



ENGEVAL ARARAS- VALVE ENGINEERING AND EQUIPMENT LTDA.

Street: João Natalino Rodini, 123 - Industrial District V - Postcode 13609-582 - Araras SP – Brazil

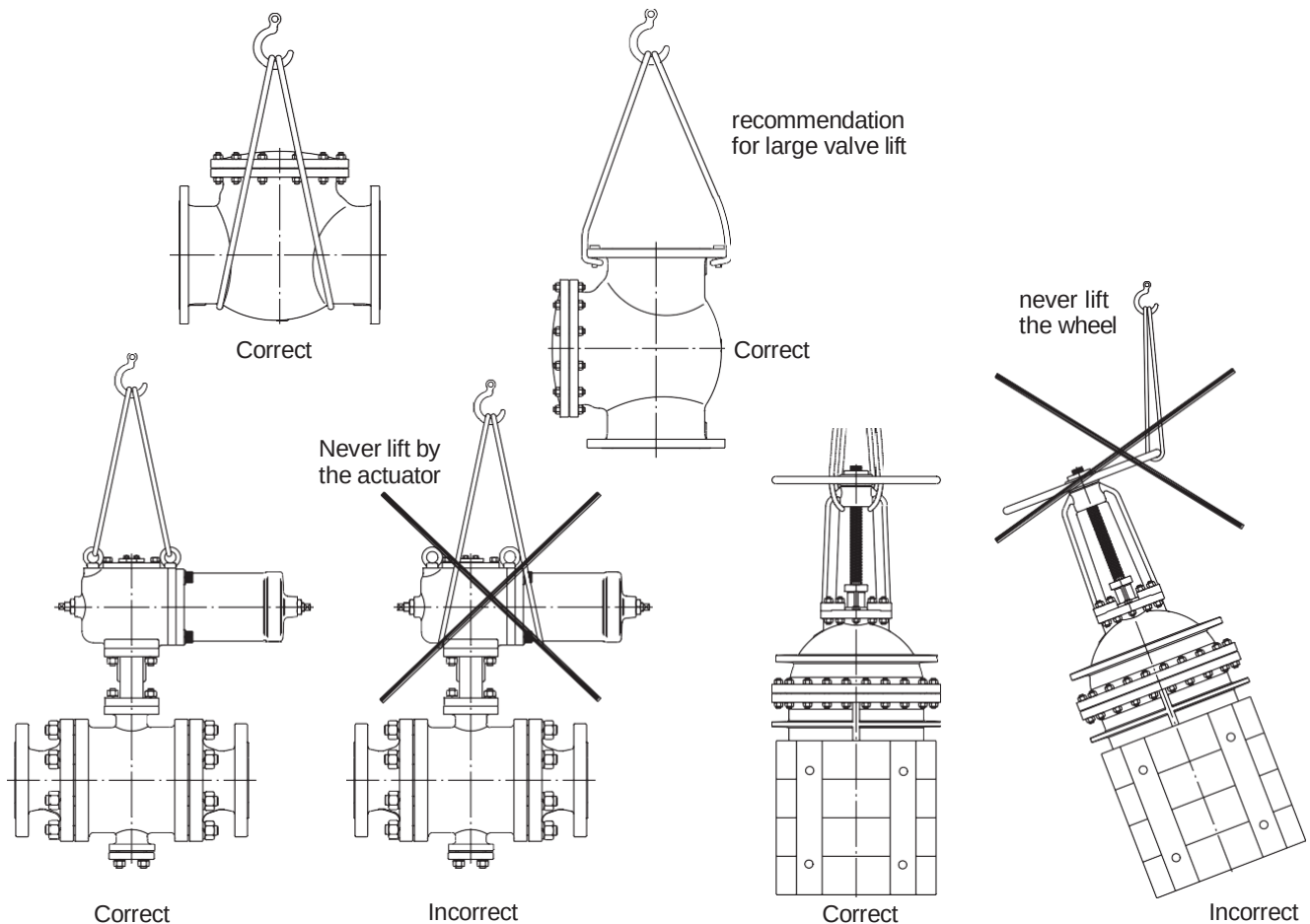
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Installation, Operation, Maintenance and Gasketing

• Transport and Storage:

- 1 - During transport and storage do not remove the plastic and / or wood caps that protect the internal parts of the valves that are placed at the factory prior to shipment;
- 2 - If the valves are going to be stored before installation take the following precautions: Keep the valves in the closed position in a covered and dry place preferably on a wooden pallet and ensure that the rods are lubricated with grease;
- 3 - Handle with care avoiding knocks and drops that can damage the outer parts of the valves, specially the grooves of the flanges, body bevels, threaded rods and actuators;
- 4 - Do not lift the valve by the steering wheel, use nylon straps on the valve bonnet.



• Installation of valves:

- 1 - The valves should not bear the weight of the pipe. Distortions in this direction will cause a lack of efficiency in operation, locking and necessity of early maintenance. If the valve has flanged ends, the adequate fixation of the flanges will be quite difficult. The tubes must be supported by suitable supports and placed one on each side of the valve to relieve the weight. Large valves due to their weight must be supported independently of the piping system to not cause stresses in the piping system.



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2 - Pipe expansion: tubes that carry fluids to high temperatures are subject to thermal stresses due to thermal expansion of the material. Unless you take precautions to reduce these expansions, these stresses will be transmitted valves and other accessory equipments. One must preview the installation of expansion joints or an equivalent device to ensure sufficient clearance to accommodate the resulting expansion of the thermal expansion of the pipe. Note the same conditions must be taken in consideration, when the tubes carry extremely cold fluids. In this case, there should be pipe contraction compensation.

3 - Before the installation of the valves the pipes must be cleaned withdrawing any weld spatter, electrodes remains, rust, mill scales and other materials that can damage the sealing seats of the valves. Cleaness is essential for high performance and long service life of the valves.

4 - Remove the protections of the internal parts of the valve and verify if it has flow direction. If the valve has flow direction, follow the direction in the valve installation.

5 - For valves with electric actuators, pneumatic or hydraulic correctly follow the instructions of the manufacturer of actuators for correct installation.

6 - Valves with threaded ends:

- Prepare the tubes correctly;
- Check the correct alignment of the pipe;
- Install the valve using the proper tools to work.

7 - Valves with flanged ends (see item 10):

- Check the correct alignment of the pipe;
- Install the valve using the proper tools to work;
- Tighten alternately opposite cases together 180° diametrically. All nuts must be tightens the gradually, thereby obtaining a uniform stress on the joints of the flanges.

8 - Valves with end plug welding:

- Prepare the tubes correctly;
 - Check the correct alignment of the pipe;
 - Inserting the tubes in the valve body fittings, leaving a space (gap) of 1.6 mm between the face of the tube and the valve body fittings;
 - Make sure that the valve is in the closed position before begin any welding process. In the case of valves that have not metal seats (ball valves), remove the extremities of the valves, identifying them, weld the pipes at the ends of the body and reassembly keeping the original position of the parts, taking care not to invert and / or damage any components. The valve and pipes must be supported during the welding process and must not be subjected to stresses during cooling.
- Important note:** only qualified welding procedures must be used and the temperature in the region of the valve seats must never exceed 250 ° C, if this temperature is exceeded, it may cause damage to the seals seats and cause possible leaks.

To control the temperature should use an appropriate tool (thermal pencil or digital thermometer) and guarantee correct placement of the resistances on the valve body to heat treatment and relief of stress only in the heat affected zone by welding.

9 - Valves with beveled ends for butt weld:

- Prepare the tube correctly;
- Check the correct alignment of the pipe;
- Tack weld the tubes in the body of valves with proper root spacing;
- Make sure that the valve is in the closed position before begin any welding process. In the case of valves that have not metal seats (ball valves), remove the extremities of the valves, identifying them, weld the pipes at the ends of the body and reassembly keeping the original position of the parts, taking care not to invert and / or damage any components. The valve and pipes must be supported during the welding process and must not be subjected to stresses during cooling.



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Valve body with resistance positioned correctly only in the regions of the bevels



Detail the positioning of the resistance



Valve body with mounted and isolated Resistance heat ready to start the heat treatment the welded joints.



Detail of thermal insulation resistances

10 – Tightening of Flanged joints according to ASME PCC-11

In order to obtain a good seal in a flanged union, three points must be considered:

- Correct specification of the joint.
- Proper torque calculation to the system.
- Follow step-by-step the joint installation procedure.



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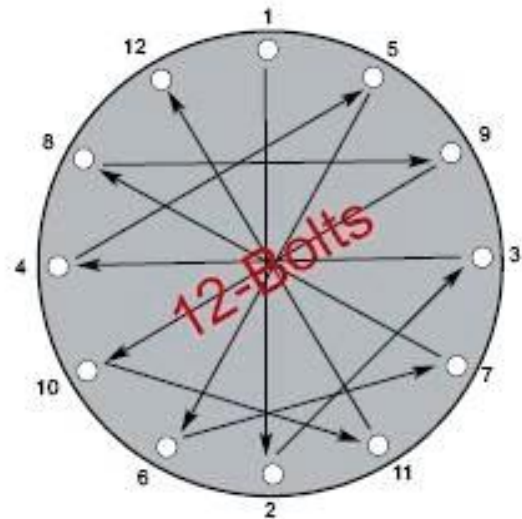
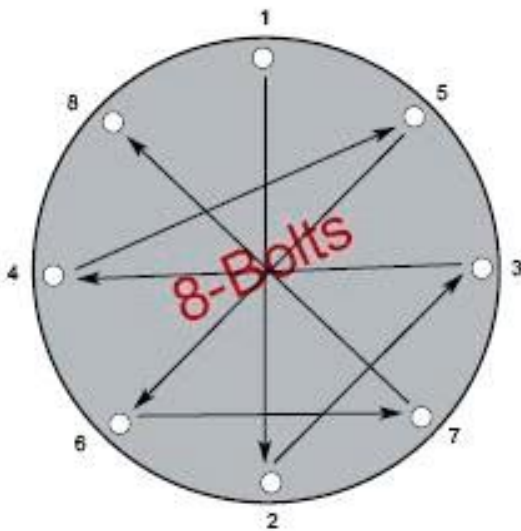
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Installation steps according to ASME PCC-1:

- **Installation:** Give first grip on all nuts by hand. Very large screws may require the use of a small hand tool. Never exceed 20% of the final torque. Ensure that the flanges are aligned and parallel measuring the spacing between them in at least four different points positioned 90 degrees from each other.
 - **Step 1:** Tighten each nut to approximately 30% of the final torque specified, following the crossed pattern detailed in the figure below. Ensure that the flanges maintain parallelism in each stage of tightening.
 - **Step 2:** Tighten each nut to 60% of the final torque specified, following up the crossed pattern.
 - **Step 3:** Tighten each nut until the final specified torque, following the crossed pattern.
 - **Step 4:** Apply the final torque on all nuts clockwise until there is no more rotation of nuts.
 - **Step 5:** Repeat Step 4 at least 4 hours after installation and before pressurizing the system.
- Importantly, the above procedure should be followed always by the end to avoid an imbalance in stress between the screws at the end of the tightening process.

Example tightening sequence 8:12 holes flanges:



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Torque table for installation joints and flanges

Cardboard joints hydraulic NA¹, tealon*
Metalflex Joints 913, 913M

Class 150 psi

Nominal Diameter		recommended torque	
Flange	Screw	(Kgf.m)	(Lb.ft)
1/2"	1/2"	4	30
3/4"	1/2"	6	40
1"	1/2"	7	50
1 1/4"	1/2"	8	60
1 1/2"	1/2"	8	60
2"	5/8"	17	120
2 1/2"	5/8"	17	120
3"	5/8"	17	120
3 1/2"	5/8"	17	120
4"	5/8"	17	120
5"	3/4"	28	200
6"	3/4"	28	200
8"	3/4"	28	200
10"	7/8"	45	320
12"	7/8"	45	320
14"	1"	70	500
16"	1"	70	500
18"	1 1/8"	100	710
20"	1 1/8"	100	710
24"	1 1/4"	140	1000

Class 300 psi

Nominal Diameter		recommended torque	
Flange	Screw	(Kgf.m)	(Lb.ft)
1/2"	1/2"	4	30
3/4"	5/8"	6	40
1"	5/8"	10	70
1 1/4"	5/8"	14	100
1 1/2"	3/4"	21	150
2"	5/8"	15	105
2 1/2"	3/4"	20	140
3"	3/4"	24	175
3 1/2"	3/4"	28	200
4"	3/4"	28	200
5"	3/4"	28	200
6"	3/4"	28	200
8"	7/8"	45	320
10"	1"	70	500
12"	1 1/8"	100	710
14"	1 1/8"	85	620
16"	1 1/4"	120	875
18"	1 1/4"	140	1000
20"	1 1/4"	140	1000
24"	1 1/2"	195	1400

1 - Cardboards hydraulic N.A (asbestos free)**Na 1000m, NA 1002, NA 1040, NA 1060, NA 1085, NA 1092, NA 1100.**



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Torque tables for installation joints in flanges

Metalflex Joints 913 e 913m

Class 400 psi

Nominal Diameter		recommended torque	
Flange	Screw	(Kgf.m)	(Lb.ft)
1/2"		Use Flange Class 600	
3/4"			
1"			
1 1/4"			
1 1/2"			
2"			
2 1/2"			
3"			
4"	7/8"	45	320
5"	7/8"	45	320
6"	7/8"	45	320
8"	1"	70	500
10"	1 1/8"	85	620
12"	1 1/4"	120	875
14"	1 1/4"	120	875
16"	1 3/8"	165	1200
18"	1 3/8"	165	1200
20"	1 1/2"	195	1400
24"	1 3/4"	360	2600

Class 600 psi

Nominal Diameter		recommended torque	
Flange	Screw	(Kgf.m)	(Lb.ft)
1/2"	1/2"	4	30
3/4"	5/8"	8	55
1"	5/8"	12	85
1 1/4"	5/8"	12	85
1 1/2"	3/4"	22	160
2"	5/8"	12	85
2 1/2"	3/4"	17	120
3"	3/4"	25	180
4"	7/8"	41	300
5"	1"	62	450
6"	1"	62	450
8"	1 1/8"	85	620
10"	1 1/4"	120	875
12"	1 1/4"	120	875
14"	1 3/8"	165	1190
16"	1 1/2"	195	1400
18"	1 5/8"	260	1900
20"	1 5/8"	260	1900
24"	1 7/8"	480	3500

Observations: all tables in this brochure are only applicable under the following conditions:

- 1 - Flange in steel according to ASME b16.5
- 2 - New bolts in alloy steel according to ASTM a193-b7 lubricated with molybdenum base grease
- 3 - Dimensions of joints hydraulic cardboard n.a(Na 1000m, na 1002, na 1040, na1060, na1085, na1092, na 1100, tealon (tf 1750, tf tf 1580, tf 1590) according to ASME b16.21, dimensions of the joints, 913, 913m according to ASME b16.20.
- 4 - The indicated torque must be applied according to ASME PCC-11, NEVER in a single tightening.

11 – Gate Valves for Steam Lines Applications: When a gate valve type (with sealing by both sides) is fully closed with liquid inside (usually water) used in hydrostatic test pipe and after completion of this test the valve is not open for drainage, this fluid accumulates in the internal spaces of the valve. When the line is heated the liquid retained expands creating a pressure buildup inside the body/bonnet (screwed bonnet as shown in Figure 1) or body/bonnet (Pressure Seal valve shown in Figure 2) and this accumulated pressure can generate an additional force which may exceed the resistance limits of the materials used and can cause serious problems or accidents (leaks by the joint body/cover, rupture of the fastener body / cover, deformation of internal components, deformation and/or rupture of the body and cap, etc).



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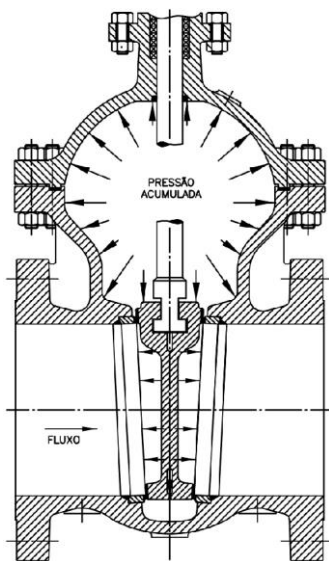


Figure 1

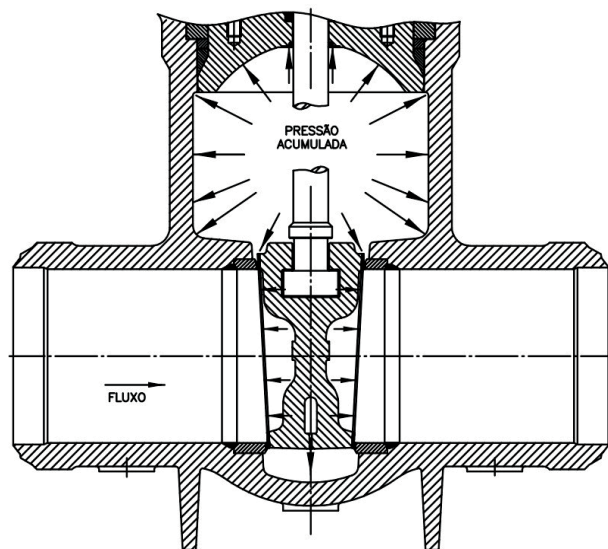


Figure 2

Solution - When this application is foreseen before supplying, one can adopt the following solutions:

1 - Simple and Economical solution: Wedge with vent-hole (relief hole for internal drainage, shown in Figure 3) in the valve pressure inlet side. **In this solution the valve has an unidirectional flow direction as indicated by the arrow on the valve body to be followed.**

2 - Installation of a manual or automatic valve for internal pressure relief (Figure 4).

3 - Install a manual by-pass valve external to equalize internal body cavity to the next inflow. The bypass valve must be manually opened during heating to relieve the internal pressure (Figure 5).

***When the valve is not provided with the condition described above, fully open the valve and drain all water from the pipe before heating processes.**

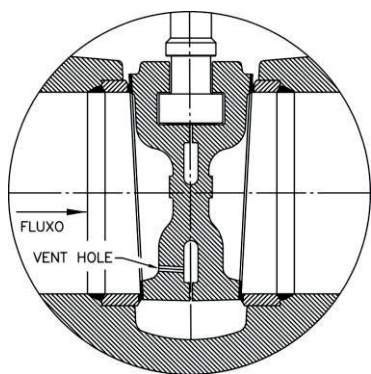


Figure 3

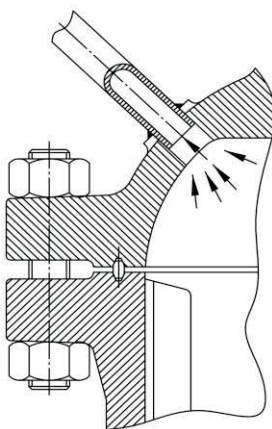


Figure 4

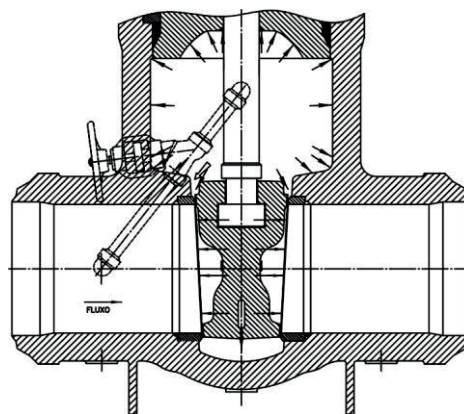


Figure 5

• Operation (Open / Close):

1 - Valves with manual actuation by handwheel or gearbox: For opening and closing follow the indication on the steering wheel: to close (clockwise) and to open (anti-clockwise);

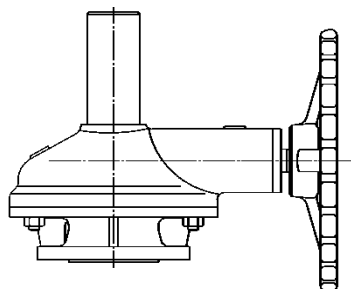


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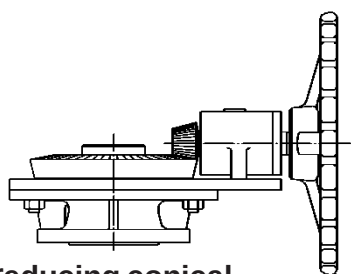
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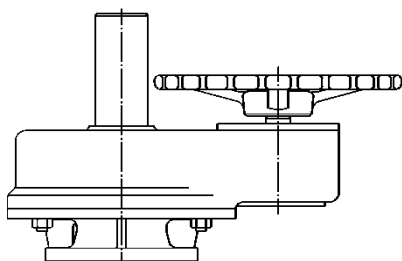
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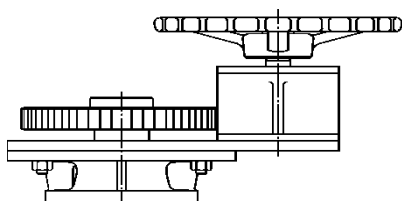
Conical Reducer Box



reducing conical
open box

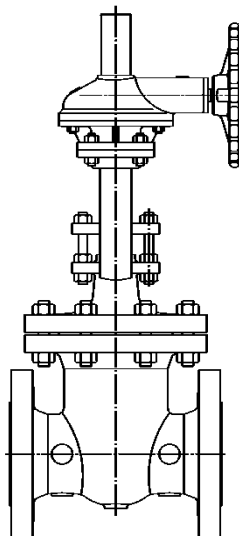


Reducing Parallel Box

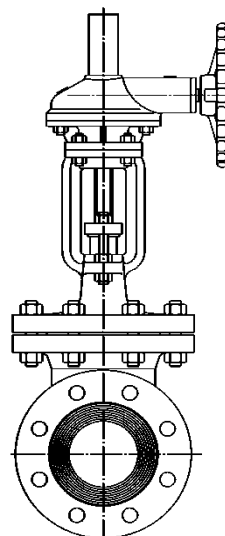


Reducing Parallel
Open Box

Types of Assemblies

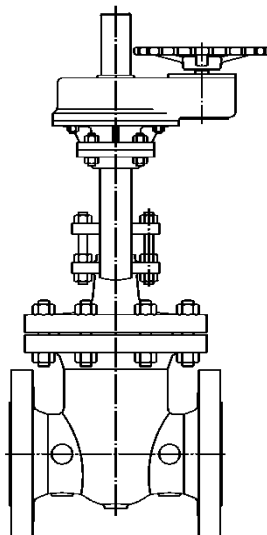


Type N

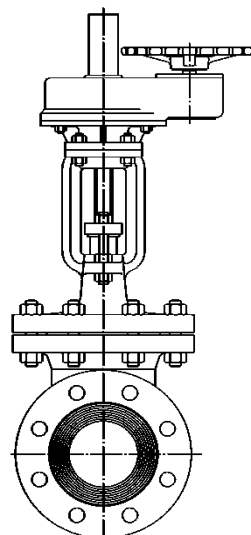


Type O

Types of Assemblies



Type N



Type O

2 - Valves automatically actuated by electric actuator, Pneumatic or Hydraulic: For opening and closing following the indication of the actuator manufacturer's operating manual

Important note: for valves actuated by electric actuator: in order to avoid damaging the contact surfaces against stem seal and cover due to over-torque the adjustment to the opening position is referenced by position, in case of need any gasket packing replacement or placement of new gasket rings to complement with a pressurized valve there is the need of engaging the manual drive in electric actuator and complete the opening stroke.

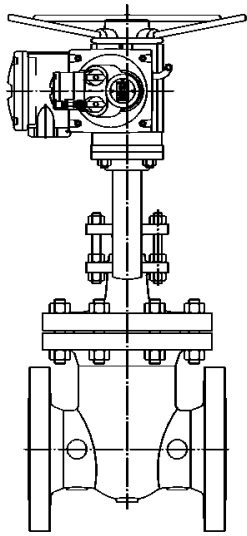


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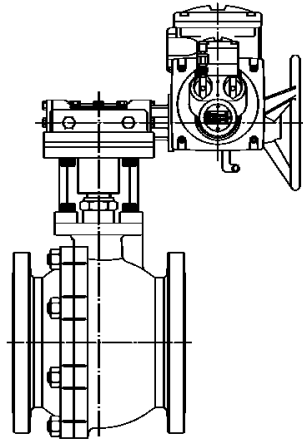
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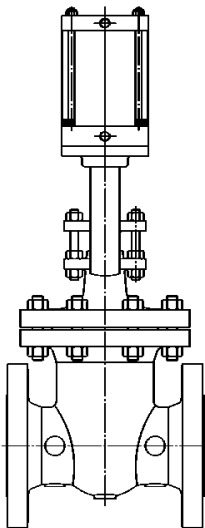
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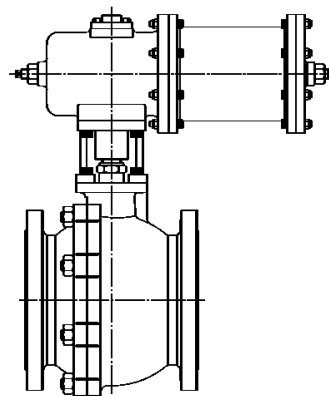
Electric Actuator
Valve Ascender



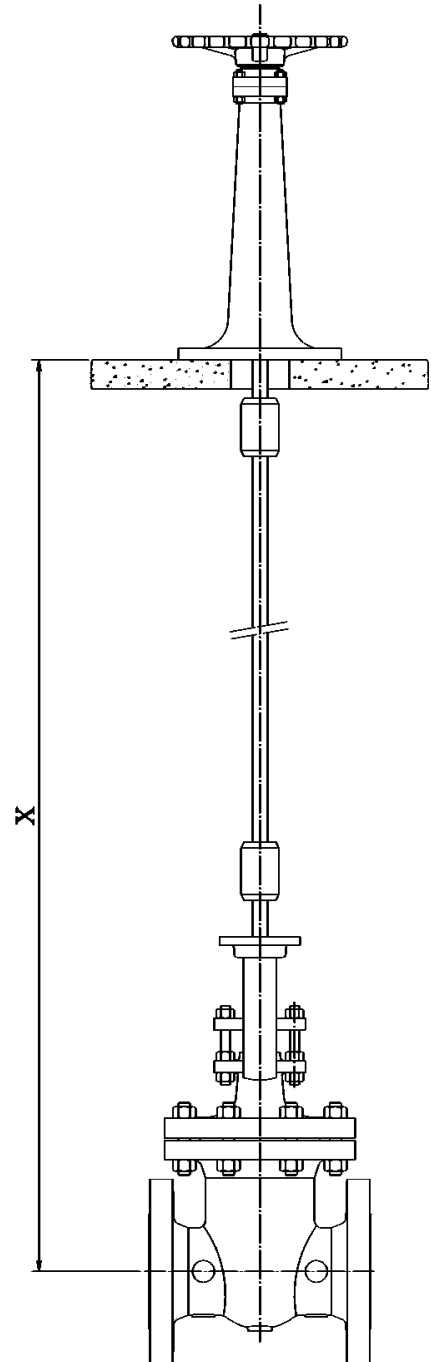
Electric Actuator
Rotary Valve



Pneumatic Actuator /
Hydraulic Rising Stem Valve



Pneumatic Actuator /
Hydraulic Rotary Valve



Maneuver Pedestal

Note: Dimension "x" must be indicated by the client

3 - Gaskets: After pressurizing the pipe check the stem packing is common the need of retightment of the packing gland bolts and in some cases putting more gasket rings due to natural accommodation of gaskets. Repeat the retightment of the packing gland opening and closing the valve a few times;

4 - Never use improvised tools to operate the valve thereby avoiding applying excessive torque in the stem.



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• Maintenance:

- 1 - Periodically check the gasket packing of the stem and body joints/cover. In the case of leaks retight them avoiding prolonged leaks;
- 2 - Keep lubricated the stem and other lubrication points.
- 3 - For valves with gearbox (manual gear reducer) check every 6 months and if necessary to inject grease through grease nipple.

Note: The gearbox Engeval manufacturing are the closed box type and can be installed in opened environments, but in case of being submerged in water (e.g. in a flood) they must be disassembled, cleaned, dried and reassembled with new grease .

Note: For security reasons, the following precautions should be taken prior to making work on the valves:

- The personnel involved should wear personal protective equipment appropriate to the job;
- Make sure the valve is depressurized, drained and cold.

• Spare Parts:

If you require the exchange of any valve component provided by Engeval get in contact and provide the serial number on the nameplate. We do not recommend the exchange of components which are not supplied by Engeval.

• Packing:

The maximum performance of gasket and longer operational life is guaranteed if the followings steps fow installation is strictly followed:

First step - Valve Preparation and tools:

- 1 - Prepare all the appropriated tools necessary materials for the execution of the service;
- 2 - Wait the release of the area where the job is going to happen;
- 3 - Certify that the valve is depressurized and at room temperature;
- 4 - Turn the valve wheel in the opening direction until it is in the fully open position and the stem is in contact with the cover seal seat;
- 5 - Remove all the old gaskets with the aid of the appropriated tool (see Figure 1) taking care not to damage the stem and the stuffing box in the cover, this means the removal of all the rings, including the lantern ring and more subsequent rings when appliable;
- 6 - Clean the stuffing box and check the stem for any damage; arrange to eliminate these defects;
- 7 - Clean and check the bolts and nuts of the packing gland and in case of wear provide the exchange by new bolts and nuts of the same material.



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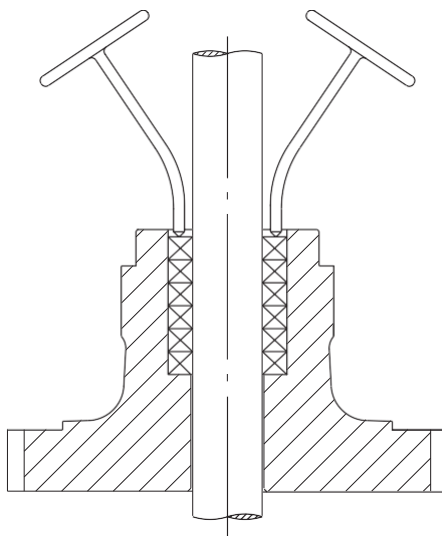


Figure 1 – Detail of gasket removal tool

Step Two - Choose the right sized gasket to be used:

1 - Determine the correct dimensional gauge (square section): Gauge Gasket = $B - A / 2$ (see Figure 2)

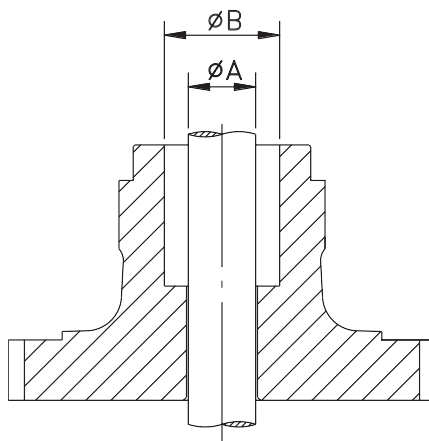


Figure 2 – Detail of the stuffing box in the cover without gaskets

Important: Use gaskets with correct dimensions for best quality in packing avoiding leaks.

Step Three - Determine the correct number of rings to be used:

- 1 - To determine the correct number of rings to fill the stuffing box, measure its depth (see Figure 3);
- 2 - Divide it for the square section to obtain the correct number of rings (correct number of rings = Depth / square section)

Ex: (Depth = 60 mm)/(Square Section = 9,53 mm) - Number of rings = 6



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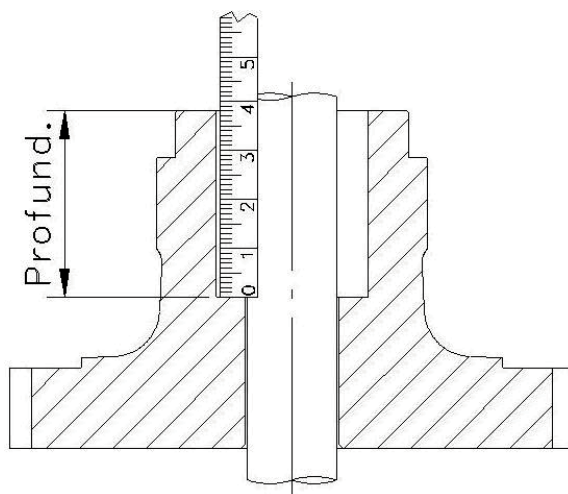


Figure 3 – Depth of Stuffing Box

Step Four – Correct cutting processo of the gasket rings (see Figure 4):

- 1 - The rings should be cut diagonally in 45 degrees;
- 2 - The best way is to cut the rings on a cylindrical stem wood of the same diameter of the valve rod stock;

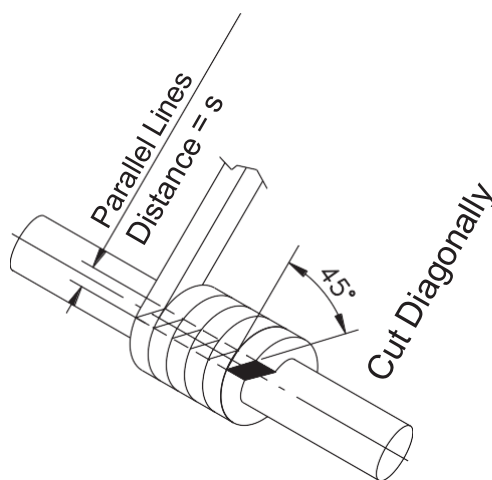


Figure 4 – Wood Rod (Even Diameter Stem Valve Original)

- 3 – Involve the wooden rod with a sufficient number of turns to cut the amount of desired rings;
- 4 - Hold the gasket firmly in the wooden rod without stretching it;
- 5 - Cut the rings at an angle of 45 degrees;
- 6 - Scratch two parallel lines gasket then cut each ring individually at an angle of 45 degrees.

Alternative cutting methods:

- 1 – Involve the valve stem with the gasket and cut the first ring on the stem. Later, use a wooden board as a base and cut each additional ring desired using the ring cut as a measure (see Figures 5 and 6).
The cutting board can be made with lines with 45 degrees and $\frac{1}{2}$ in spaces.



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Stem Diameter

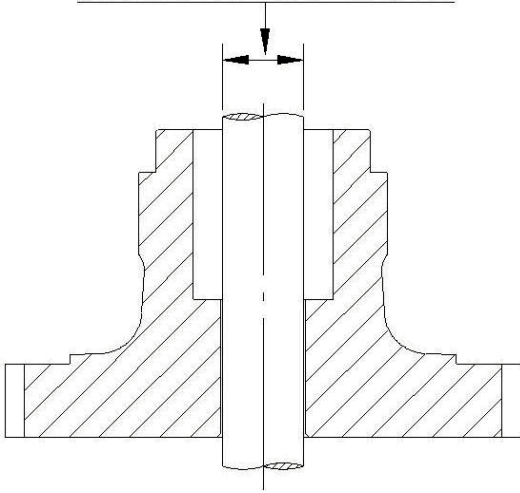


Figure 5 - Detail of Stuffing Box + Stem

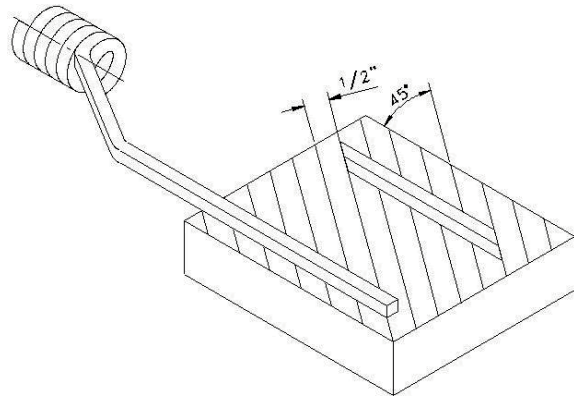


Figure 6 - Cutting board Detail

Or

2 - Wrap the valve stem with the gasket and cut all the necessary rings, taking care not to scratch the stem (see figure 7).

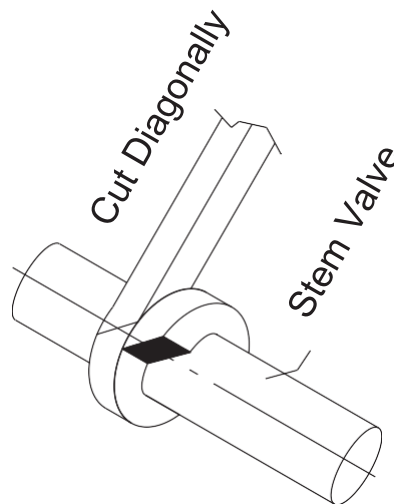


Figure 7 – Stem partial with gasket involved

Or

3 - Determine the length of the rings to be cut by the formulas:

- For valves using gaskets to 1/2 in gauge.

$$L = (1.3 \times S + A) \times 3.14$$

- For valves using gaskets above 1/2 in gauge.

$$L = ((1.3 \times S + A) \times 3.14) + S$$

Where: L = Length of the ring

S = Gauge for the ring

A = Stem Diameter



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Step Five - Method of assembly of the rings in the stuffing box:

1 - Each gasket ring must be individually seated (see Figure 8);

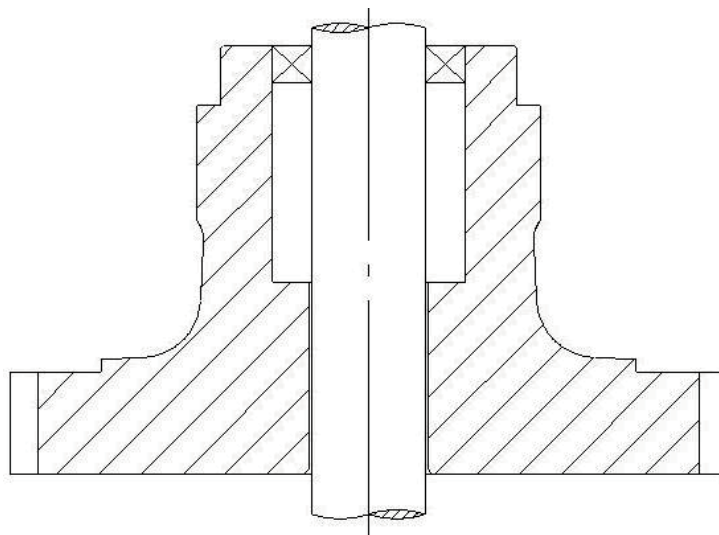


Figure 8 – Stuffing box detail with the first gasket ring positioned.

2 - Make sure that the ring is clean;

3 - Use the packing gland for the assembly of each ring;

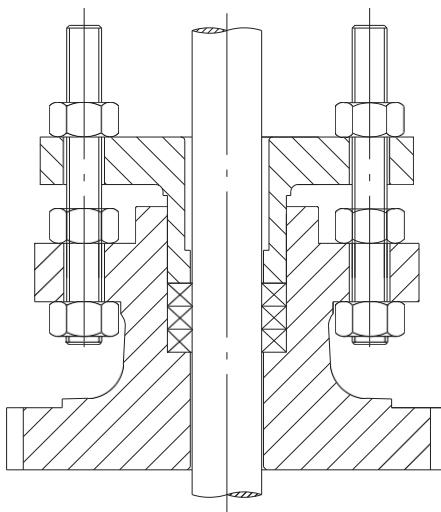


Figure 9 - Gaskets camera detail with 3 rings with the packing gland compressing the rings

4 - Do not use a screwdriver to push the rings in the chamber;

5 - Install the rings in a way that the cuts (splices) are displaced to approximately 90 degrees to each other;

6 - When all the rings are properly positioned, the packing gland nuts must be tightened alternately 1/4 turn at a time to the point of feeling resistance;

7 - The packing gland must enter into the stuffing box at least 3 mm in order to prevent that the last gasket ring extrude throw the gap between the packing gland and the stuffing box, locking its course.

8 - Open and close the valve three times and if necessary retight the gaskets.



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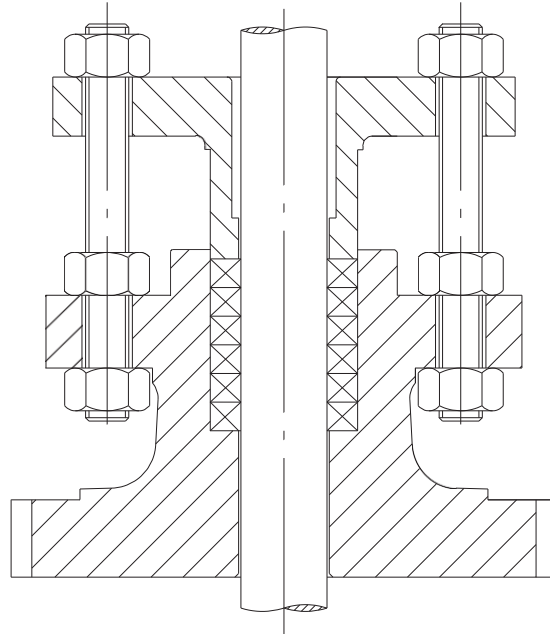


Figure 10 – Stuffing Chamber Fully Gasketed

Important Notes: The use of appropriate gaskets for the service conditions is essential to obtain satisfactory results, excessive tightening may lock the valve stem preventing its opening or closing and insufficient tightening may cause leakage and/or extrusion of the gaskets.

• **Warranty:** The products manufactured by ENGEVAL are guaranteed against defects in material or workmanship for a period of nine months in operation or fifteen months from delivery, whichever occurs first. This period starts to run from the legal guarantee ninety days of delivery of the product, as Article 26 - section II - paragraph 1 of Law No. 8.078 of September 11, 1990.

• **Technical assistance:** Technical assistance will be provided for manufacturing defects since all assembly recommendations are followed, in some cases the equipment may need to return to the Engeval company. For any information about your valve or if you need technical assistance, please provide the serial number found on the valve nameplate.

Note: We do not accept returns without prior consultation with our commercial department.