INSTALLATION, MAINTENANCE AND OPERATING INSTRUCTIONS
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1 GENERAL

The series C ball valve has flanges or welded ends, two symmetrical body halves, one-piece ball and stem with the ball supported by its seat rings.

Standard valves are tight in both flow directions, because the differential pressure across the valve presses the ball against the down-stream seat.

The same valve can serve as a throttling control valve and a tight shut-off valve.

2 HANDLING

2.1 Reception and storing

Check that the valve has not been damaged during transportation. Store the valve properly before installation is due to commence. Do not remove the protective plates before installing the valve into the pipe-line. The valve is always delivered in the open position.

2.2 Installation into pipe-line

Flush or blow the pipes clean before installing the valve. Impurities, sand or parts of welding electrodes might damage the ball surface and seats.

There are three marks to indicate the open-closed position of the valve:
- an arrow on the drive centre of the actuator
- a groove at the end of the ball stem
- the keyway of the ball stem

All are in the same direction as the flow opening. If you feel uncertain about the arrow, check by the groove and the keyway.

Place the lifting ropes around the valve body. **Never lift the valve by the actuator.** (See Fig. 1)

Neither the direction of flow nor the installation position interferes with the operation of the valve actuator or positioner.
If possible, instal the valve in such a position that the actuator can, if necessary, be detached without removing the valve from the pipe-line.

**Be sure to use flange gaskets which are suitable for the operating conditions.**

**Do not attempt to correct pipe misalignments by means of the flange bolts.**

The actuator must not touch the pipe-line, as pipe-line vibrations might damage it or lead to faulty operation.

Fig. 1  How to lift a ball valve
2.3 Supporting the valve

A well-supported pipe-line minimises strain in the valve caused by the vibrations in the pipeline.

For maintenance it is preferable not to support the valve. However, if necessary, support it by the body with pipe clamps and supports. Do not fasten supporting structures to flange bolts or to the actuator. See Fig. 2.

2.4 Commissioning

Check that the pipe-line is clean.

Should the valve leak when the pipe-line is being pressure tested, possible reasons could be an insufficient quantity of testing liquid, or a very low pipe-line pressure resulting in the ball not pressing tightly against the seat. Here the differential pressure can be increased or the movement of the ball assisted, for example, by slackening the actuator installation brackets and gland nuts, before lightly knocking the stem or body. If it is necessary to slacken the brackets, check that the open position does not change.

The gland packing may leak after long storage. Tighten it uniformly by both nuts until the leakage ceases, see item 5.4.1.

3 MAINTENANCE OF THE INSTALLED VALVE

No regular maintenance is necessary. However, check the gland packing tightness at regular interval.

Fig. 2 Ways of supporting a ball valve
3.1 Gland packing

If the gland packing leaks after the nuts have been tightened to the values given in section 5.4.1, change the packing. The valve must not be under pressure.

The change can be carried out without removing the actuator if cut seat rings have been used.

Remove the old packing with, or instance, a pointed knife or the special tool for the purpose, see Fig. 3. Instal the new packing as instructed in section 5.4.

Fig. 3 Removal of the gland packing with the removing tool

3.2 Body joint

Should the body joint leak, tighten the nuts as per the torques given in section 5.3.2. Should leakage continue, open the body and check the body joint gasket. Also check that the body joint sealing surfaces are level and undamaged, see section 5.3.1.
3.3 Ball and seats

Valve leakage exceeding the acceptable values can be due to the ball being incorrectly located between the seats, or damaged sealing surfaces caused by dirt, grit, etc. Stellite-seated valves have a clearance between the ball and seats to prevent jamming of the ball due to thermal expansion.

At low differential pressures or as result of the weight of the actuator, the force pressing the ball against the down-stream seat can be inadequate and the valve may leak. Therefore it will be necessary to swing the ball externally against the down-stream seat by means of distance washers located between the the actuator and one of the brackets.

Fig. 4 Swinging the ball by means of the actuator installation brackets

If damage to the down-stream sealing surface of the ball is suspected, try to stop the leakage by turning the ball through 180 degrees. If the leakage continues, then the down-stream seat or possibly both sealing surfaces of the ball are damaged. Turn the ball back to its original position and then turn the entire valve 180 degrees in the pipe-line. Should the leakage still persist then it will be necessary to dismantle the valve and carefully check the sealing surfaces.
3.4 Jammed or stuck valve

Jamming or sticking can be caused by accumulated medium between the ball and body. Turn the ball partially open and flush the valve inside.

Another reason could be too small a ball clearance for the operating temperature. If insulating the valve body does not help, dismantle the valve and check the ball clearance as directed in section 5.2.1.

4 REPAIR OF VALVE

It may be necessary to remove and dismantle the valve if the steps mentioned above (section 3) do not remedy the problems.

4.1 Removing the valve from the pipe-line

Remove the valve with its actuator from the pipe-line. Turn the valve to remove all the medium from inside.

If the medium is toxic or corrosive, flush the valve **TO AVOID ACCIDENTS**.

If the valve is going to be returned to the manufacturer for repairs do **NOT** dismantle it.

4.2 Dismantling the valve

Dismantle the valve on a clean level surface of wood, cardboard or plastic with the valve standing on its flange. Support the actuator so that it cannot revolve when the fixing bolts are removed.

Fig. 5 Valve placed on a level surface for dismantling
Remove the actuator fastening bolts. Pull the actuator away from the stem either with a pulling tool or by hand. The pulling tool is shown in section 9.4. Remove the fastening brackets from the valve. Tap loose the key at the end of the ball stem. (Remove any burrs from the keyway edges.) Unscrew the fastening bolts of the bonnet and the bolts fastening the body halves and the pull the bonnet away from the ball stem. Remove the bolts fastening the body halves and lift the upper body half and place it standing on its flange.

Fig. 6    Removal of actuator with the pulling tool

4.3 Inspection and maintenance of valve parts

Check each part separately and determine steps to be taken.

4.3.1 Ball

Lift the ball from the body onto a soft surface and clean it. Check the sealing and bearing surfaces of the ball and stem. Remove smaller scratches and impurities with emery cloth. File off any burrs from the stem keyway.

If there are any deeper scratches on the sealing and bearing surfaces or if the ball is not perfectly spherical, it must be returned to the manufacturer for repair.
4.3.2 Stellite seats

To check the back seal remove the stellite seats. Rotate the seat in its groove, tapping with, e.g. a chisel, until it moves freely. Turn the body upside down and hammer the end of the seat through the flow opening.

If the seat is badly damaged and will not come out, weld a suitable flat iron bar onto it, this can then be hit through the flow opening.

Change PTFE back seals only if they are in bad condition. Grafoil® back seals should always be changed.

4.3.3 Locked-up stellite seats

If the seats are in good condition they need not be removed unless the back seal needs to be checked.

Firstly, carefully grind off most of the metal from the locking points, then chisel off the rest of the locking points using a sharp chisel. See Fig. 7. Remove the seats as instructed in section 4.3.2. If the seats are locked-up with stellite bushing as described in section 5.2.2, grind off the welding joints from the edge of the flow opening and press the bushing inwards to allow the seat to come out. See Fig. 8.

Fig. 7  Grinding off the locking points  Removing the locking points with a sharp chisel
4.3.4 PTFE seats

PTFE seats need not be removed if they are still in good condition. If medium can be seen to have accumulated behind them, they must be removed for cleaning.

If the original seats are to be refitted, remove them very carefully by means of, e.g. a thin knife or screwdriver. Insert the blade between the metal clamp and seat, and from several points lift the seat from the groove.

4.3.5 Body

Body and bonnet gaskets must always be replaced during maintenance. Clean all sealing surfaces carefully. Do not round the sharp edges at the convergence point of the body joint and bonnet sealing surfaces as this could cause leakage. See Fig. 9.

Fig. 9  Sealing surfaces must have sharp edges
4.3.6 Other parts

Clean all other parts, i.e. bonnet, packing gland, nuts and bolts, etc. Place the bonnet upside down on a valve and remove the gland packing.

After cleaning and inspection keep all parts well protected until re-assembling, especially the ball, seats and body joint surfaces.

If the damage is so severe that the valve cannot be repaired by changing the parts, return it assembled to the manufacturer for repair.

5 RE-ASSEMBLING

Re-assemble the Series C valve so that the body half with a groove in its flange lies on a level surface with the pipe flange downwards. Then install the parts in the following order:

(5.1) seats
(5.2) ball
(5.3) body joint between the body halves and bonnet
(5.4) gland packings
      key for the ball stem

5.1 Cleaning and inspection of parts.

Begin by checking the parts. Remove any burrs and scratches and clean the internal parts again.

In PTFE-seated valves check that the sealing edge of the pre-pressed outer circumference of the seats is undamaged.

5.2 Installation of ball and seats

The bodies, balls and seats are inter-changeable for each size. Valves with stellite seats have hard chrome-plated or stellited balls; those with PTFE seats have polished balls in the basic material.
5.2.1 Stellite seats

With PTFE strip as back seal.

5.2.1.1 Checking the ball clearance

When installing new seats or a ball, check the ball clearance as follows:

Place the ball seat into its groove without the back seal.
Lift the ball into the female body half.
Do not fit the body joint gasket.
Lift the male body half into position. In order to keep the ball seat in position during this operation, place it obliquely in the groove or centre it on the ball so that it slips into the groove when the upper body half is lowered into place.
Install the bonnet.
Tighten several of the flange bolts by hand.
Move the ball to the closed position. Move the ball up and down the maximum distance possible by lifting and pressing the stem, see Fig. 10.
Measure the ball clearance with a dial indicator, a T gauge or two feeler gauges.
Fig. 10  Measuring the ball clearance

Measure $C$ taken with a dial indicator or T gauge. Measure $\frac{C}{\sqrt{2}}$ measured simultaneously with two feeler gauges where "C" equals ball clearance or movement.
5.2.1.2 Assembly of the stellite seats

Fig. 11  Stellite seats

Place the back seal in the seat groove as shown in Fig. 12. If necessary, fasten the PTFE strip with 3 or 4 small PTFE keys.

Fig. 12  Cutting and fastening the back seal strip

Place the ball seats into the groove and lift the ball onto the female body half.

Fit the body joint gasket as instructed in section 5.3.
5.2.2 Locked up stellite seats

Locking seats are recessed and their back seals are of Grafoil or PTFE.

The seats are locked either
- with a metal clamp which is peened over the seat shoulder by punching it at 4-8 points with a punch. Be careful not to deform the seat by excessive punching,
- with a stellite bushing pressed against the seat shoulder and welded at the flange-end of the valve with 4-8 welds of approx. 10 mm as instructed in section 6.1.

Seat grafoil back seals are first pressed before locking using a filling cone.

The thickness "t" of the filling cone, which is made of gasket sheet, is calculated as follows:

\[ t \geq \frac{ball\ clearance\ C}{\sqrt{2}} \]

Fig. 15     Filling cone
5.2.2.1 Seats for normal temperatures
- with PTFE strip as back seal

Fig. 16 Assembly by pressing

Tighten the body halves together in a press or by tightening at least half of the flange bolts thus compressing the seals into their final shapes. In this case it is sufficient to tighten the bolts to approx. 50% of the final torque required, see Table 3.

Grafoil back seals are compressed to about half of their original thickness. The narrowing of the gap between the body joint indicates the compression of the back seal.

In valve size 25 mm (1") the filling cone is not necessary. The body halves are simply pressed together.

Dismantle the valve. Lock up the seats as instructed in section 5.2.2. Lift the ball into the female body half and fit the body joint gasket into place as instructed in section 5.3.
5.2.2.2 High temperature seats

- Graphite sheet as back seal

Fig. 17 Locked up high temperature seats

High temperature seats are always locked up.

Place the ball seat with a graphite back seal into the body groove. Fit the ball and the male body half onto the female half. Check the ball clearance as instructed in section 5.2.1.1.

Remove the upper body half, turn the ball to the open position and place the filling cone between the ball and seat. Replace the upper body half.

Tighten the body halves together in a press or by the flange bolts so that the back seals are compressed to one half of their original thickness. The narrowing of the slit between the body joint indicates the compression of the back seal.

In valve size 25 mm (1") fit three graphite seals behind each ball seat. Do not use the filling cone. Tighten the body halves together.

Dismantle the valve. Lock up the seats as per 5.2.2. Fit the ball into the female body half and position the body joint gasket as instructed in section 5.3.
5.2.3 PTFE seats

Assembly of PTFE seats

The ball and seats are pre-pressed to ensure a good tightness even at low differential pressures.

The pre-pressed edge must be unbroken. The clearance need not be checked if the inner parts, ball and seat are not changed.

Fit the ball into position on the female body half and fit the body joint gasket as instructed in section 5.3.

Fig. 18 PTFE seats

5.3 Body joint between the body halves

5.3.1 Fitting the body joint gasket

The gasket is either a PTFE + PTFE impregnated, diam. 2 or 3 mm or a Grafoil sheet ring, the choice depending on the valve application. See tables 1 and 2.
5.3.1.1 Soft PTFE strip

Fit the sealing strip into the outer circumference of the seat groove, bending the strip so that its ends touch the inner circumference of the groove. See Fig. 19.

Fig. 19 Fitting the soft PTFE strip

Fit the sealing strip into the outer circumference of the seat groove, bending the strip so that its ends touch the inner circumference of the groove. See Fig. 19.

Table 1. Dimensions of soft PTFE strip

<table>
<thead>
<tr>
<th>Valve size mm (in)</th>
<th>Strip diameter mm (in)</th>
<th>Strip length mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 (1&quot;)</td>
<td>2 (5/64&quot;)</td>
<td>210 (8.5&quot;)</td>
</tr>
<tr>
<td>40 (1 1/2&quot;)</td>
<td>2 (5/64&quot;)</td>
<td>280 (11.5&quot;)</td>
</tr>
<tr>
<td>50 (2&quot;)</td>
<td>2 (5/64&quot;)</td>
<td>325 (13.0&quot;)</td>
</tr>
<tr>
<td>80 (3&quot;)</td>
<td>2 (5/64&quot;)</td>
<td>460 (18.5&quot;)</td>
</tr>
<tr>
<td>100 (4&quot;)</td>
<td>2 (5/64&quot;)</td>
<td>580 (23.0&quot;)</td>
</tr>
<tr>
<td>125 (5&quot;)</td>
<td>2 (5/64&quot;)</td>
<td>705 (28.0&quot;)</td>
</tr>
<tr>
<td>150 (6&quot;)</td>
<td>2 (5/64&quot;)</td>
<td>845 (33.5&quot;)</td>
</tr>
<tr>
<td>200 (8&quot;)</td>
<td>3 (1/8&quot;)</td>
<td>1055 (42.0&quot;)</td>
</tr>
<tr>
<td>250 (10&quot;)</td>
<td>3 (1/8&quot;)</td>
<td>1305 (51.5&quot;)</td>
</tr>
<tr>
<td>300 (12&quot;)</td>
<td>3 (1/8&quot;)</td>
<td>1520 (60.0&quot;)</td>
</tr>
<tr>
<td>350 (14&quot;)</td>
<td>3 (1/8&quot;)</td>
<td>1680 (66.5&quot;)</td>
</tr>
</tbody>
</table>
5.3.1.2 Graphite sheet

When fitting this ring-shaped gasket, trim the ends as shown in the above figure. For large valves, 12” and larger, a straight strip can be cut from a sheet and bent into the seat groove. The gasket sheet thickness is 0.4 mm (0.016”).

Table 2. Dimensions of body joint sheet gasket

<table>
<thead>
<tr>
<th>Valve size</th>
<th>Internal diameter</th>
<th>Width</th>
<th>Length of strip</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm (in)</td>
<td>(mm)</td>
<td>(mm)</td>
<td>(mm)</td>
</tr>
<tr>
<td>25 (1”)</td>
<td>61 (2.4”)</td>
<td>210 (8.5”)</td>
<td>Use prefabricated gaskets only</td>
</tr>
<tr>
<td>40 (1 1/2”)</td>
<td>93 (3.66”)</td>
<td>280 (11.5”)</td>
<td></td>
</tr>
<tr>
<td>50 (2”)</td>
<td>108 (4.25”)</td>
<td>325 (13.0”)</td>
<td></td>
</tr>
<tr>
<td>80 (3”)</td>
<td>150 (5.9”)</td>
<td>460 (18.5”)</td>
<td></td>
</tr>
<tr>
<td>100 (4”)</td>
<td>192 (7.56”)</td>
<td>580 (23.0”)</td>
<td></td>
</tr>
<tr>
<td>125 (5”)</td>
<td>227 (8.94”)</td>
<td>705 (28.0”)</td>
<td>690 (27.5”)</td>
</tr>
<tr>
<td>150 (6”)</td>
<td>274 (10.79”)</td>
<td>845 (33.5”)</td>
<td>830 (33.0”)</td>
</tr>
<tr>
<td>200 (8”)</td>
<td>346 (13.62”)</td>
<td>1055 (42.0”)</td>
<td>1035 (41.0”)</td>
</tr>
<tr>
<td>250 (10”)</td>
<td>430 (16.93”)</td>
<td>1305 (51.5”)</td>
<td>1290 (51.0”)</td>
</tr>
<tr>
<td>300 (12”)</td>
<td>500 (19.68”)</td>
<td>1520 (60.0”)</td>
<td>1500 (59.5”)</td>
</tr>
<tr>
<td>350 (14”)</td>
<td>555 (21.85”)</td>
<td>1680 (66.5”)</td>
<td>1660 (65.6”)</td>
</tr>
</tbody>
</table>
5.3.2 Tightening the body joint bolts

After fitting the body joint gasket, lift the male body half, complete with pre-installed seat, see section 5.2, onto the ball. Check there are no noticeable steps in the bonnet bore, between the body halves. Centre the body halves with the bonnet. See Fig. 21.

Lubricate the flange and neck bolts, screw into place and tighten to the torques given in Table 3. If hexagon bolts are used as flange bolts, the tightening is simpler if the bolts are inserted from below so that the nuts are screwed on from above the body joint flange.

Neck bolts in valve sizes 100 mm (4") and smaller must be positioned before installing the body halves.

Centre them so that the distance from the outer side of the nut to the shoulder of the bolt is equal at both ends.
For unlubricated bolts the torque values must be multiplied by a factor of 1.5.

The flange bolts are first tightened to about 10% of the torque values given in Table 3, in the sequence shown in the diagram below. Then they are tightened in the same sequence to the final torques.

Fig. 22  Flange bolt tightening sequence - typical example
5.3.3 Installation of the bonnet

After tightening the body joint bolts, remove the bonnet from the ball stem.

Fit the ring-shaped bonnet gasket onto the shoulder between the body and seat ring. If there were originally more than one sheet ring, then the same number must be re-fitted. See Fig. 23.

Fig. 23. The bonnet seals must be fitted before the bonnet is installed

When necessary, fit a back seal at the same time into the stem bore of the bonnet, see 5.4.3.

Push the bonnet onto the stem. To protect the back seal (if fitted), tape the edges of the stem keyway. Lubricate the fastening bolts of the bonnet. Tighten the bonnet bolts in accordance with the torques shown in Table 3.

5.4 Gland packing

According to application, gland packing is either braided, Grafoil strip or O-ring type. In addition to the gland packing, there can be an O-ring or a PTFE back seal on the stem.
5.4.1 PTFE braided gland packing

Braided PTFE strip is generally used as gland packing.

If no pre-cut rings are available, cut the braided strip on the valve shaft vertically with a sharp thin knife as shown in Fig. 24.

If a support ring is used under the gland packing, place it at the bottom of the packing box. Tap each ring into position, one by one, e.g. with the packing gland. Place each packing joint at a 90° angle to each other and 45° to the flow opening.

<table>
<thead>
<tr>
<th>Stem diameter (mm)</th>
<th>Packing width, (b) (mm)</th>
<th>Depth of packing box, (h) (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 (19/32&quot;)</td>
<td>5 (7/64&quot;)</td>
<td>20 (3/4&quot;)</td>
</tr>
<tr>
<td>25 (1&quot;)</td>
<td>6.35 (1/4&quot;)</td>
<td>25 (1&quot;)</td>
</tr>
<tr>
<td>35 (1 3/8&quot;)</td>
<td>6.35 (1/4&quot;)</td>
<td>25 (1&quot;)</td>
</tr>
<tr>
<td>40 (1 1/2&quot;)</td>
<td>6.35 (1/4&quot;)</td>
<td>25 (1&quot;)</td>
</tr>
<tr>
<td>55 (2 5/32&quot;)</td>
<td>8 (5/16&quot;)</td>
<td>32 (1 1/4&quot;)</td>
</tr>
<tr>
<td>70 (2 3/4&quot;)</td>
<td>8 (5/16&quot;)</td>
<td>32 (1 1/4&quot;)</td>
</tr>
<tr>
<td>85 (3 11/32&quot;)</td>
<td>8 (5/16&quot;)</td>
<td>40 (1 1/4&quot;)</td>
</tr>
<tr>
<td>95 (3 3/4&quot;)</td>
<td>11 (7/16&quot;)</td>
<td>55 (2 5/32&quot;)</td>
</tr>
<tr>
<td>105 (4&quot;)</td>
<td>11 (7/16&quot;)</td>
<td>55 (2 5/32&quot;)</td>
</tr>
</tbody>
</table>

Table 4. Dimensions of the packing box
No clearance must show between the ends of the packing rings.

Tighten the non-pressurised gland packing three times: initially when the valve is assembled, then after it has been pressure tested, and finally before installing the valve into the pipe-line.

Table 5 below gives the tightening torques and the tightening margins allowed. If the margin is too small, add another packing ring. Tighten with a torque wrench.

![Fig. 24 Cutting a braided packing strip](image1)

![Fig. 25 Tightening margin of new gland packing](image2)

<table>
<thead>
<tr>
<th>Stem diameter</th>
<th>Size of nut</th>
<th>Torque</th>
<th>Min. tightening margin allowed</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>(in)</td>
<td>Nm</td>
<td>ft-lb</td>
</tr>
<tr>
<td>15-20</td>
<td>(1/2”-3/4”)</td>
<td>5/16 UNC</td>
<td>10</td>
</tr>
<tr>
<td>25-40</td>
<td>(1”-1 1/4”)</td>
<td>3/8 UNC</td>
<td>20</td>
</tr>
<tr>
<td>45-55</td>
<td>(1 1/2”-2 1/4”)</td>
<td>1/2 UNC</td>
<td>50</td>
</tr>
<tr>
<td>70-85</td>
<td>(2 3/4”-3 1/2”)</td>
<td>5/8 UNC</td>
<td>90</td>
</tr>
<tr>
<td>95-130</td>
<td>(3 3/4”-5 1/4”)</td>
<td>3/4 UNC</td>
<td>150</td>
</tr>
</tbody>
</table>
5.4.2 Grafoil strip

If no pre pressed rings are available, make the packing ring by winding the strip onto the stem, so that it fits the packing box diameter exactly.

With this type of packing a support ring is always necessary.

Tighten the packing rings one by one as instructed in section 5.4.1. Their thickness is normally compressed to about 50% of the strip used.
5.4.3 Fitting the bonnet back seal

Either an O-ring or a PTFE ring can be placed in the back seal groove of the bonnet.

Fig. 27. Gland packing back seal

Fit the back seals when installing the bonnet, see section 5.3.3.

Press the PTFE ring by hand into an oval shape, insert it into the stem bore and then position it in the groove.

Lubricate the O-ring, e.g. with silicone.

Fig. 28. Inserting the PTFE back seal into the groove
6 INSTALLATION OF OTHER VALVE CONSTRUCTIONS

6.1 Body with stellite bushing

For applications where the standard body material would quickly wear out, the flow opening is stellite lined. Usually the ball is also stellited.

Fig. 29 Installation of stellite bushing

<table>
<thead>
<tr>
<th>Size mm</th>
<th>(in)</th>
<th>h mm</th>
<th>(in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>(1)</td>
<td>4</td>
<td>(5/32)</td>
</tr>
<tr>
<td>40</td>
<td>(1 1/2)</td>
<td>4</td>
<td>(5/32)</td>
</tr>
<tr>
<td>50</td>
<td>(2)</td>
<td>4.5</td>
<td>(11/64)</td>
</tr>
<tr>
<td>80</td>
<td>(3)</td>
<td>4.5</td>
<td>(11/64)</td>
</tr>
<tr>
<td>100</td>
<td>(4)</td>
<td>4.5</td>
<td>(11/64)</td>
</tr>
<tr>
<td>125</td>
<td>(5)</td>
<td>4.5</td>
<td>(11/64)</td>
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<tr>
<td>150</td>
<td>(6)</td>
<td>5</td>
<td>(13/64)</td>
</tr>
<tr>
<td>200</td>
<td>(8)</td>
<td>5.5</td>
<td>(7/32)</td>
</tr>
<tr>
<td>250</td>
<td>(10)</td>
<td>6</td>
<td>(1/4)</td>
</tr>
<tr>
<td>300</td>
<td>(12)</td>
<td>6</td>
<td>(1/4)</td>
</tr>
<tr>
<td>350</td>
<td>(14)</td>
<td>6</td>
<td>(1/4)</td>
</tr>
</tbody>
</table>

Press the bushing into position so that the end which protrudes inside the valve is at the given distance "h" from the seat groove bottom.

Tack-weld the flange end, without build-up, 4 to 8 tacks of about 10 mm each, depending on valve size.
6.2 Ball with cylindrical pipe-lining

This type of a ball is intended for applications where a straight-through opening is required.

The pipe is formed from thin plate and will not withstand pressure. The pressure is balanced by a small hole drilled through the bottom of the ball.

The pipe lining is not fastened to the ball.

6.3 Jacketed valve

The inner parts of a jacketed valve are identical to those in a standard valve and the valves are repaired in the same way. Check that the jacket is not corroded or otherwise damaged.

The jacket usually has a lower pressure rating than the valve and is tested at a pressure of 1.5 times that of the heating medium.
7 INSTALLATION OF THE ACTUATOR

The Neles-Jamesbury drive centre is suitable for various control units.

Clean the stem bore. File off any burrs. Lubricate the stem bore and ball stem. Fasten the actuator brackets to the valve loosely.

If a reducing bush is required between the stem bore and the valve stem, insert the bush in the actuator stem bore.

In the actuator stem bore there are two keyways at 90° angle to each other. The valve stem has a keyway parallel to the flow port of the ball.

When mounting a cylinder actuator, choose the actuator keyway which establishes the piston in its upper position (top end of the cylinder) when the valve is closed. When installing a screw operator, choose the actuator keyway which establishes the closed valve position when the handwheel is turned clockwise.

Push the actuator onto the ball stem carefully. Excessive force may damage the sealing of the ball and seat, especially with PTFE seats.

When there is a threaded hole at the end of the stem, the actuator can be pulled into position using a bolt.

Position the actuator as straight as possible with regard to the valve. Lubricate the fastening bolts and tighten them together with the bracket nuts.

Adjust the open- and closed-positions of the ball by means of the actuator adjustment screws, see Fig. 32. The correct open position is obtained from the flow opening, and the closed position by means of the arrow marked on the actuator. No adjustments are necessary if the actuator was installed on the same valve previously. It is only necessary to drive the actuator to its open position and then twist the entire actuator. Turn the ball to the fully open position and tighten the nuts and bolts.

Check the tightness of the stop screw at the top of the cylinder. For the entire process of tightening the screw, a non-hardening sealant must be used, e.g. Loctite® 76.

For required installation parts, see Figs. 33, 34 and 35.
Fig. 32 Open and closed position of actuator

Fig. 33 No bushing between valve stem and actuator bore

Fig. 34 Bushing between valve stem and actuator bore
7.1 Installation of hand lever

When a hand lever is installed on the valve, the valve stem has a shortened key to avoid interference with the surface of the stop plate or the bearing bushing.

Push the hand lever onto the ball stem, parallel to the flow opening of the ball.

Fit the stop plate, with the bearing bushing if required, onto the stem.
Tighten the stop plate fastening nuts preliminarily.

The open and closed positions of the ball can be determined by twisting the lever against the open and closed position pins. Check the open position with the flow opening, and the closed position with the position of the lever relative to the keyway and the body joint.

Finally tighten the stop plate.

A knob is fitted in the hand lever to facilitate locking the valve in intermediate positions.

Fig. 36 Installation of hand lever

![Diagram of hand lever installation]

Parts list

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
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<tr>
<td>3</td>
<td>2</td>
<td>Hexagon nut</td>
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<tr>
<td>4</td>
<td>2</td>
<td>Washer</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>Bushing</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>Key (shortened)</td>
</tr>
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8 VALVE PARTS

8.1 Ordering spare parts

Please give the following details in your order sheet:
- Valve type, given on the identification plate and in all related documents.
- Manufacturing number of valve, stamped on pipe flange - with flangeless valves on machined part of the welded end.
- Code number of part. If valve’s spare parts list is used, the name and quantity of the part
  or
- number of parts list number, item number, the name and quantity of the part.
- number of this manual, item number, the name and quantity of the part.
## 8.2 Parts List

<table>
<thead>
<tr>
<th>Item</th>
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<th>Part</th>
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<tr>
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<td>Body, male</td>
</tr>
<tr>
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<td>Ball</td>
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<td>Seat</td>
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</tr>
<tr>
<td>9</td>
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<td>Gland</td>
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<tr>
<td>10</td>
<td>1</td>
<td>Key</td>
</tr>
<tr>
<td>11</td>
<td>2</td>
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<td>4</td>
<td>Stud (Bolt)</td>
</tr>
<tr>
<td>14</td>
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<td>Stud</td>
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<td>69</td>
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<td>Gland packing x</td>
</tr>
</tbody>
</table>

x = Recommended spare parts
8.3 Assembly drawings
8.3.1 Stellite-seated valve
8.3.2 PTFE-seated valve
8.4 Valve stamping

- **Mfg. No.**
- **Seat material**
- **Tester's initials**
- **Mark of pressure testing**
- **Two marks on a stellite seated valve= tightness acc. to MSS SP-72**
- **Ball dia. below nominal one (mm/100)**
- **Nominal size**
- **Batch No. of body material**
- **Pair No. of body halves**
- **Direction mark of ball opening**
- **Name of manufacturing**
- **Material code**
- **Casting code**
- **Name plate**
- **Ball clearance of stellite-seated valve Stamped with letter-number combination, e.g. CL 0.55**
9 EQUIPMENT

No special equipment is needed to repair C series ball valves. However, a special removing tool is recommended for the actuator removal. See section 10.4.

9.1 Tools

Series C ball valves are threaded to ANSI B1.1-1974 standard. (UNC nuts and bolts)

For body and neck bolts the use of socket tools is recommended.

9.2 Measuring devices

Measure the ball clearance either with a dial indicator, T gauge or feeler gauges.

In PTFE-seated valves the clearance for thermal expansion between the ball and seat is measured with feeler gauges.

9.3 Grinding compounds and belts

For the ball and seats:

Diamond or boric carbide paste - for pre-grinding, coarseness 28/20 µm - for finishing, 7/5 µm

Thin with thinner suitable for diamond grinding when necessary.

For sealing surface of the stem:

Grinding cloth with a coarseness of about 400.

9.4 Actuator removing tool

Fig. 37. Actuator removing tool