	-
1"R	24	30	-	-
1.1/4"R	30	32	-	-
1.1/2"R	32	32	-	-
2"R	32	36	-	-
1/4"F	19	-	-	-
3/8"F	19	-	-	-
1/2"F	19	-	30	30
3/4"F	24	-	32	36
1"F	30	-	32	36
1.1/4"F	32	-	-	-
1.1/2"F	32	-	50	50
2"F	36	-	50	50

9.5) Assembly/Disassembly Handwheel nuts (Globe Valves)

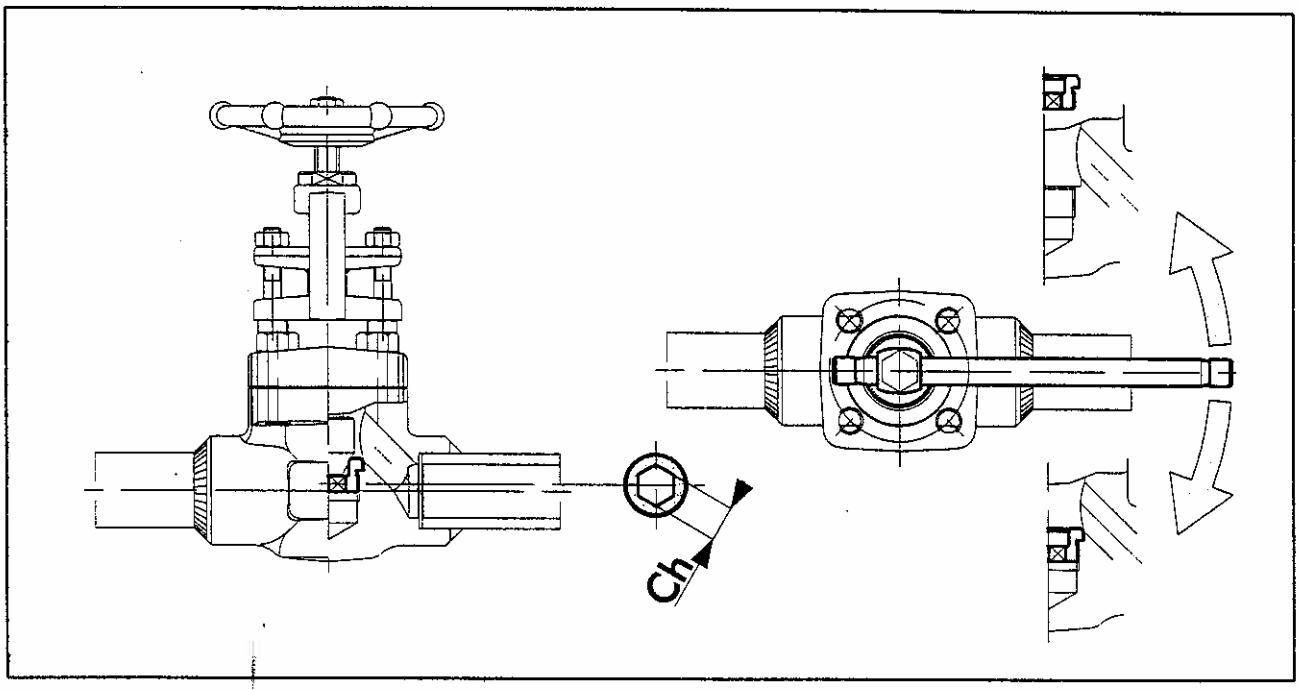
The wrench can be open or close type



	Ch (mm)			
	150÷800	1500c	1500	2500
1/2"R	10	13	-	-
3/4"R	10	13	-	-
1"R	13	17	-	-
1.1/4"R	17	17	-	-
1.1/2"R	17	17	-	-
2"R	17	19	-	-
1/4"F	10	-	-	-
3/8"F	10	-	-	-
1/2"F	10	-	17	17
3/4"F	13	-	17	19
1"F	17	-	17	19
1.1/4"F	17	-	-	-
1.1/2"F	17	-	24	24
2"F	19	-	24	24

9.6) Assembly/Disassembly Body seat (Globe Valves, Ball and Piston Check Valves)

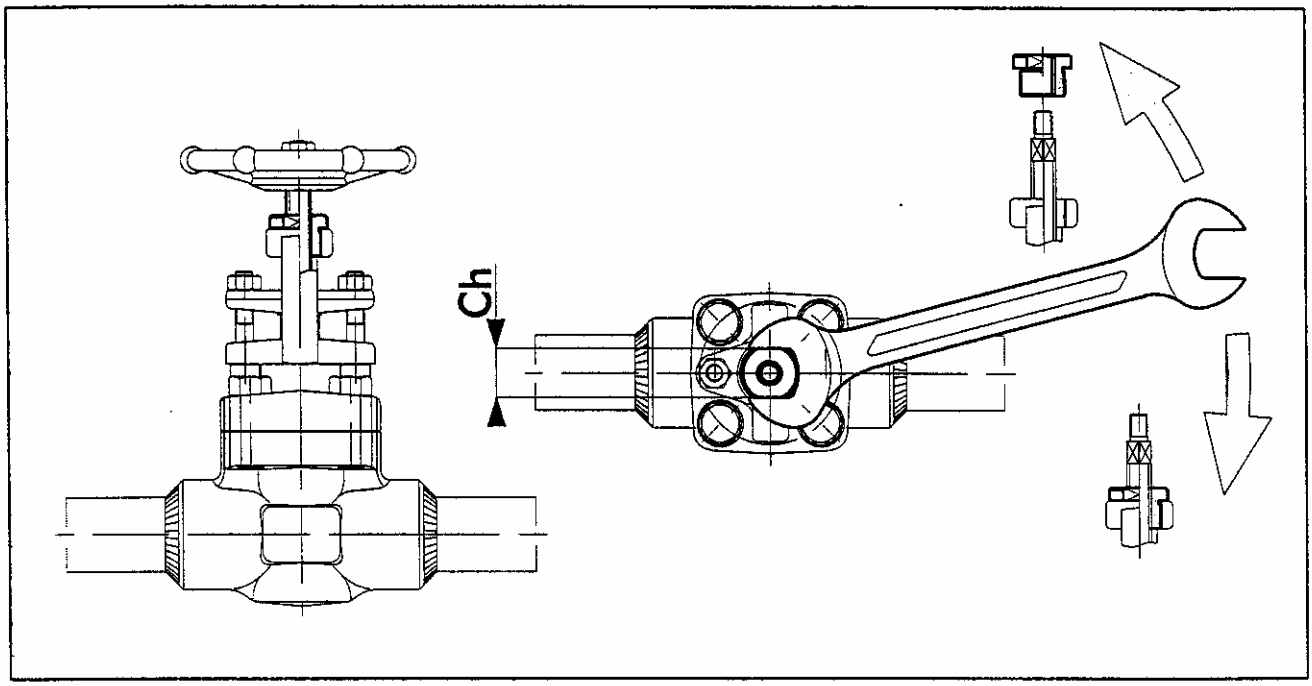
The wrench must be "T" type



	Ch (mm)				
	150÷800		1500c	1500	2500
1/2"R	8	-	8	-	-
3/4"R	12	-	12	-	-
1"R	16	-	16	-	-
1.1/4"R	19	-	19	-	-
1.1/2"R	22	-	22	-	-
2"R	26	-	26	-	-
1/4"F	8	6 (*)	-	-	-
3/8"F	8	-	-	-	-
1/2"F	12	-	-	8	8
3/4"F	16	-	-	12	12
1"F	19	-	-	16	16
1.1/4"F	22	-	-	-	-
1.1/2"F	26	-	-	22	22
2"F	40	-	-	26	26

9.7) Assembly/Disassembly Stem Nut (Globe Valves)

The wrench must be open type



	Ch (mm)			
	150÷800	1500c	1500	2500
1/2"R	19	22	-	-
3/4"R	19	22	-	-
1"R	22	30	-	-
1.1/4"R	27	30	-	-
1.1/2"R	30	30	-	-
2"R	30	34	-	-
1/4"F	19	-	-	-
3/8"F	19	-	-	-
1/2"F	19	-	27	27
3/4"F	22	-	30	34
1"F	27	-	30	34
1.1/4"F	30	-	-	-
1.1/2"F	30	-	46	46
2"F	34	-	46	46

9.8) Other tools and accessories

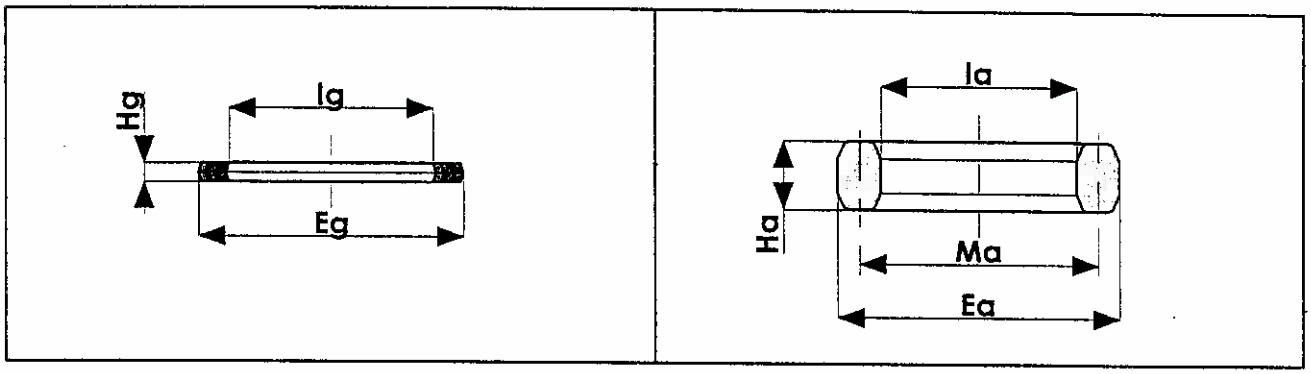
Wrenches and tools are available for valves maintenance:

- Tools to take packing rings off;
- Combination of oil/greases for lubrications, compounds for lapping and fine sandpaper to lap or clean different surfaces;
- Pipe wrench for threaded ends valves installation;
- Chisels, rolling pins, false-stem for repairs;
- Other accessories and tools recalled in this manual.

10) APPENDIX

10.1) Gaskets Dimensions

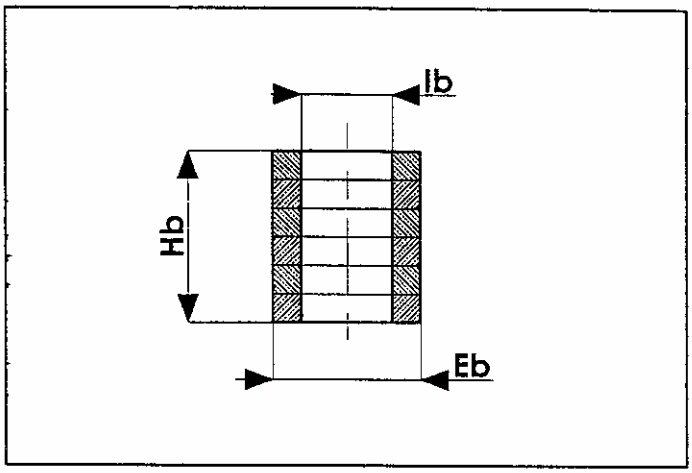
Here are shown body gaskets dimensions installed on valves.



	150÷800			1500c			1500÷2500			
	Ig	Eg	Hg	Ig	Eg	Hg	Ia	Ma	Ea	Ha
1/2"R	31	39,5	3,5	28	37,5	3,5	-	-	-	-
3/4"R	31	39,5	3,5	31	39,5	3,5	-	-	-	-
1"R	40	48,5	3,5	36	45,5	3,5	-	-	-	-
1.1/4"R	42	53,5	3,5	42	53,5	3,5	-	-	-	-
1.1/2"R	50	62,5	3,5	50	62,5	3,5	-	-	-	-
2"R	58	71,5	3,5	58	71,5	3,5	-	-	-	-
1/4"F	31	39,5	3,5	-	-	-	-	-	-	-
3/8"F	31	39,5	3,5	-	-	-	-	-	-	-
1/2"F	31	39,5	3,5	-	-	-	31,8	39,7	47,6	12,7
3/4"F	40	48,5	3,5	-	-	-	39,7	47,6	55,6	12,7
1"F	42	53,5	3,5	-	-	-	42,9	50,8	58,7	12,7
1.1/4"F	50	62,5	3,5	-	-	-	-	-	-	-
1.1/2"F	58	71,5	3,5	-	-	-	62,9	74,0	85,1	15,9
2"F	74,5	87,5	4,5	-	-	-	62,9	74,0	85,1	15,9

10.2) Packings Dimensions

Here are shown packings dimensions installed on valves.



	150÷800			1500c			1500			2500		
	lb	Eb	Hb	lb	Eb	Hb	lb	Eb	Hb	lb	Eb	Hb
1/2"R	9,5	16	18	11,1	17,5	24	-	-	-	-	-	-
3/4"R	9,5	16	18	11,1	17,5	26	-	-	-	-	-	-
1"R	11,1	17,5	26	14,3	24	30	-	-	-	-	-	-
1.1/4"R	12,7	20	28	15,9	29	30	-	-	-	-	-	-
1.1/2"R	15,9	26	30	15,9	26	30	-	-	-	-	-	-
2"R	15,9	26	30	19,0	29	35	-	-	-	-	-	-
1/4"F	9,5	16	18	-	-	-	-	-	-	-	-	-
3/8"F	9,5	16	18	-	-	-	-	-	-	-	-	-
1/2"F	9,5	16	18	-	-	-	12,7	22	34	14,3	24	35
3/4"F	11,1	17,5	26	-	-	-	15,9	26	40	19,0	29	40
1"F	12,7	20	27	-	-	-	15,9	26	40	19,0	29	40
1.1/4"F	15,9	26	30	-	-	-	-	-	-	-	-	-
1.1/2"F	15,9	26	30	-	-	-	22,2	34	54	22,2	34	54
2"F	19,0	39	35	-	-	-	22,2	34	54	25,4	38	58

10.3) Pneumatic and Hydraulic Tests

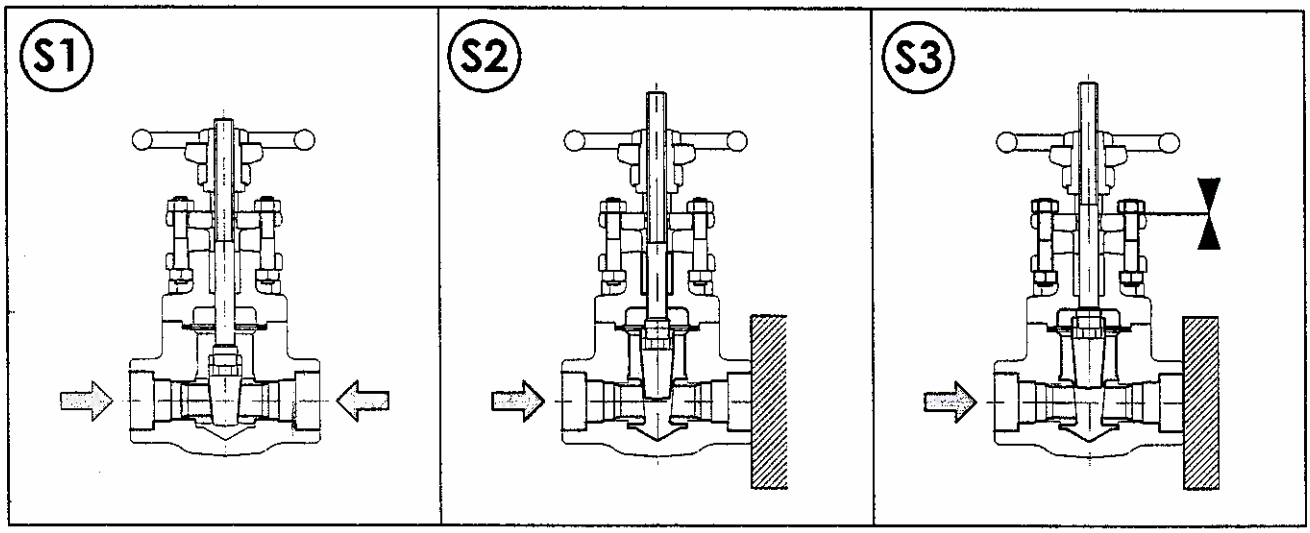
Here are shown the thight final test and pressure values that can be applied on valves.

10.3.1) Gate Valves

S1 - Seat tight Test

S2 - Body tight Test

S3 - Backseat tight Test (with ranged Gland Nuts)

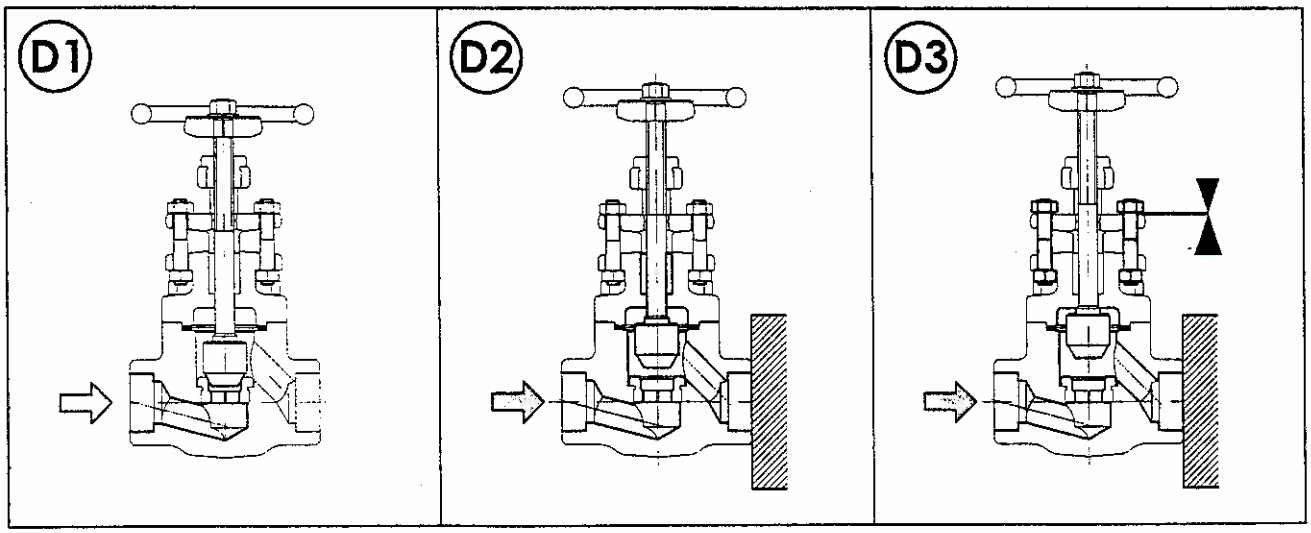


10.3.2) Globe Valves

D1 - Seat tight Test

D2 - Body tight Test

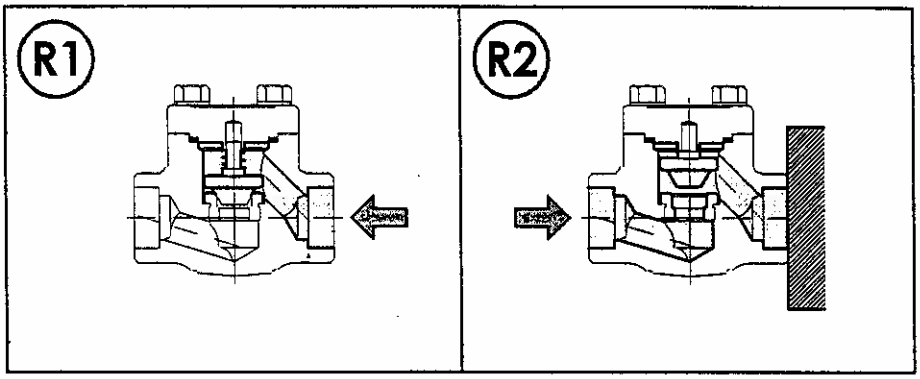
D3 - Backseat tight Test (*with ranged Gland Nuts*)



10.3.3) Check Valves

R1 - Seat tight Test

R2 - Body tight Test



10.3.4) Applicable Pressure Tests

Here are shown the pressure values applicable for final tight tests of valves.

	S1 - D1 - R1		S2 - D2 - R2		S3 - D3	
	Bar	*PSI*	*Bar*	*PSI*	*Bar*	*PSI*
150	**22**	319	**30**	435	**22**	319
300	**57**	826	**78**	1131	**57**	826
600	**114**	1653	**156**	2262	**114**	1653
800	**155**	2247	**211**	3059	**155**	2247
900	**171**	2479	**233**	3378	**171**	2479
1500	**285**	4132	**388**	5626	**285**	4132
2500	**475**	6887	**647**	9381	**475**	6887
4500	**855**	12400	**1165**	16897	**855**	12400

10.4) Limits of Working

For safety reasons, the limits of working pressure/temperature for each class of valve and for each material are stated on the PMA and on the Identification Nameplates put on the valves.

In every case, the limits stated on 3 tables attached, 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.

Nickel Steels

	Cl. 150		Cl. 300		Cl. 600		Cl. 800		Cl. 900		Cl. 1500		Cl. 2500		Cl. 4500	
Maximum Working Pressure BAR																
UNS N05500																
Maximum Working Pressure BAR	15,9	9,7	41,5	24,9	83	49,8	110,6	66,4	155	39,6	258,5	50,6	430,9	84,1	775,6	151,6
UNS N10276	-198	676	-198	676	-198	676	-198	676	-198	676	-198	676	-198	676	-198	676
Maximum Working Pressure BAR	20	1,4	51,8	12,8	103,7	25,6	138,3	34,2	155	38,2	258,5	63,7	430,9	106,5	775,6	191,3
UNS N06625	-198	648	-198	648	-198	648	-198	648	-198	648	-198	648	-198	648	-198	648
Maximum Working Pressure BAR	20	1,4	51,8	25,2	103,7	50,1	138,3	67,1	155	75,1	258,5	125,4	430,9	208,9	775,6	375,7
UNS N08825	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537
Maximum Working Pressure BAR	20	5,5	51,8	35,3	103,7	70,2	138,3	93,7	155	105	258,5	175	430,9	291,6	775,6	524,6
UNS N10665	-198	426	-198	426	-198	426	-198	426	-198	426	-198	426	-198	426	-198	426
Maximum Working Pressure BAR	15,9	1,4	41,5	25,2	83	50,2	110,6	67	124	75,1	206,8	125,4	344,7	208,9	620,5	375,7
UNS N08810	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537
Maximum Working Pressure BAR	19	1,4	49,8	25,2	99,6	50,1	132,8	67	148,9	75,1	248	125,4	413,6	208,9	744,6	375,7
UNS N08800	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537
Maximum Working Pressure BAR	20	1,4	51,8	14,8	103,7	29,7	138,3	39,7	155	44,8	258,5	74,4	430,9	124,1	775,6	223,3
UNS N06600	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537
Maximum Working Pressure BAR	15,9	3,5	41,5	17	83	34,2	110,6	45,5	124	51	206,8	85,1	344,7	141,6	620,5	255,4
UNS N04400	-198	482	-198	482	-198	482	-198	482	-198	482	-198	482	-198	482	-198	482
Material / Maximum Working Pressure	Minimum Temperature °C	Maximum Temperature °C	Minimum Temperature °C	Maximum Temperature °C	Minimum Temperature °C	Maximum Temperature °C	Minimum Temperature °C	Maximum Temperature °C	Minimum Temperature °C	Maximum Temperature °C	Minimum Temperature °C	Maximum Temperature °C	Minimum Temperature °C	Maximum Temperature °C	Minimum Temperature °C	Maximum Temperature °C

Carbon Steels, Low Alloys, Austenitic, Martensitic and Ferritic-Austenitic Steels

	Cl. 150		Cl. 300		Cl. 600		Cl. 800		Cl. 900		Cl. 1500		Cl. 2500		Cl. 4500	
Maximum Working Pressure BAR																
UNS S32550																
Maximum Working Pressure BAR	17	9,7	44,3	29,7	88,5	59,8	118	79,6	132	84,8	221	141,3	368,1	235,5	662,3	424,3
UNS N08904	-198	371	-198	371	-198	371	-198	371	-198	371	-198	371	-198	371	-198	371
Maximum Working Pressure BAR	15,9	5,5	41,5	33,9	83	67,8	110,7	90,3	155	105	258,5	175	430,9	291,6	775,6	524,6
UNS N08020	-198	426	-198	426	-198	426	-198	426	-198	426	-198	426	-198	426	-198	426
Maximum Working Pressure BAR	20	9,7	51,8	38,4	103,7	77,1	138,3	102,7	155	115	258,5	192	430,9	319,9	775,6	575,7
ASTM A182/F44 - F51 - F53 - F55	-50	315	-50	315	-50	315	-50	315	-50	315	-50	315	-50	315	-50	315
Maximum Working Pressure BAR	19	1,4	49,8	25,3	99,6	50,1	132,4	66,9	149	75,2	248,2	125,5	413,7	208,9	775,6	435
ASTM A182/F347 - F347H	-198	537	-198	537	-235	537	-235	537	-235	537	-235	537	-235	537	-235	537
Maximum Working Pressure BAR	19	1,4	49,8	24,5	99,6	49,4	132,4	65,5	149	73,8	248,2	123	413,7	204,8	775,6	435
ASTM A182/F321 - F321H	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537
Maximum Working Pressure BAR	15,9	4,5	41,5	22,1	83	44,6	110,3	59,3	124	66,5	206,8	111	344,7	184,9	620,5	332,6
ASTM A182/F304L - F316L	-198	454	-198	454	-198	454	-198	454	-198	454	-198	454	-198	454	-198	454
Maximum Working Pressure BAR	19	1,4	49,8	2,8	99,6	5,9	132,4	7,6	149	8,6	248,2	14,1	413,7	23,7	744,6	42,7
ASTM A182/F316H	-198	815	-198	815	-198	815	-198	815	-198	815	-198	815	-198	815	-198	815
Maximum Working Pressure BAR	19	1,4	49,8	24,2	99,6	48,4	132,4	64,5	149	75,2	248,2	125,5	413,7	208,9	744,6	361,6
ASTM A182/F316	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537
Maximum Working Pressure BAR	19	0,7	49,8	1,7	99,6	3,8	132,4	4,8	149	5,5	248,2	9,3	413,7	15,8	744,6	28,2
ASTM A182/F304H	-198	815	-198	815	-198	815	-198	815	-198	815	-198	815	-198	815	-198	815
Maximum Working Pressure BAR	19	1,4	49,8	22,1	99,6	44,2	132,4	59	149	66,5	248,2	111	413,7	185,1	744,6	331,9
ASTM A182/F304	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537
Maximum Working Pressure BAR	20	1,4	51,8	25,2	103,7	48,8	138,3	67	155	75,1	258,5	125,4	430,9	208,9	775,6	375,7
ASTM A182/F91	-29	537	-29	537	-29	537	-29	537	-29	537	-29	537	-29	537	-29	537
Maximum Working Pressure BAR	20	1,4	51,8	18	103,7	36	137,9	47,9	155	55,5	258,5	92,4	430,9	153,8	775,6	269,5
ASTM A182/F22	-29	537	-29	537	-29	537	-29	537	-29	537	-29	537	-29	537	-29	537
Maximum Working Pressure BAR	20	1,4	51,8	14,8	103,7	29,7	137,9	39,7	155	46,2	258,5	76,9	430,9	128,2	775,6	223,3
ASTM A182/F11	-29	537	-29	537	-29	537	-29	537	-29	537	-29	537	-29	537	-29	537
Maximum Working Pressure BAR	20	1,4	51,8	17,6	103,7	34,9	137,9	46,6	155	60,3	258,5	100,7	430,9	167,5	775,6	262,3
ASTM A182/F9	-29	537	-29	537	-29	537	-29	537	-29	537	-29	537	-29	537	-29	537
Maximum Working Pressure BAR	20	1,4	51,8	13,8	103,7	27,6	137,9	36,6	155	39,6	258,5	66,2	430,9	110,3	775,6	205,8
ASTM A182/F5	-29	537	-29	537	-29	537	-29	537	-29	537	-29	537	-29	537	-29	537
Maximum Working Pressure BAR	18,3	4	48	32,3	96,1	64,8	128,2	86,4	143	100,7	239	167,8	398,8	279,9	718	503,6
ASTM A182/F1	-29	468	-29	468	-29	468	-29	468	-29	468	-29	468	-29	468	-29	468
Maximum Working Pressure BAR	20	7,6	51,8	39,4	103,7	78,5	138,3	99	155	112	258,5	187	430,9	310	775,6	559
ASTM A182/F6a Cl. 1-2-3-4 - AISI 410	-29	371	-29	371	-29	371	-29	371	-29	371	-29	371	-29	371	-29	371
Maximum Working Pressure BAR	19,7	5,5	51,2	28,3	102,3	57	136,2	75,9	153	85	255,4	142	425,4	236,5	766	425,4
ASTM A350/LF2	-46	426	-46	426	-46	426	-46	426	-46	426	-46	426	-46	426	-46	426
Maximum Working Pressure BAR	19,7	5,5	51,2	28,3	102,3	57	136,2	75,9	153	85	255,4	142	425,4	236,5	766	425,4
ASTM A105N	-29	426	-29	426	-29	426	-29	426	-29	426	-29	426	-29	426	-29	426
Material / Maximum Working Pressure	Minimum Temperature °C	Maximum Temperature °C	Minimum Temperature °C	Maximum Temperature °C	Minimum Temperature °C	Maximum Temperature °C	Minimum Temperature °C	Maximum Temperature °C	Minimum Temperature °C	Maximum Temperature °C	Minimum Temperature °C	Maximum Temperature °C	Minimum Temperature °C	Maximum Temperature °C	Minimum Temperature °C	Maximum Temperature °C

Cast Steels

	Cl. 150		Cl. 300		Cl. 600		Cl. 800		Cl. 900		Cl. 1500		Cl. 2500		Cl. 4500	
Maximum Working Pressure BAR	15,9	9,7	41,3	24,8	82,7	49,6	110,6	90,2	124	74,4	206,8	124	344,7	206,8	620,5	372
ASTM A351/CN7M	-198	315	-198	315	-198	315	-198	315	-198	315	-198	315	-198	315	-198	315
Maximum Working Pressure BAR	20	1,4	51,8	25,2	103,7	50,1	111	67	124	75	206,8	125,4	344,7	208,9	620,5	375,7
ASTM A494/CU5MCuC	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537
Maximum Working Pressure BAR	17,5	11	46,2	29	92,4	58	123	77,2	138,6	86,9	231	145,2	385	241,8	693	435
ASTM A494/CW-12MW	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537
Maximum Working Pressure BAR	20	1,4	51,8	14,8	103,7	29,7	138	39,7	154	44,8	259	74,5	431	124	776	223
ASTM A494/CW-6MC	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537	-198	537
Maximum Working Pressure BAR	20	5,5	51,8	35,2	104	70	138	93,4	154	105,2	259	175	431	291	776	525
ASTM A494/CY-40	-198	426	-198	426	-198	426	-198	426	-198	426	-198	426	-198	426	-198	426
Maximum Working Pressure BAR	15,9	3,5	41,5	17	83	34,2	110,6	45,5	124	51	206,8	85,1	344,7	141,6	620,5	255,4
ASTM A494/M35-1	-198	482	-198	482	-198	482	-198	482	-198	482	-198	482	-198	482	-198	482
Material / Maximum Working Pressure	Minimum Temperature °C	Maximum Temperature °C	Minimum Temperature °C	Maximum Temperature °C	Minimum Temperature °C	Maximum Temperature °C	Minimum Temperature °C	Maximum Temperature °C	Minimum Temperature °C	Maximum Temperature °C	Minimum Temperature °C	Maximum Temperature °C	Minimum Temperature °C	Maximum Temperature °C	Minimum Temperature °C	Maximum Temperature °C

10.5) CV Values

CV values:

DOUGLAS CHERO Valves

Flow Coefficient (Cv)

	GATE		GLOBE			PISTON Ch.			BALL Ch.		SWING Ch.	
	Red.	Full	Red.	Full	"Y" Full	Red.	Full	"Y" Full	Red.	Full	Red.	Full
Class 150-300-600												
1/2"			1,5	3,5	-			-				
3/4"			3,2	5,5	-			-				
1"			6,2	9,5	-			-				
1.1/2"			19,0	21,0	-			-				
2"			21,5	38,0	-			-				
Class 800												
1/4"	-	2,6	-	0,8	-	-	0,8	-	-	0,8	-	-
3/8"	-	5,6	-	0,8	-	-	0,8	-	-	0,8	-	-
1/2"	6,2	12,2	1,6	3,0	4,3	1,2	2,6	4,0	1,2	2,6	3,4	6,2
3/4"	10,0	22,8	3,6	6,0	11,1	3,2	5,0	8,0	3,2	5,0	7,0	13,4
1"	25,8	44,0	7,4	11,2	13,8	5,8	12,0	11,8	5,8	12,0	14,2	19,0
1.1/4"	44,6	56,2	10,2	15,8	20,6	9,6	13,6	18,8	9,6	13,6	20,4	28,6
1.1/2"	68,7	98,8	16,2	18,4	37,0	13,0	16,0	36,0	13,0	16,0	30,2	57,4
2"	99,0	198,0	20,0	35,4	68,0	17,0	31,0	62,4	17,0	31,0	56,2	104,2
Class 1500c												
1/2"	8,8	-	3,2	-	-	2,6	-	-	2,6	-	4,4	-
3/4"	18,4	-	4,4	-	-	4,2	-	-	4,2	-	9,8	-
1"	34,0	-	6,8	-	-	6,0	-	-	6,0	-	17,2	-
1.1/4"	46,6	-	10,2	-	-	9,8	-	-	9,8	-	27,4	-
1.1/2"	56,6	-	18,0	-	-	17,8	-	-	17,8	-	52,0	-
2"	78,2	-	26,8	-	-	22,0	-	-	22,0	-	76,4	-
Class 1500												
1/2"	-	9,0	-	3,4	5,4	-	2,8	4,0	-	2,8	-	4,6
3/4"	-	18,6	-	4,8	11,2	-	4,6	10,6	-	4,6	-	10,2
1"	-	34,8	-	7,2	14,8	-	6,2	17,0	-	6,2	-	17,6
1.1/4"	-	-	-	-	-	-	-	-	-	-	-	-
1.1/2"	-	58,6	-	19,6	35,0	-	19,4	45,4	-	19,4	-	56,4
2"	-	83,8	-	29,4	68,0	-	24,8	74,0	-	24,8	-	81,8
Class 2500												
1/2"	-	8,2	-	2,8	2,9	-	2,4	4,0	-	2,4	-	4,0
3/4"	-	17,8	-	4,0	5,8	-	3,6	6,6	-	3,6	-	6,2
1"	-	32,0	-	6,4	12,1	-	5,8	10,2	-	5,8	-	11,2
1.1/4"	-	-	-	-	-	-	-	-	-	-	-	-
1.1/2"	-	57,4	-	17,2	27,0	-	15,8	32,0	-	15,8	-	48,4
2"	-	74,8	-	26,4	36,0	-	24,0	57,6	-	24,0	-	70,0

The flow characteristic of a valve is identified by means of the C_V symbol.

Values in U.S. gallons per minute of Water at 60°F (with differential pressure of 1 psi and with val completely open). C.V. factor in U.S.A. GALLON (US liquid)=3,78541 litre.

$$C_V = \frac{Q}{\sqrt{\frac{\Delta p}{S}}}$$

where:

Δp= Pressure drop (p.s.i)
Q= Liquid flow in gallons per minute
S= Specific gravity of liquid relative to water (Water=1)
C_V= Valves flow coefficient

Rev.7 - Date Sep. 04,1997