Virgo

INSTALLATION OPERATION & MAINTENANCE MANUAL

FLOATING BALL VALVE

VIRGO ENGINEERS LIMITED
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Content

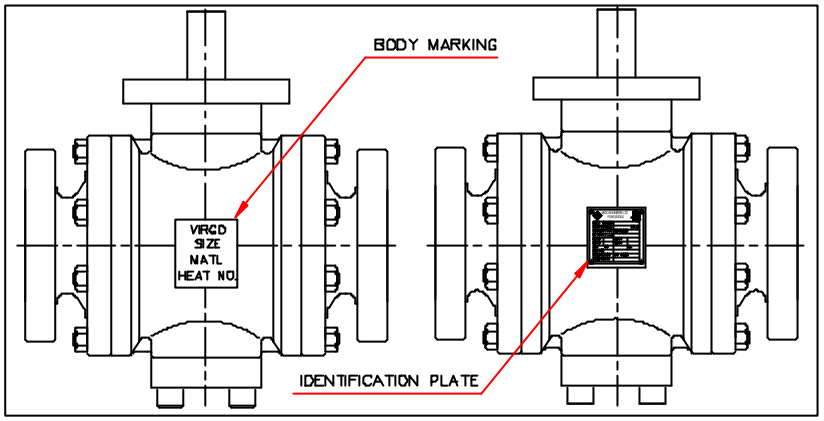
1. Introduction

Scope

The purpose of this manual is to ensure that the valves supplied are properly installed and maintained to give trouble free performance. For better understanding of product and the maintenance requirements, see enclosed exploded view of the valve, where different parts are identified.

Identification of Valve

Specifications of the valve are marked on the body or on an identification plate or both, prior to shipment.



1.1 Identification of Valve

2. Transportation, Reception and Storage

While unpacking the valves, check that the valves & any accessories have not been damaged during transportation.

Note: *If the valve or any of its accessories is damaged or missing during transportation, inform the same to the Factory / Branch Office.*

CAUTION !
Placing the valves directly on the ground or on a concrete floor should be avoided!

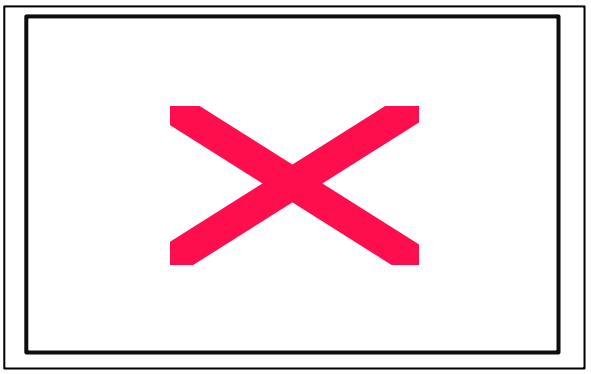
Valve open or close position is indicated on the handle sleeves for lever operated valves or on the top of the gearbox for gearbox operated valves.

All valves are delivered with the ball port in full open position and ends protected with protective end caps to avoid the entry of debris, other solid particles during transportation and damage to serrations.

Note: *When the valve operation is by single acting pneumatic actuator, where spring closes the ball port and air supply open the ball port, the valves are supplied with ball port in closed position. Special care must be taken to avoid damage to the surface of the ball.*

All wrapping and protection on the valves should not be removed until the valve is ready for installation. If protective end caps are removed for the examination of the valve internals, they should be refitted immediately.

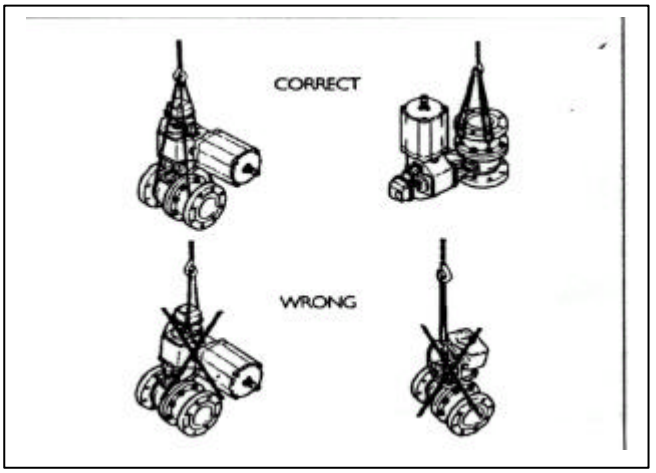
We recommend storing the valves indoor, in a dry and dust free atmosphere. Avoid any accidental damage during storage.



2.1 Storing the Valve

If the valves are stored for a longer time, then all the valves should be cleaned and hydrostatic/pneumatic shell/seat tested before installation in consultation with the Factory / Branch Office.

CAUTION !
When handling the valve or the valve package, bear in mind its weight.
Place the rope securely around the valve body or use lifting hooks (provided for valves greater than 250 kg.) while handling the valve. Special care should be taken not to damage the lever or gearbox or actuator.



2.2 Lifting of Valve

3. Do's and Don'ts

Note: *User should ensure that he has read and understood the Do's and Don'ts before Installation, Operation and Maintenance of the valve is carried out. In case of any clarification contact the Factory /Branch Office.*

Do's

- Use the valve for the specified application as agreed between the manufacturer & the purchaser.
- Read Installation, Operation and Maintenance manual before installing, operating or repairing any valve.
- The purchaser / end users should train their employee for the safe use of the valve.
- Ensure that nuts/bolts are tightened to specified torque value.
- Periodically ensure the electrical continuity of the valve.
- Open or close the valve slowly to avoid hammering effect on the valve and the pipeline.
- Always replace the damaged parts with genuine and recommended parts only.

- Be aware of the type of media & the environment (explosive, highly flammable, toxic, oxidising etc.) in which the valve is to be used. Protect the peoples & the environment from any harmful or poisonous substances.
- Carefully read the Cautions / Warning plates on the valve.
- Customer to take care of residual hazard (if applicable or as informed by the manufacturer) at his premises to avoid any major damage.
- The valve body may be very hot or very cold during use. Protect the people against burns or cold injuries.

Don'ts

- Specification of the valve is marked on the body or on the nameplate or both, prior to shipment. Users to ensure that the maximum operating conditions are not exceeded.
- Do not keep the valve open at any intermediate position.
- Do not try to rectify the valve leakage by reworking of seats. Leaking seats have to be replaced with the new Virgo genuine seats.
- The threaded connections of the valve body for the drain and the vent lines are sealed by threaded plugs. These plugs should not be removed as long as the valve is under pressure.
- Modification in the valve should not be carried out.

4. Installation

Before installing a new valve in the line, make sure that the valve should be checked for identification purpose and ensure that characteristics of the valve matches to those specified for piping specifications, for the line where that is to be mounted. Nameplate instructions and Tag plates will give the necessary information. If this information is missing, consult Factory/Branch office.

When taking out the valve from storage a careful check should be made to ensure that the valve is not being damaged during the storage period.

Before installation of the valves, remove the end protectors & check that serrations on flange face are not damaged and the valve bore is clean. Clean the valve, if necessary.

CAUTION !

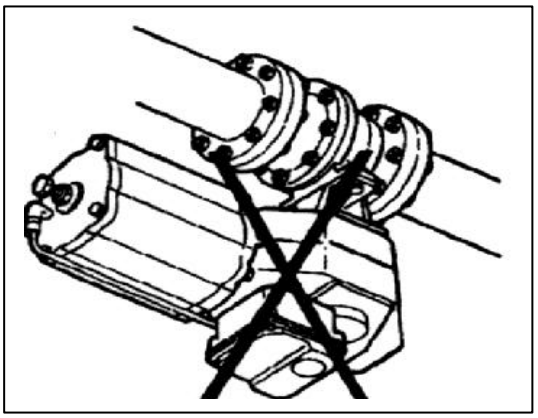
- **Ensure pipeline is fully cleaned before installation of the valve into the pipeline. pipeline debris, scaling, etc will damage the soft seat inserts of the valve and cause seat leakage during commissioning.**
- **During commissioning and pipeline flushing, valve should be kept fully open to prevent damage to the internal parts.**

***Note**: One way to prevent damage to the valve during flushing and testing of pipelines is to substitute them by spool pieces. If use of spool pieces is not possible, it is essential that the valve is kept in fully open condition and it is also advisable to install temporary strainers at critical places to protect soft Seats of the valves from solid particles.*

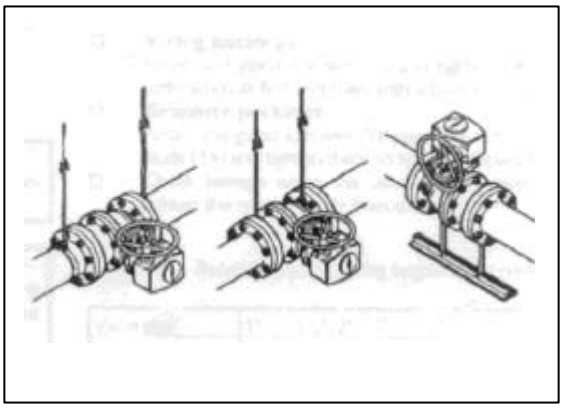
Ball valves are designed for bi-directional flow unless the ball is drilled for cavity relief. For the ball with cavity relief hole, ensure that the installation of the valve is correct with respect to flow direction arrow marked on valve.

Valves can be mounted in a horizontal (with stem upwards only) or vertical position depending on the pipeline routing. However we do not recommend installing the Valve with the Actuator on the underneath side because dirt in the pipeline may then enter the Body cavity and damage the gland packing.

It may be necessary to firmly support the pipeline in order to protect the valve from excess stress & to reduce the pipeline vibrations. To facilitate servicing, it is preferable that the valve should be supported by the body, using the pipe clamps and supports. Do not fasten supports to the flange bolting or to the actuator. Refer Figure No. 4.2.



4.1 Avoid this mounting position.



4.2 Supporting the valve

I. Flanged End Valves :

Don't attempt to correct the misalignment, by means of flange bolts.

During the tightening operation, ensure that piping stresses are not transferred to the valve.

Excessive over-tightening of flange studs can cause damage and/or leakage on the end flanges or body-to-body end joints.

II. Weld End Valves :

Note: *A qualified Welder must do welding operation. The welding procedure should be according to ASME Boiler And Pressure Vessel Code Section IX.*

CAUTION !
Don't allow temperature of the valve body seat area to exceed 200 °F (94^{0}C) to prevent seat and seal damage during welding operation. It is recommended that thermal chalks are used to check the temperature.

Note : Any damage to the seats due to the temperature above 200°F (94°C) can cause the valve leakage. It is recommended that the customer keeps spares kit at his end.

CAUTION !
Ensure that weld spatter does not fall over ball & body seals. This may damage the sealing surfaces & seals.

After welding, flush the pipeline when the valve is in open condition to remove the weld spatter formed during welding and then operate the valve 3-4 times in order to ensure the proper operation of the valve.

Butt Weld End Valves :

Ensure a gap of 0.08" to 0.12" between the valve ends and pipeline as per ASME welding standard and tack weld the pipeline and the valve ends. After ensuring the proper alignment between the pipeline and the valve, weld the valve end.

Socket-Weld End Valves :

There are various methods for welding of three-piece socket end ball valves in the pipeline.

Welding by dismantling the socket weld ends from the Valve Body assembly :

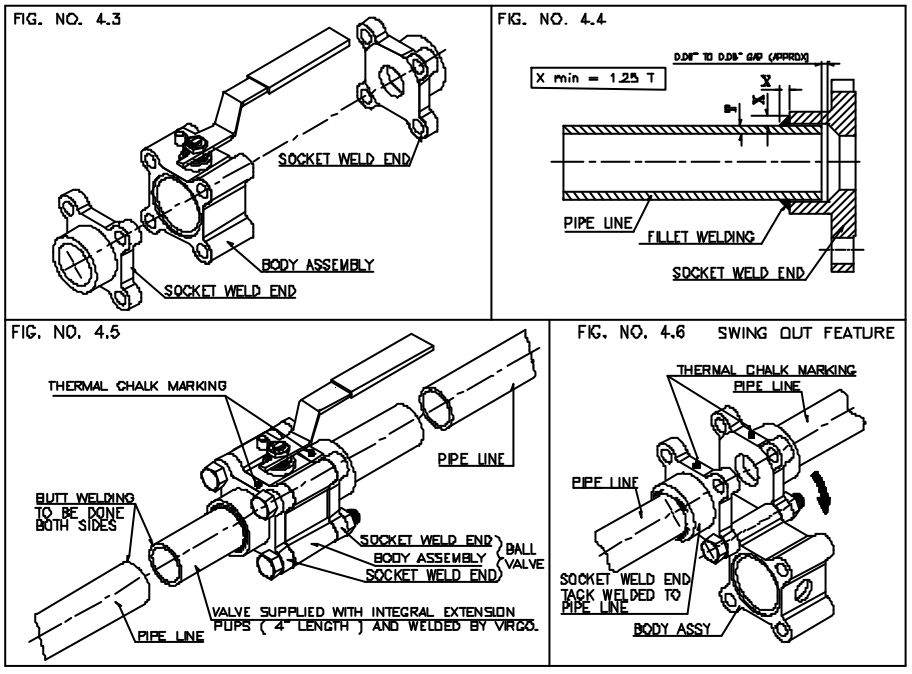
- Dismantle the valve by removing the bolting between the body and the socket weld ends. Refer to Figure No. 4.3. The body assembly separates from the socket weld ends.
- Ensure a gap 0.06" to 0.08" between the pipes and the socket weld ends and tack weld the pipe and socket weld end. Refer to Figure No. 4.4.
- After ensuring the proper alignment between the socket weld end and the pipe, fillet weld both socket weld ends as per Figure No. 4.4.
- Remove the weld spatter formed during the welding.
- Assemble the valve by tightening the bolting between the body and socket weld end.

Direct welding of three-piece socket weld end Valve to pipeline :

- If the socket weld end valves are procured with "extension pups" (4" in length) as shown in figure 4.5, then following procedure can be adopted.
- Ensure a gap of 0.12" between the pups and pipe as per ASME welding standard and tack weld the pipe and the pup. After ensuring the proper alignment between the pipe and the valve with pups, butt weld as per Figure No. 4.5.

Welding by using " Swing out design " feature :

- Mechanically assemble the valve in the pipeline. Tack welds the socket weld end to the pipe ensuring a gap of 0.06" to 0.08" as shown in Figure No. 4.6.
- The three-piece soft seated ball valve is a 'Swing Out' type design. Remove the three bolts/studs between the body and socket weld end and swing out the body assembly as shown in Figure No. 4.6.
- After ensuring the proper alignment between the socket weld end and the pipe, fillet weld as per figure no. 4.4.
- Remove the weld spatter formed during the welding.
- Rotate the body assembly so that it aligns with the socket weld ends and tighten the body bolts.



III. Screwed end Valves :

- Ensure that threads on pipe ends are of proper size and type.
- Clean both male and female threads properly. Use appropriate thread sealant or Teflon tape while fitting into the pipeline based on pressure rating to ensure complete sealing.

5. Operation of the Valve :

For lever operated valves, the hand lever is either assembled with the valve or shipped loose depending upon the size of the valve / handlever.

For gear operated valves, ***THE GEARBOX OPEN / CLOSE ADJUSTMENT HAS BEEN DONE PRIOR TO DESPATCH AND MUST NOT BE DISTURBED.*** Rotation of handwheel in the clockwise direction closes the valve and counter clockwise rotation opens it (Looking from handwheel end). The details of gearbox are shown in the Figure No. 5.1. The internal details/construction of gearbox may vary as per manufacturers standard.

CAUTION !
Ensure that the force applied on the handwheel of the gearbox or lever shall not exceed 360 N.

Note: *Do not apply extra leverage (using pipe/bar), when the end stops of the gearbox are reached to its final setting position.*

Virgo ball valve always closes in clockwise direction. The ball should always be rotated through 90 º to the fully opened or fully closed position.

CAUTION !
Keeping the Valve at any intermediate position should specially be avoided, as high fluid velocity through the narrow opening will produce erosion of seats, ball & even the body.

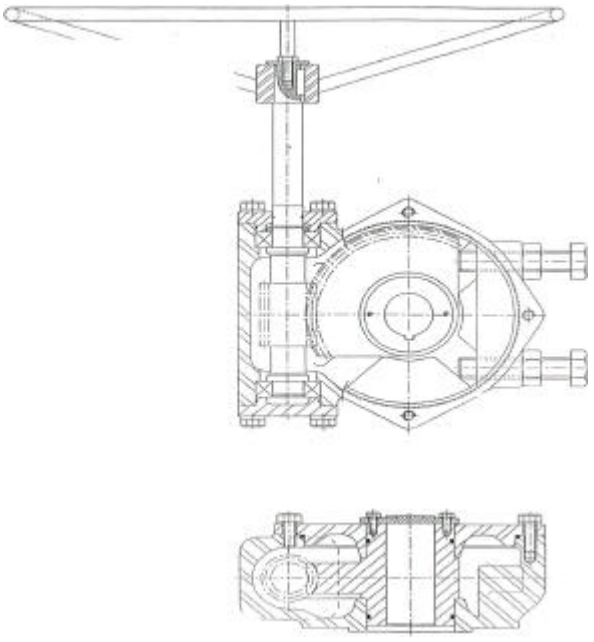


Fig No. 5.1 : Details of Gearbox.

6. Maintenance :

CAUTION !
Observe the Cautions/Safety precautions before carrying out the maintenance.

Routine checks by the user

- The following points will give guidelines for routine maintenance.
- Check the tightness of nuts/bolts between the body/body adapter, the bracket/stem housing, and the body/trunnion.
- Ensure that the performance of the valve is satisfactory.
- Ensure the electrical continuity of the valve.
- Ensure that no leakage is being observed from the valve.
- Frequent observation is recommended under extreme application / condition.
- Periodically flush the sealant ports with suitable valve cleaner to flush debris from the sealant system.
- Mounting studs/nuts of the worm gearbox may be checked for tightness and retightened if necessary.

Preventive Maintenance

In order to avoid valve failure during operation, all valves in a process plant should be periodically inspected thoroughly to detect the wear of ball, seats, seals and even the body. It is recommended that on such occasion's seats, gaskets, seals and packing should be replaced. Check the electrical continuity of the valve and the pipeline.

The type of process, fluids involved, working conditions and location of the valves in the process plants, will determine the frequency of this periodic inspection / maintenance which in fact will be made at the time of partial or total shutdown of the plant. Preventive maintenance is absolutely essential as the failure due to lack of the same may cause an emergency shut down of the plant.

The procedure for disassembly, repair and reassembly of the valve is given separately.

The procedure will be the same for a valve failing during operation due to lack of preventive maintenance, changes in process conditions or fluids, or by some other cause.

Before removing the valve from the pipe, it is important to mark the relative position of the valve flange with respect to pipeline flange and the flow of direction of the valve.

Once a the valve is repaired, it should undergo a complete set of tests to make sure that the valve is adequate for the original working conditions. Hydrostatic/pneumatic shell/seat tests should be carried out as per the specifications relevant to the valve (Refer general arrangement drawing).

Note:
If the customer wants to send the valve to the manufacturer for servicing, do not dismantle it. Instead, clean the valve carefully of all media and inform the manufacturer of any dangerous media involved

Lubrication of Worm Gear Box

Worm gear boxes are supplied with grease filled. Normally the grease is suitable for –20^{o}C (-4^{0}F) to 80^{o}C (176 ^{0}F). For other applications, consult the Factory/Branch Office.
Grease should be changed as under: If operated frequently, after approx. 3 years.
If operated rarely, after approx. 5 years.

The primary reducing spur gear unit attached to main worm gearbox should be re-greased at least annually.

CAUTION !
Disassembly of the gearbox should be done only by experienced / trained operators.

7. Trouble Shooting :

The following table lists the possible malfunctions that might occur after prolonged use.

Symptom	Possible fault	Actions
Leakage through a closed Valve	Damaged ball surface	Replace the ball.
	Damaged seats	Replace seats.
	Ball might not be closed fully	Check ball Open/Close settings.
Irregular ball movement	Impurities between the ball and seats or ball – body cavity and ball Seats.	Flush the ball from inside.
		Clean the sealing surfaces and seats.
Valve too hard to operate / valve torque too high	Damaged seats	Replace the seats.
	High application pressure / temperature	Confirm the application pressure /temperature rating.
	Foreign particles in Valve	Clean the internals.
Water hammer or noisy operation	Error in valve sizing or flow of fluid with high velocity.	Confirm valve sizing with respect to flow.
Leakage through stem	Gland nut loose	Tighten gland nut.
	Damaged stem, stem sealing surface	Replace the stem.
	Damaged stem seal	Replace the stem seal.

Ordering the spares

When ordering for spare parts, always convey the following information.

Size of the valve
Valve rating
Sr. No. / Batch No.
Mfg. Date

} Available on name plate or body of the valve

Part No.
Name of the part
Number of pieces required.
P. O. Number

} Available on general arrangement drawing

Note: Selection and use of the valve for a specific application requires close consideration of detailed aspects. Due to the nature of the product, this manual cannot cover all the individual situations that may occur when installing, using or servicing the valve.

Disassembly

CAUTION !

Pipeline and valve must be depressurized by shutting off the valves & the bleed line, then cycling the valve once & leaving it half open to relieve the pressure from the body cavity.

Note: *Recommended spare parts are listed on the exploded view. These parts should be stocked to minimise the down time.*

Follow these steps to disassemble the valve:

1. Remove the valve from pipeline. Ensure that the valve should be in closed position for disassembling.
2. Keep the valve in vertical position on a plane & clean surface, taking care that end flange sealing surface should not be damaged.
3. Remove the handle lock nut (19) & the handle (18) from the stem (04).
4. Remove the body nuts (15) in a crisscross pattern & remove the body adapter (02).
5. Remove the body seal (06) from the body adapter and body gasket (07) from the body (01).
6. Remove the ball (03) from the body & the seats (05) from body & body adapter.

   Note*: Be careful not to damage the ball & the body seat area, otherwise leakage could result, even when new seats are installed. Always place the ball on a soft liner on a table & prevent it from rolling.*

7. Remove the lock washer (17), stem nut (13) & disc springs (12) from the stem.
8. Remove the stem by pushing into the body.
9. Remove the spacer ring (11) & the stem seal top (10) from the body.
10. Remove the stem 'O' ring (09) & the stem seal bottom (08) from the stem.

    Note: *After the complete disassembly of the valve, all the components should be stored in a clean place to avoid damage.*

Reassembly

1. Clean & inspect all the parts for damage & change any part if in doubt.

   Note: *If complete disassembling becomes necessary, replacement of all seats & seals is recommended.*

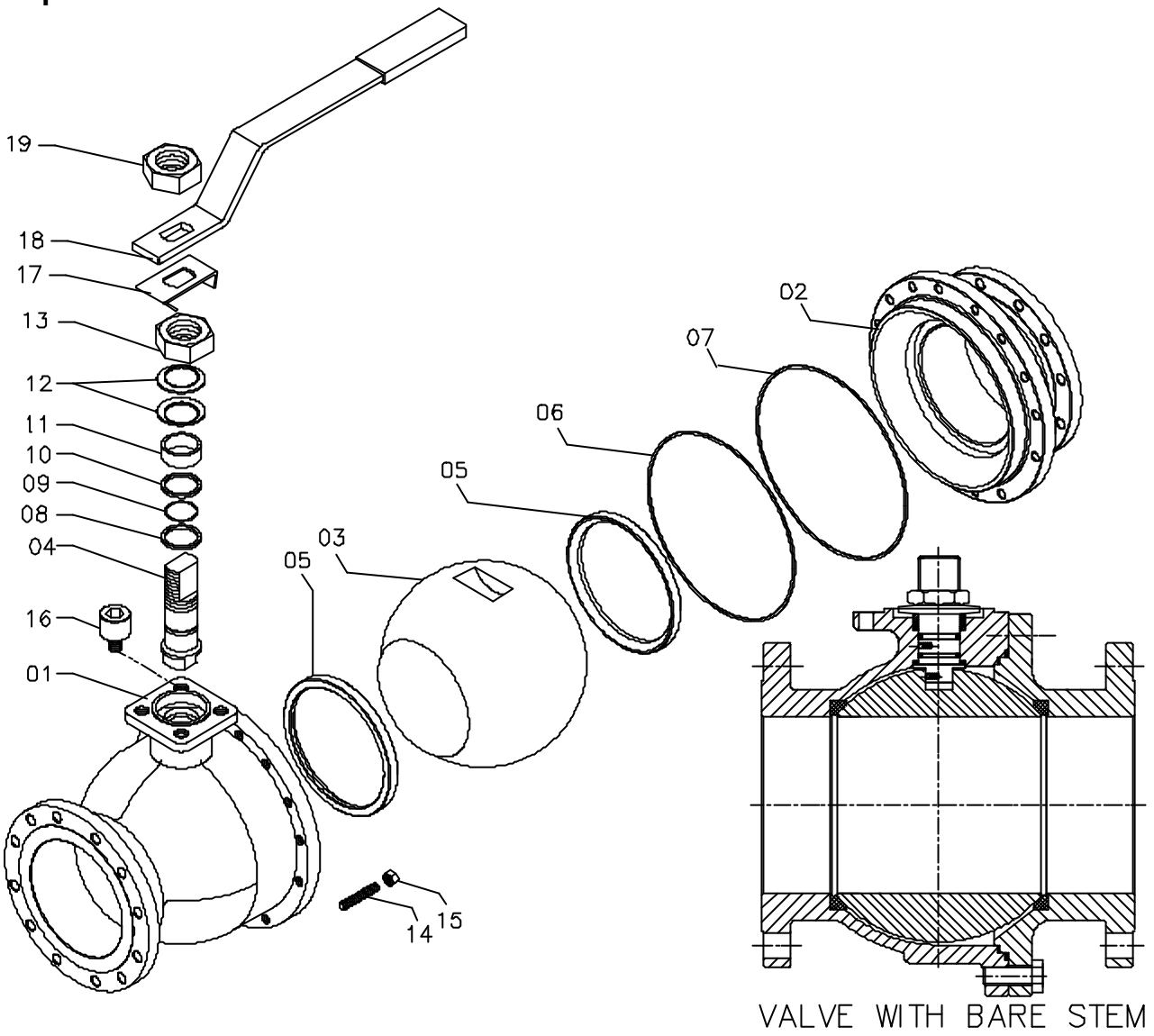
2. Place the body on plane & clean wooden surface. Install the seat in the body.
3. Coat the studs (14) with anti-corrosive paste.
4. Insert the stem seal bottom & the stem 'O' rings on the stem.
5. Install the stem from inside the body.
6. Fit the stem seal top, the spacer ring and the disc springs on the stem.
7. Place & tighten the stem nut, so that the disc springs are in tension.
8. Fit the lock washer on stem nut.
9. Fit the handle to stem & tighten the handle lock nut.
10. Align the two stem flats parallel with the body bore.
11. Insert the ball in the stem in closed position. Gently rock the ball to make sure the stem is centered in the ball slot.
12. Install the second seat in the body adapter. Place body seal on the body adapter & body gasket in the body recess.
13. Lower the body adapter with seat onto the body. Place & tighten the body nuts in a crisscross pattern.
14. Rotate the ball slowly back & forth to a full quarter turn. This will allow the seat to assume its permanent position & shape against ball & body. A fast turning motion may damage the seat before it has a chance to form a proper seal.

    Note: *When the handle is re-assembled on the valve, it may be necessary to adjust handle to ensure proper setting of the ball in the open and closed position.*

CAUTION !

Follow safety rules & regulations to avoid personal injury or equipment damage.

Exploded view



Parts & Fastener Torques

ITEM	PART NAME
01	Body
02	Body Adapter
03	Ball
04	Stem
* 05	Seat
* 06	Body Seal
* 07	Body Gasket
* 08	Stem Seal Bottom
* 09	Stem 'O' Ring
* 10	Stem Seal Top
11	Spacer Ring
12	Disc Spring
13	Stem Nut
14	Stud
15	Nut
16	Stop Pin
17	Lock Washer
18	Handle
19	Handle Lock Nut

RECOMMENDED TIGHTENING TORQUES, Kg.m (N.m)

Thread Size	Property Class 8.8	Property Class 10.9	Property Class B7/B7M/B8/B8M
M8	2 (20)	2.9 (28)	0.6 (6)
M10	4 (40)	5.7 (56)	1.2 (12)
M12	7 (69)	10 (98)	2.2 (22)
M14	11.3 (111)	15.9 (156)	3.6 (35)
M16	17.2 (168)	24.2 (237)	5.4 (53)
M18	24.4 (239)	34.3 (336)	7.7 (76)
M20	33.5 (329)	47.2 (463)	10.7 (105)
M24	57.9 (568)	81.5 (799)	18.5 (181)
M27	87.5 (858)	123 (1207)	27.8 (273)
M30	115.9 (1137)	163 (1599)	36.9 (362)

Note: *Ensure that all the nuts/bolts are tightened to the torque values as specified in this Table.*

* Recommended spare parts.

Note: *Always use the genuine spare parts to make sure that the valve functions as intended.*

Disassembly

CAUTION !

Pipeline and valve must be depressurized by shutting off the valves & the bleed line, then cycling the valve once & leaving it half open to relieve the pressure from the body cavity.

Note: *Recommended spare parts are listed on the exploded view. These parts should be stocked to minimise the down time.*

Follow these steps to disassemble the valve:

1. Remove the valve from pipeline. Ensure that the valve should be in closed position for disassembling.
2. Keep the valve in a vertical position on a plane & clean surface, taking care that end flange sealing surface should not be damaged.
3. Remove the handle lock nut (21) & the handle coupler(18) with pipe from stem (04).
4. Remove the body nuts (15) in a crisscross pattern & remove the body adapter (02).
5. Remove the body seal (06) from the body adapter and body gasket (07) from the body (01).
6. Remove the ball (03) from the body & the seats (05) from the body & body adapter.

   Note*: Be careful not to damage the ball & the body seat area, otherwise leakage could result, even when new seats are installed. Always place the ball on a soft liner on a table & prevent it from rolling.*

7. Remove the lock washer (17), stem nut (13) & disc springs (12) from the stem. Remove the stem by pushing into the body.
8. Remove spacer ring (11) & stem seal top (10) from the body.
9. Remove the stem 'O' ring (09) & the stem seal bottom (08) from the stem.

   Note: *After the complete disassembly of the valve, all the components should be stored in a clean place to avoid damage.*

Reassembly

1. Clean & inspect all the parts for damage & change any part if in doubt.

   Note: *If complete disassembling becomes necessary, replacement of all seats & seals is recommended.*

2. Place the body on plane & clean wooden surface. Install the seat in the body.
3. Coat the studs (14) with anti-corrosive paste.
4. Insert the stem seal bottom & the stem 'O' rings on the stem.
5. Install the stem from inside the body.
6. Fit the stem seal top, the spacer ring and the disc springs on the stem.
7. Place & tighten the stem nut, so that the disc springs are in tension.
8. Fit the lock washer on the stem nut.
9. Fit the handle coupler with the pipe to the stem & tighten the handle lock nut.
10. Align the two stem flats parallel with the body bore.
11. Insert the ball in the stem in closed position. Gently rock the ball to make sure the stem is centered in the ball slot.
12. Install second seat in the body adapter. Place the body seal on the body adapter & body gasket in the body recess.
13. Lower the body adapter with seat onto the body. Place & tighten the body nuts in a crisscross pattern.
14. Rotate the ball slowly back & forth to a full quarter turn. This will allow the seat to assume its permanent position & shape against the ball & the body. A fast turning motion may damage the seat before it has a chance to form a proper seal.

    Note: *When the handle is re-assembled on the valve, it may be necessary to adjust the handle to ensure proper setting of the ball in the open and closed position.*

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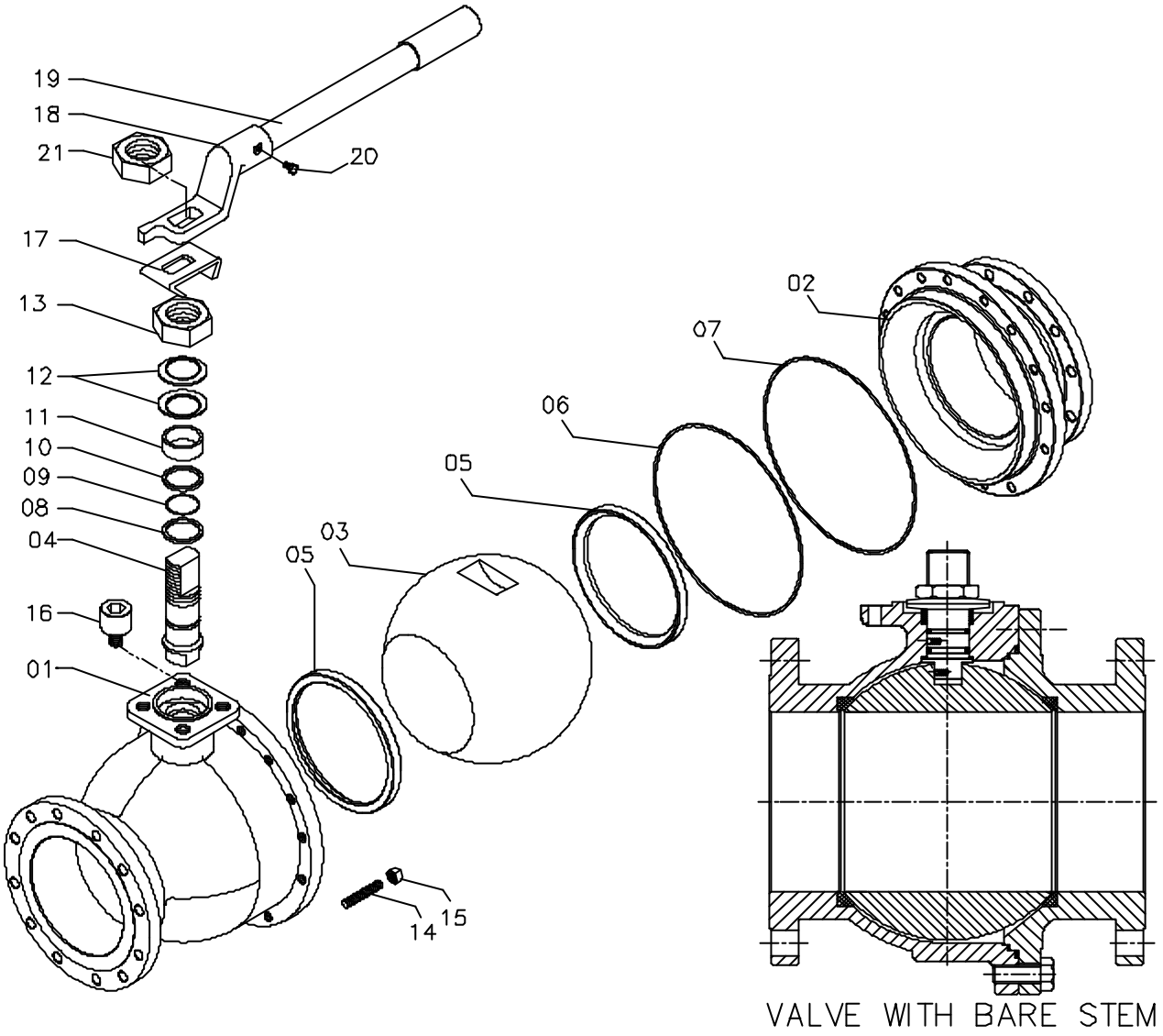

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14	Stud
15	Nut
16	Stop Pin
17	Lock Washer
18	Handle Coupler
19	Pipe
20	Hex Bolt/Grub Screw
21	Handle Lock Nut

RECOMMENDED TIGHTENING TORQUES, Kg.m (N.m)

Thread Size	Property Class 8.8	Property Class 10.9	Property Class B7/B7M/B8/B8M
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Note: *Ensure that all the nuts/bolts are tightened to the torque values as specified in this Table.*

* Recommended spare parts.

Note: *Always use the genuine spare parts to make sure that the valve functions as intended.*

Disassembly

CAUTION !

Pipeline and valve must be depressurized by shutting off the valves & the bleed line, then cycling the valve once & leaving it half open to relieve the pressure from the body cavity.

Note: *Recommended spare parts are listed on the exploded view. These parts should be stocked to minimise the down time.*

Follow these steps to disassemble the valve:

1. Remove the valve from pipeline. Ensure that the valve should be in closed position for disassembling.
2. Keep the valve in vertical position on a plane & clean surface, taking care that end flange sealing surface should not be damaged.
3. Remove the T-handle coupler (19) by removing the hex bolt/grub screw(20).
4. Remove the stop & lock plate (18) from stem (04).
5. Remove the body nuts (15) in a crisscross pattern & remove the body adapter (02).
6. Remove the body seal (06) from the body adapter and body gasket(07) from body (01).
7. Remove the ball (03) from the body & the seats (05) from the body & body adapter.

   Note*: Be careful not to damage the ball & the body seat area, otherwise leakage could result, even when new seats are installed. Always place the ball on a soft liner on a table & prevent it from rolling.*

8. Remove the lock washer (17), stem nut (13) & disc springs (12) from the stem.
9. Remove the stem by pushing into the body.
10. Remove the spacer ring (11) & stem seal top (10) from the body.
11. Remove the stem 'O' ring (09) & stem seal bottom (08) from the stem.

Note: *After the complete disassembly of the valve, all the components should be stored in a clean place to avoid damage.*

Reassembly

1. Clean & inspect all the parts for damage & change any part if in doubt.

   Note: *If complete disassembling becomes necessary, replacement of all seats & seals is recommended.*

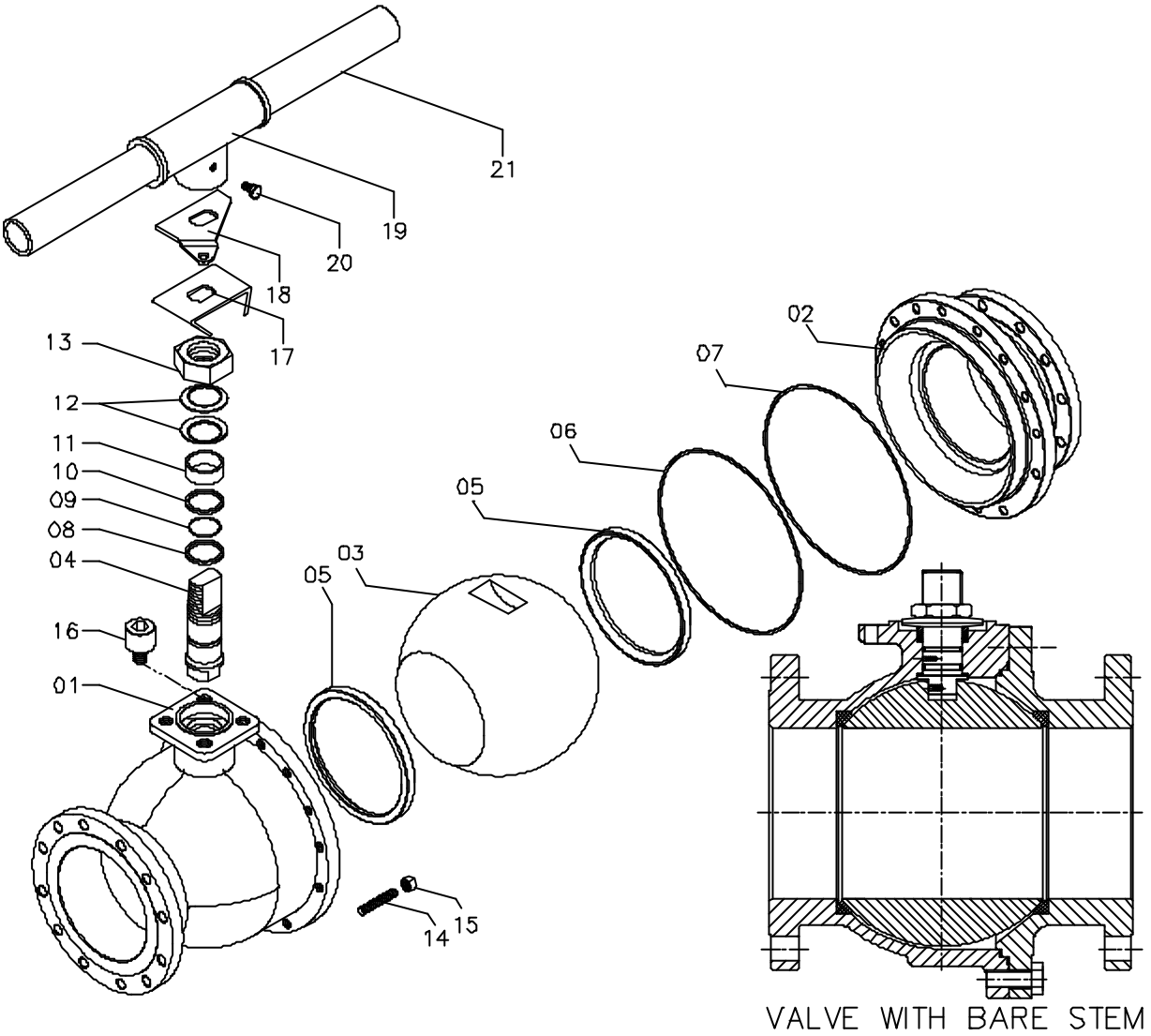
2. Place the body on plane & clean wooden surface. Install the seat in the body.
3. Coat the studs (14) with anti-corrosive paste.
4. Insert the stem seal bottom & the stem 'O' rings on the stem.
5. Install the stem from inside the body.
6. Fit the stem seal top, the spacer ring and the disc springs on the stem.
7. Place & tighten the stem nut, so that the disc springs are in tension.
8. Fit the lock washer on the stem nut & the stop & lock plate to the stem.
9. Fit the T-handle coupler to stem & tighten the hex bolt/grub screw.
10. Align the two stem flats parallel with the body bore.
11. Insert the ball in the stem in closed position. Gently rock the ball to make sure the stem is centered in the ball slot.
12. Install the second seat in the body adapter. Place the body seal on the body adapter & the body gasket in the body recess.
13. Lower the body adapter with the seat onto the body. Place & tighten the body nuts in a crisscross pattern.
14. Rotate the ball slowly back & forth to a full quarter turn. This will allow the seat to assume its permanent position & shape against the ball & the body. A fast turning motion may damage the seat before it has a chance to form a proper seal.

    Note: *When the Handle is re-assembled on the Valve, it may be necessary to adjust the handle to ensure proper setting of the ball in the open and closed position.*

CAUTION !

Follow safety rules & regulations to avoid personal injury or equipment damage.

Exploded view



Parts & fastener torques

ITEM	PART NAME
01	Body
02	Body Adapter
03	Ball
04	Stem
* 05	Seat
* 06	Body Seal
* 07	Body Gasket
* 08	Stem Seal Bottom
* 09	Stem 'O' Ring
* 10	Stem Seal Top
11	Spacer Ring
12	Disc Spring
13	Stem Nut
14	Stud
15	Nut
16	Stop Pin
17	Lock washer
18	Stop & Lock Plate
19	T-Handle Coupler
20	Hex Bolt/Grub Screw
21	Pipe

RECOMMENDED TIGHTENING TORQUES, Kg.m (N.m)

Thread Size	Property Class 8.8	Property Class 10.9	Property Class B7/B7M/B8/B8M
M8	2 (20)	2.9 (28)	0.6 (6)
M10	4 (40)	5.7 (56)	1.2 (12)
M12	7 (69)	10 (98)	2.2 (22)
M14	11.3 (111)	15.9 (156)	3.6 (35)
M16	17.2 (168)	24.2 (237)	5.4 (53)
M18	24.4 (239)	34.3 (336)	7.7 (76)
M20	33.5 (329)	47.2 (463)	10.7 (105)
M24	57.9 (568)	81.5 (799)	18.5 (181)
M27	87.5 (858)	123 (1207)	27.8 (273)
M30	115.9 (1137)	163 (1599)	36.9 (362)

Note: *Ensure that all the nuts/bolts are tightened to the torque values as specified in this Table.*

* Recommended spare parts.

Note: *Always use the genuine spare parts to make sure that the valve functions as intended.*

Disassembly

CAUTION !

Pipeline and valve must be depressurized by shutting off the valves & the bleed line, then cycling the valve once & leaving it half open to relieve the pressure from the body cavity.

Note: *Recommended spare parts are listed on the Exploded view. These parts should be stocked to minimise the down time.*

Follow these steps to disassemble the valve:

1. Remove the valve from pipeline. Ensure that the valve should be in closed position for disassembling.
2. Keep the valve in vertical position on a plane & clean surface, taking care that end flange sealing surface should not be damaged.
3. Remove the gearbox (16) by removing the nuts (18) & then remove the studs (17).
4. Remove the stem key (13).
5. Remove the mounting flange (14) by removing the cap screws (15).
6. Remove the body nuts (12) in a crisscross pattern & remove the body adapter (02).
7. Remove the body seal (06) from the body adapter and body gasket (07) from the body (01).
8. Remove the ball (03) from the body & the seats (05) from body & body adapter.

   Note*: Be careful not to damage the ball & the body seat area, otherwise leakage could result, even when new seats are installed. Always place the ball on a soft liner on a table & prevent it from rolling.*

9. Remove the stem by pushing into the body.
10. Remove the stem bush (10) from the body.
11. Remove the stem 'O' ring (09) & the stem seal bottom (08) from the stem.

    Note: *After the complete disassembly of the valve, all the components should be stored in a clean place to avoid damage.*

Reassembly

1. Clean & inspect all the parts for damage & change any part if in doubt.

   Note: *If complete disassembling becomes necessary, replacement of all seats & seals is recommended.*

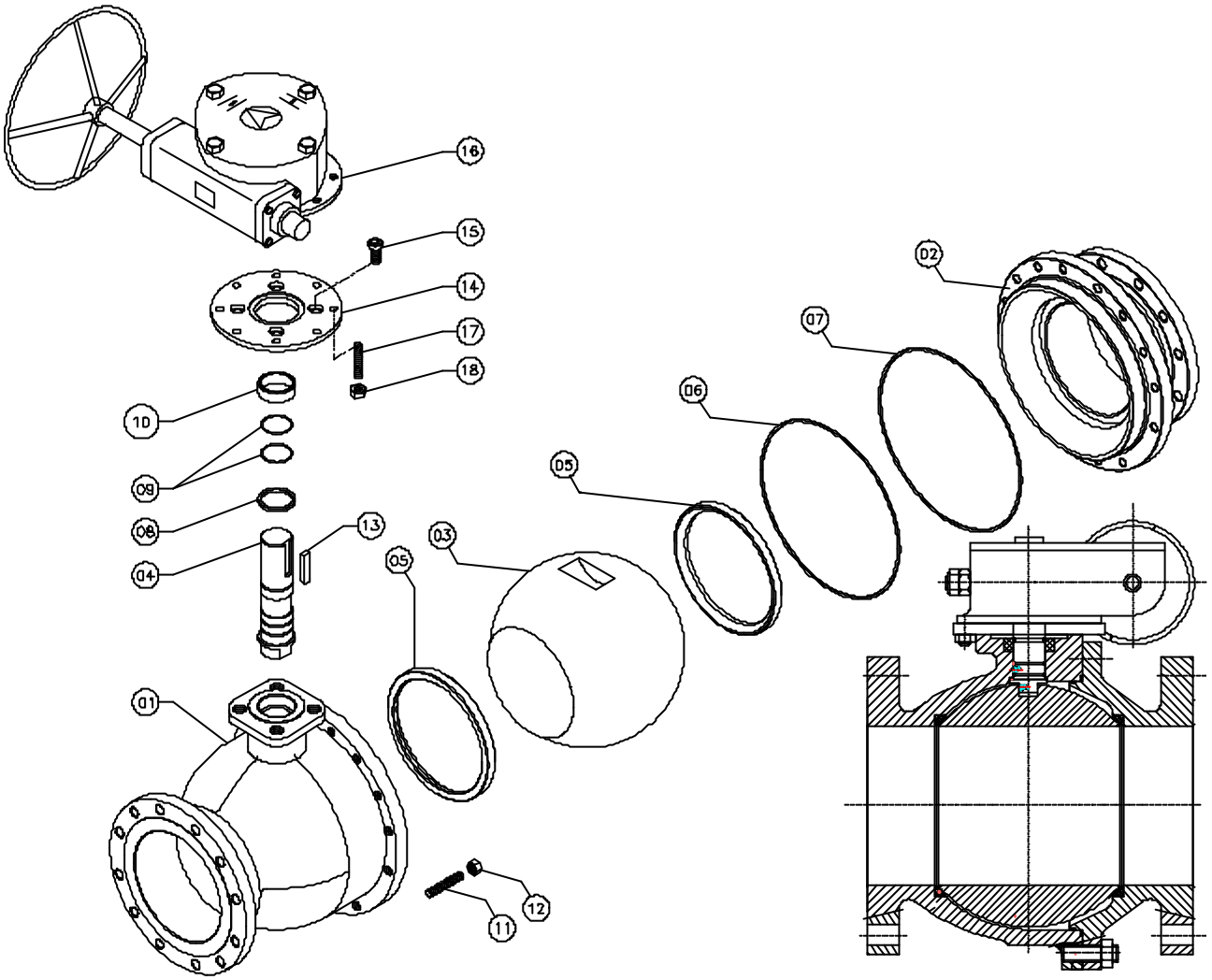
2. Place the body on plane & clean wooden surface. Install the seat in the body.
3. Coat the body studs (11) with anti-corrosive paste.
4. Insert stem seal bottom & stem 'O' rings on stem & install stem from inside the body.
5. Slide the stem bush over the stem & down into body recess.
6. Place the mounting flange on the stem with the flat surface facing upward & tighten the cap screws against mounting flange to the body.
7. Align the two stem flats parallel with the body bore.
8. Insert the ball in the stem in closed position. Gently rock the ball to make sure the stem is centered in the ball slot.
9. Install second seat in the body adapter. Place the body seal on the body adapter & body gasket in the body recess.
10. Lower the body adapter with the seat onto the body. Place & tighten the body nuts in a crisscross pattern.
11. Fit the stem key to the stem. Screw in the gearbox studs to the mounting flange.
12. Slide the gearbox over the stem down to mounting flange & tighten gearbox nuts.
13. Rotate the ball slowly back & forth to a full quarter turn. This will allow the seat to assume its permanent position & shape against the ball & the body. A fast turning motion may damage the seat before it has a chance to form a proper seal.

    Note: *When the gearbox is re-assembled on the valve, it may be necessary to adjust gearbox travel stops to ensure proper setting of the ball in the open and closed position. Check proper assembly of the key in the key way.*

CAUTION !

Follow safety rules & regulations to avoid personal injury or equipment damage.

Exploded view



Parts & Fastener Torques

ITEM	PART NAME
01	Body
02	Body Adapter
03	Ball
04	Stem
* 05	Seat
* 06	Body Seal
* 07	Body Gasket
* 08	Stem Seal Bottom
* 09	Stem 'O' Ring
10	Stem Bush
11	Body Stud
12	Body Nut
13	Stem Key
14	Mounting Flange
15	Cap Screw
16	Gear box
17	Gear box stud
18	Gear box Nut

RECOMMENDED TIGHTENING TORQUES, Kg.m (N.m)

Thread Size	Property Class 8.8	Property Class 10.9	Property Class B7/B7M/B8/B8M
M8	2 (20)	2.9 (28)	0.6 (6)
M10	4 (40)	5.7 (56)	1.2 (12)
M12	7 (69)	10 (98)	2.2 (22)
M14	11.3 (111)	15.9 (156)	3.6 (35)
M16	17.2 (168)	24.2 (237)	5.4 (53)
M18	24.4 (239)	34.3 (336)	7.7 (76)
M20	33.5 (329)	47.2 (463)	10.7 (105)
M24	57.9 (568)	81.5 (799)	18.5 (181)
M27	87.5 (858)	123 (1207)	27.8 (273)
M30	115.9 (1137)	163 (1599)	36.9 (362)

Note: *Ensure that all the nuts/bolts are tightened to the torque values as specified in this Table.*

* Recommended spare parts.

Note: *Always use the genuine spare parts to make sure that the valve functions as intended.*

Disassembly

CAUTION !

Pipeline and valve must be depressurized by shutting off the valves & the bleed line, then cycling the valve once & leaving it half open to relieve the pressure from the body cavity.

Note: *Recommended spare parts are listed on the exploded view. These parts should be stocked to minimise the down time.*

Follow these steps to disassemble the valve:

11. Remove the valve from pipeline. Ensure that the valve should be in closed position for disassembling.
12. Keep the valve in a vertical position plane & clean surface, taking care that end flange sealing surface should not be damaged.
13. Remove the gearbox (22) by removing the nuts (24) & then remove the studs (23).
14. Remove the stem key (14) by removing the cap screw (15).
15. Remove the stem housing nuts (17) & dowel pin (19).
16. Lift the stem (04) along with stem housing (16) from the boby.
17. Remove body nuts (12) in a crisscross pattern & remove body adapter (02).
18. Remove the body seal (06) from body adapter and body gasket (07) from body (01).
19. Remove the ball (03) from the body & the seats (05) from the body & body adapter.

    Note*: Be careful not to damage the ball & the body seat area, otherwise leakage could result, even when new seats are installed. Always place the ball on a soft liner on a table & prevent it from rolling.*

20. Remove the stem from the stem housing.
21. Remove the stem housing 'O'rings (10), stem housing gasket (11) & stem bush (21).
22. Remove the stem 'O' ring (09) & the stem seal bottom (08) from the stem.

    Note: *After the complete disassembly of the valve, all the components should be stored in a clean place to avoid damage.*

Reassembly

15. Clean & inspect all the parts for damage & change any part if in doubt.

    Note: *If complete disassembling becomes necessary, replacement of all seats & seals is recommended.*

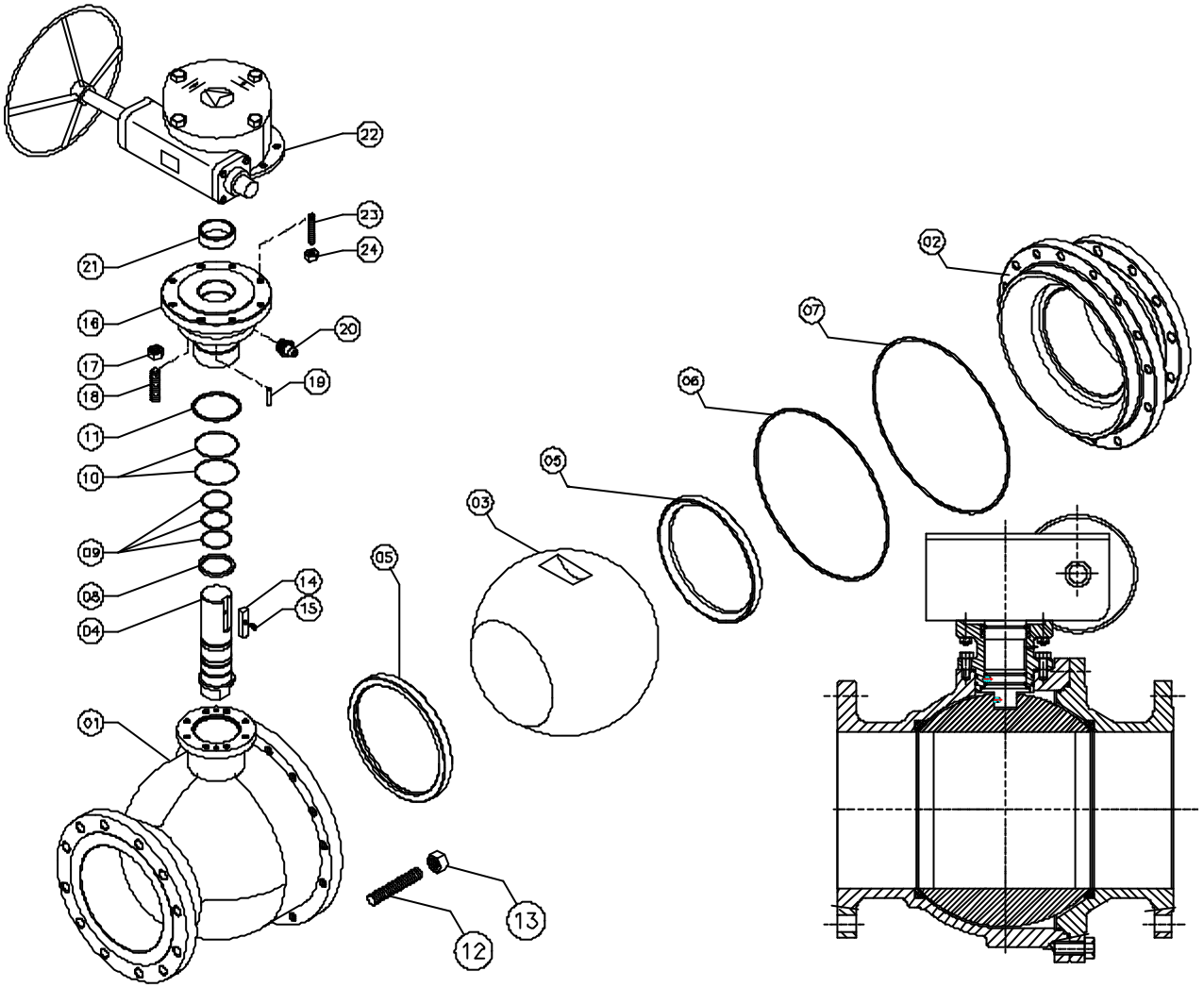
16. Place the body on plane & clean wooden surface. Install the seat in the body.
17. Coat the body studs (12) with anti-corrosive paste.
18. Insert the stem seal bottom & the stem 'O'rings on stem & install the stem from inside the stem housing.
19. Slide the stem bush over the stem & down into the stem housing recess.
20. Screw the stem housing studs into the body. Lower the stem with stem housing onto the body. Place & tighten the stem housing nuts & fit the dowel pins.
21. Align the two stem flats parallel with the body bore.
22. Insert the ball in the stem in closed position. Gently rock the ball to make sure the stem is centered in the ball slot.
23. Install second seat in the body adapter. Place the body seal on the body adapter & body gasket in the body recess.
24. Lower the body adapter with the seat onto the body. Place & tighten the body nuts in a crisscross pattern.
25. Fit the stem key to the stem. Screw in the gearbox studs to the stem housing.
26. Slide the gearbox over the stem down to the stem housing & tighten gearbox nuts.
27. Rotate the ball slowly back & forth to a full quarter turn. This will allow the seat to assume its permanent position & shape against the ball & the body. A fast turning motion may damage the seat before it has a chance to form a proper seal.

    Note: *When the gearbox is re-assembled on the valve, it may be necessary to adjust gearbox travel stops to ensure proper setting of the ball in the open and closed position. Check proper assembly of the key in the key way.*

CAUTION !

Follow safety rules & regulations to avoid personal injury or equipment damage.

Exploded view



Parts & Fastener Torques

ITEM	PART NAME
01	Body
02	Body Adapter
03	Ball
04	Stem
* 05	Seat
* 06	Body Seal
* 07	Body Gasket
* 08	Stem Seal Bottom
* 09	Stem 'O' Ring
* 10	Stem Housing 'O'ring
* 11	Stem Housing Gasket
12	Body Stud
13	Body Nut
14	Stem Key
15	Cap Screw
16	Stem Housing
17	Stem Housing Nut
18	Stem Housing Studs
19	Dowel Pin
20	Grease Nipple
21	Stem Bush
22	Gearbox
23	Gearbox Studs
24	Gearbox Nut

RECOMMENDED TIGHTENING TORQUES, Kg.m (N.m)

Thread Size	Property Class 8.8	Property Class 10.9	Property Class B7/B7M/B8/B8M
M8	2 (20)	2.9 (28)	0.6 (6)
M10	4 (40)	5.7 (56)	1.2 (12)
M12	7 (69)	10 (98)	2.2 (22)
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M27	87.5 (858)	123 (1207)	27.8 (273)
M30	115.9 (1137)	163 (1599)	36.9 (362)

Note: *Ensure that all the nuts/bolts are tightened to the torque values as specified in this Table.*

* Recommended spare parts.

Note: *Always use the genuine spare parts to make sure that the valve functions as intended.*

Disassembly

CAUTION !

Pipeline and valve must be depressurized by shutting off the valves & the bleed line, then cycling the valve once & leaving it half open to relieve the pressure from the body cavity.

Note: *Recommended spare parts are listed on the exploded view. These parts should be stocked to minimise the down time.*

Follow these steps to disassemble the valve:

1. Remove the valve from pipeline. Ensure that the valve should be in closed position for disassembling.
2. Keep the valve in vertical position on a plane & clean surface, taking care that end flange sealing surface should not be damaged.
3. Remove the handle (14) by removing the hex bolt/grub screw (15).
4. Remove the body nuts (11) in a crisscross pattern & remove the body adapter (02).
5. Remove the body seal (06) from the body adapter and the body gasket (07) from the body (01).
6. Remove the ball (03) from the body & the seats (05) from the body & body adapter.

   Note*: Be careful not to damage the ball & the body seat area, otherwise leakage could result, even when new seats are installed. Always place the ball on a soft liner on a table & prevent it from rolling.*

7. Remove the stop & lock plate (12) by removing the circlip (13) from the stem (04).
8. Remove the stem by pushing into the body.
9. Remove the stem 'O' rings (09) & the stem seal bottom (08) from the stem.

   Note: *After the complete disassembly of the valve, all the components should be stored in a clean place to avoid damage.*

Reassembly

1. Clean & inspect all the parts for damage & change any part if in doubt.

   Note: *If complete disassembling becomes necessary, replacement of all seats & seals is recommended.*

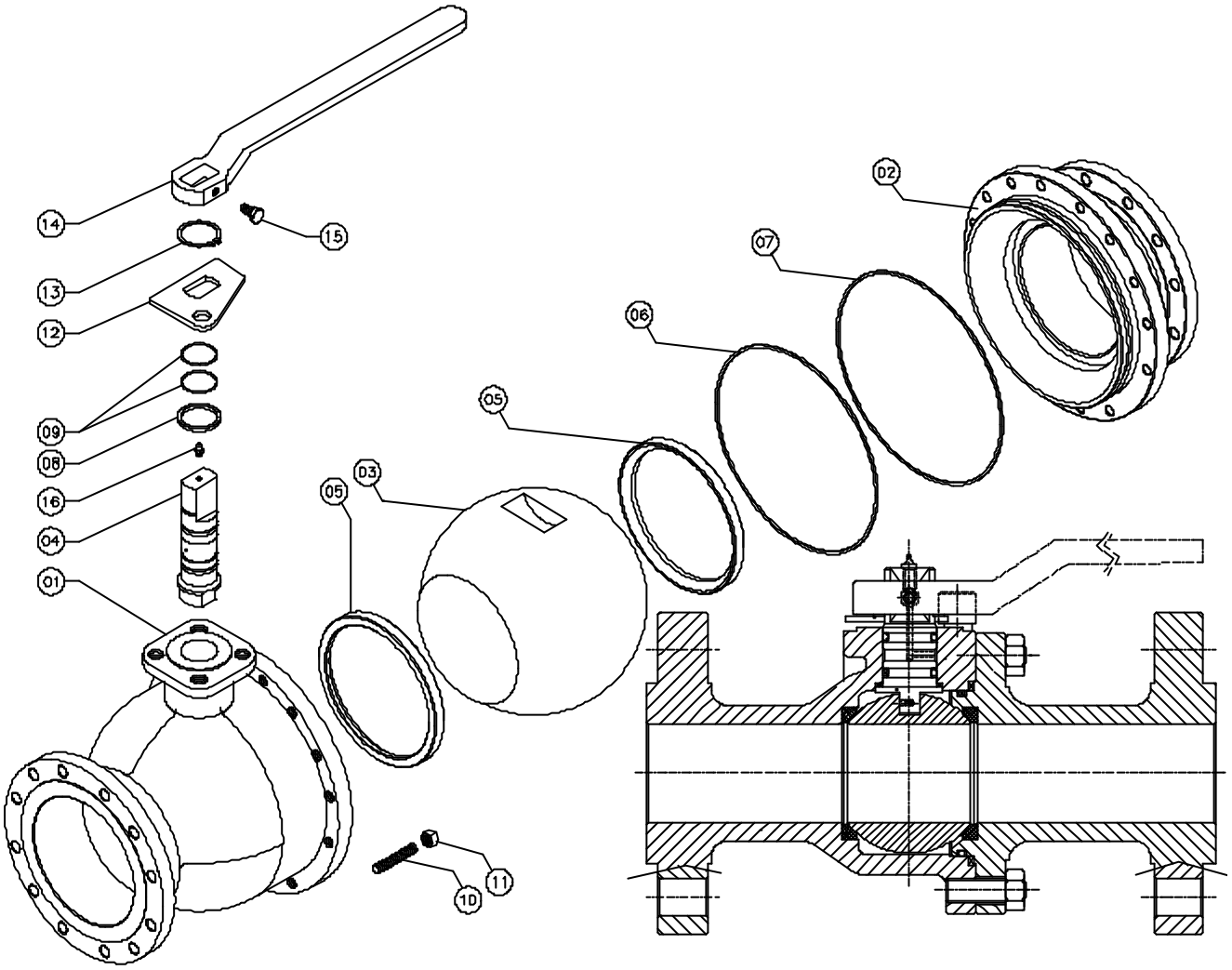
2. Place the body on plane & clean wooden surface. Install the seat in the body.
3. Coat the studs (10) with anti-corrosive paste.
4. Insert the stem seal bottom & the stem 'O' rings on the stem.
5. Install the stem from inside the body.
6. Fit the stop & lock plate on the stem & fit the circlip to the stem.
7. Fit the handle to the stem & tighten the hex bolt/grub screw.
8. Align the two stem flats parallel with the body bore.
9. Insert the ball in the stem in closed position. Gently rock the ball to make sure the stem is centered in the ball slot.
10. Install second seat in the body adapter. Place body seal on the body adapter & body gasket in the body recess.
11. Lower the body adapter with the seat onto the body. Place & tighten the body nuts in a crisscross pattern.
12. Rotate the ball slowly back & forth to a full quarter turn. This will allow the seat to assume its permanent position & shape against the ball & the body. A fast turning motion may damage the seat before it has a chance to form a proper seal.

    Note: *When the handle is re-assembled on the valve, it may be necessary to adjust handle to ensure proper setting of the ball in the open and closed position.*

CAUTION !

Follow safety rules & regulations to avoid personal injury or equipment damage.

Exploded view



Parts & Fastener Torques

ITEM	PART NAME
01	Body
02	Body Adapter
03	Ball
04	Stem
* 05	Seat
* 06	Body Seal
* 07	Body Gasket
* 08	Stem Seal Bottom
* 09	Stem 'O' Ring
10	Stud
11	Nut
12	Lock & Stop Plate
13	Circlip
14	Handle
15	Hex Bolt/Grub Screw
16	Grease Nipple

RECOMMENDED TIGHTENING TORQUES, Kg.m (N.m)

Thread Size	Property Class 8.8	Property Class 10.9	Property Class B7/B7M/B8/B8M
M8	2 (20)	2.9 (28)	0.6 (6)
M10	4 (40)	5.7 (56)	1.2 (12)
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Note: *Ensure that all the nuts/bolts are tightened to the torque values as specified in this Table.*

* Recommended spare parts.

Note: *Always use the genuine spare parts to make sure that the valve functions as intended.*

Disassembly

CAUTION !

Pipeline and valve must be depressurized by shutting off the valves & the bleed line, then cycling the valve once & leaving it half open to relieve the pressure from the body cavity.

Note: *Recommended spare parts are listed on the exploded view. These parts should be stocked to minimise the down time.*

Follow these steps to disassemble the valve:

1. Remove the valve from pipeline. Ensure that the valve should be in closed position for disassembling.
2. Keep the valve in vertical position on a plane & clean surface, taking care that end flange sealing surface should not be damaged.
3. Remove the handle coupler (14) with pipe by removing the hex bolt/grub screw (15).
4. Remove the body nuts (11) in a crisscross pattern & remove the body adapter (02).
5. Remove the body seal (06) from the body adapter and the body gasket (07) from the body (01).
6. Remove the ball (03) from the body & the seats (05) from the body & body adapter.

   Note*: Be careful not to damage the ball & the body seat area, otherwise leakage could result, even when new seats are installed. Always place the ball on a soft liner on a table & prevent it from rolling.*

7. Remove the stop & lock plate (12) by removing the circlip (13) from the stem (04).
8. Remove the stem by pushing into the body.
9. Remove the stem 'O' rings (09) & the stem seal bottom (08) from the stem.

   Note: *After the complete disassembly of the valve, all the components should be stored in a clean place to avoid damage.*

Reassembly

1. Clean & inspect all the parts for damage & change any part if in doubt.

   Note: *If complete disassembling becomes necessary, replacement of all seats & seals is recommended.*

2. Place the body on plane & clean wooden surface. Install the seat in the body.
3. Coat the studs (10) with anti-corrosive paste.
4. Insert the stem seal bottom & the stem 'O' rings on the stem.
5. Install the stem from inside the body.
6. Fit the stop & lock plate on the stem & fit the circlip to the stem.
7. Fit the handle coupler with pipe to the stem & tighten the hex bolt/grub screw.
8. Align the two stem flats parallel with the body bore.
9. Insert the ball in the stem in closed position. Gently rock the ball to make sure the stem is centered in the ball slot.
10. Install the second seat in the body adapter. Place the body seal on the body adapter & body gasket in the body recess.
11. Lower the body adapter with the seat onto the body. Place & tighten the body nuts in a crisscross pattern.
12. Rotate the ball slowly back & forth to a full quarter turn. This will allow the seat to assume its permanent position & shape against the ball & the body. A fast turning motion may damage the seat before it has a chance to form a proper seal.

    Note: *When the handle is re-assembled on the valve, it may be necessary to adjust handle to ensure proper setting of the ball in the open and closed position.*

CAUTION !

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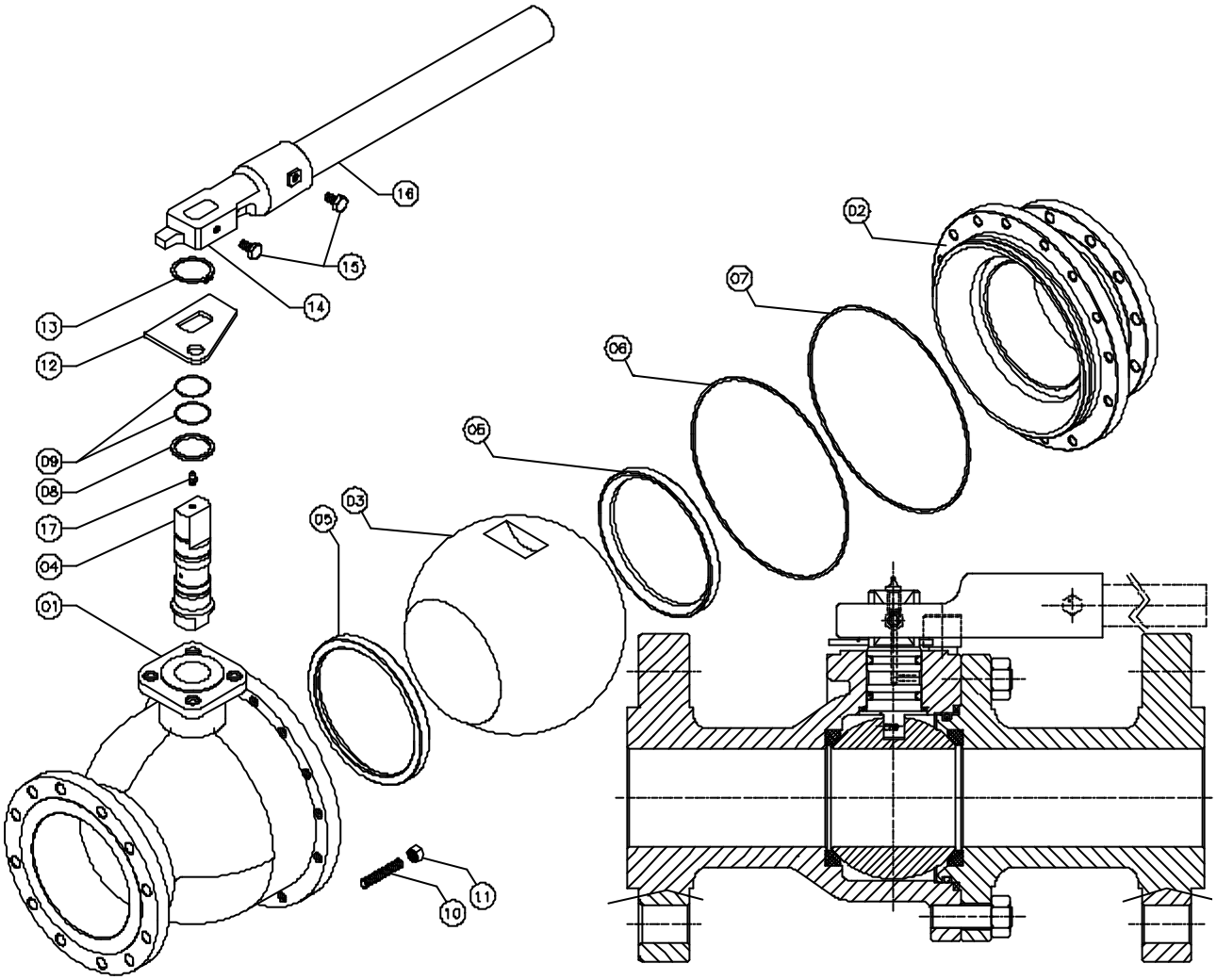
Exploded view



Parts & Fastener Torques

ITEM	PART NAME
01	Body
02	Body Adapter
03	Ball
04	Stem
* 05	Seat
* 06	Body Seal
* 07	Body Gasket
* 08	Stem Seal Bottom
* 09	Stem 'O' Ring
10	Stud
11	Nut
12	Lock & Stop Plate
13	Circlip
14	Handle Coupler
15	Hex Bolt/Grub Screw
16	Pipe
17	Grease Nipple

RECOMMENDED TIGHTENING TORQUES, Kg.m (N.m)

Thread Size	Property Class 8.8	Property Class 10.9	Property Class B7/B7M/B8/B8M
M8	2 (20)	2.9 (28)	0.6 (6)
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Note: *Ensure that all the nuts/bolts are tightened to the torque values as specified in this Table.*

* Recommended spare parts.

Note: *Always use the genuine spare parts to make sure that the valve functions as intended.*

Disassembly

CAUTION !

Pipeline and valve must be depressurized by shutting off the valves & the bleed line, then cycling the valve once & leaving it half open to relieve the pressure from the body cavity.

Note: *Recommended spare parts are listed on the exploded view. These parts should be stocked to minimise the down time.*

Follow these steps to disassemble the valve:

1. Remove the valve from pipeline. Ensure that the valve should be in closed position for disassembling.
2. Keep the valve in vertical position on a plane & clean surface, taking care that end flange sealing surface should not be damaged.
3. Remove the T-handle coupler (14) along with the lock & stop plate (12) & the pipe (16) by removing the hex bolt/grub screw (15).
4. Remove the stem key (17) from the stem (04).
5. Remove the body nuts (11) in a crisscross pattern & remove the body adapter (02).
6. Remove the body seal (06) from the body adapter and body gasket (07) from the body (01).
7. Remove the ball (03) from the body & the seats (05) from the body & body adapter.

   Note*: Be careful not to damage the ball & the body seat area, otherwise leakage could result, even when new seats are installed. Always place the ball on a soft liner on a table & prevent it from rolling.*

8. Remove the stem by pushing into the body.
9. Remove the stem 'O' rings (09) & the stem seal bottom (08) from the stem.

   Note: *After the complete disassembly of the valve, all the components should be stored in a clean place to avoid damage.*

Reassembly

1. Clean & inspect all the parts for damage & change any part if in doubt.

   Note: *If complete disassembling becomes necessary, replacement of all seats & seals is recommended.*

2. Place the body on plane & clean wooden surface. Install the seat in the body.
3. Coat the studs (10) with anti-corrosive paste.
4. Insert the stem seal bottom & the stem 'O' rings on the stem.
5. Install the stem from inside the body.
6. Fit the stem key in stem key way.
7. Fit the T-handle coupler along with the lock & stop plate & the pipe to the stem.
8. Place & tighten the hex bolt/grub screw to the T-handle coupler.
9. Align the two stem flats parallel with the body bore.
10. Insert the ball in the stem in closed position. Gently rock the ball to make sure the stem is centered in the ball slot.
11. Install the second seat in the body adapter. Place the body seal on the body adapter & body gasket in the body recess.
12. Lower the body adapter with the seat onto the body. Place & tighten the body nuts in a crisscross pattern.
13. Rotate the ball slowly back & forth to a full quarter turn. This will allow the seat to assume its permanent position & shape against the ball & the body. A fast turning motion may damage the seat before it has a chance to form a proper seal.

    Note: *When the handle is re-assembled on the valve, it may be necessary to adjust handle to ensure proper setting of the ball in the open and closed position.*

CAUTION !

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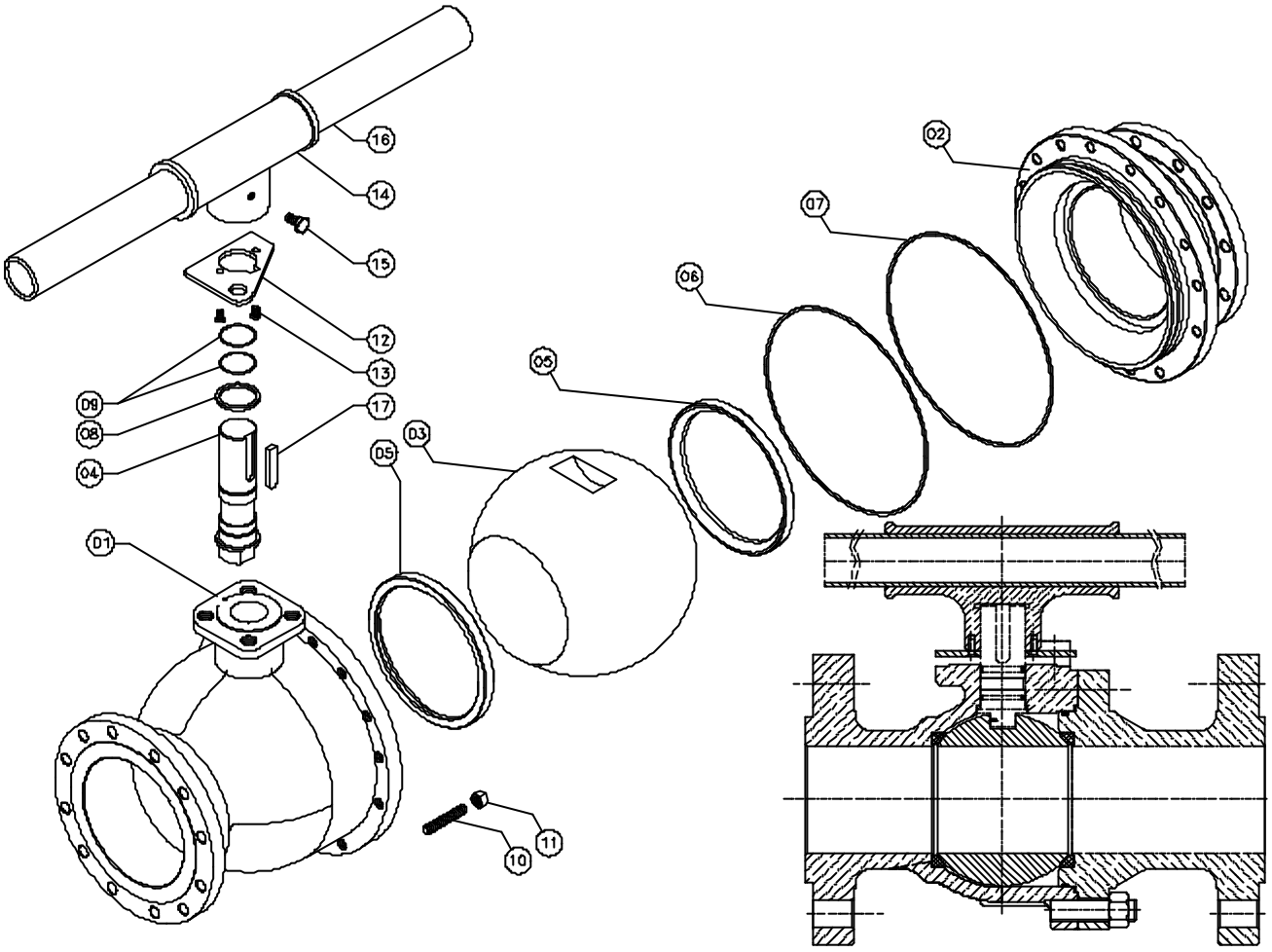
Exploded view



Parts & Fastener Torques

ITEM	PART NAME
01	Body
02	Body Adapter
03	Ball
04	Stem
* 05	Seat
* 06	Body Seal
* 07	Body Gasket
* 08	Stem Seal Bottom
* 09	Stem 'O' Ring
10	Stud
11	Nut
12	Lock & Stop Plate
13	Countersunk Screw
14	T-Handle Coupler
15	Hex Bolt/Grub Screw
16	Pipe
17	Stem Key

RECOMMENDED TIGHTENING TORQUES, Kg.m (N.m)

Thread Size	Property Class 8.8	Property Class 10.9	Property Class B7/B7M/B8/B8M
M8	2 (20)	2.9 (28)	0.6 (6)
M10	4 (40)	5.7 (56)	1.2 (12)
M12	7 (69)	10 (98)	2.2 (22)
M14	11.3 (111)	15.9 (156)	3.6 (35)
M16	17.2 (168)	24.2 (237)	5.4 (53)
M18	24.4 (239)	34.3 (336)	7.7 (76)
M20	33.5 (329)	47.2 (463)	10.7 (105)
M24	57.9 (568)	81.5 (799)	18.5 (181)
M27	87.5 (858)	123 (1207)	27.8 (273)
M30	115.9 (1137)	163 (1599)	36.9 (362)

Note: *Ensure that all the nuts/bolts are tightened to the torque values as specified in this Table.*

* Recommended spare parts.

Note: *Always use the genuine spare parts to make sure that the valve functions as intended.*

Disassembly

CAUTION !

Pipeline and valve must be depressurized by shutting off the valves & the bleed line, then cycling the valve once & leaving it half open to relieve the pressure from the body cavity.

Note: *Recommended spare parts are listed on the exploded view. These parts should be stocked to minimise the down time.*

Follow these steps to disassemble the valve:

1. Ensure that the valve should be in closed position for disassembling.

   Note: *The three piece design valve can be repaired without removing the entire valve from line, as the design is a swing-out design & the body of the valve that contains all the sealing parts can be easily removed & repaired.*

2. Remove the handle lock nut (12) & handle (14) from the stem (04).
3. Unscrew & remove the nuts (16) from the three studs (15) & only loosen the nuts of fourth stud.
4. The body (01) can now be swung out of the pipeline.
5. Remove the body gaskets (07) & seats (05) along with seat ring (06) from both sides.
6. Remove the ball (03) from the body.

   Note*: Be careful not to damage the ball & the body seat area, otherwise leakage could result, even when new seats are installed. Always place the ball on a soft liner on a table & prevent it from rolling.*

7. Remove the second stem nut (12) & the disc springs (11) from the stem.
8. Remove the stem by pushing into the body.
9. Remove the spacer ring (10) & the stem seal top (09) from the body.
10. Remove the stem seal bottom (08) from the stem.

    Note: *After the complete disassembly of the valve, all the components should be stored in a clean place to avoid damage.*

Reassembly

1. Clean & inspect all the parts for damage & change any part if in doubt.

   Note: *If complete disassembling becomes necessary, replacement of all seats & seals is recommended.*

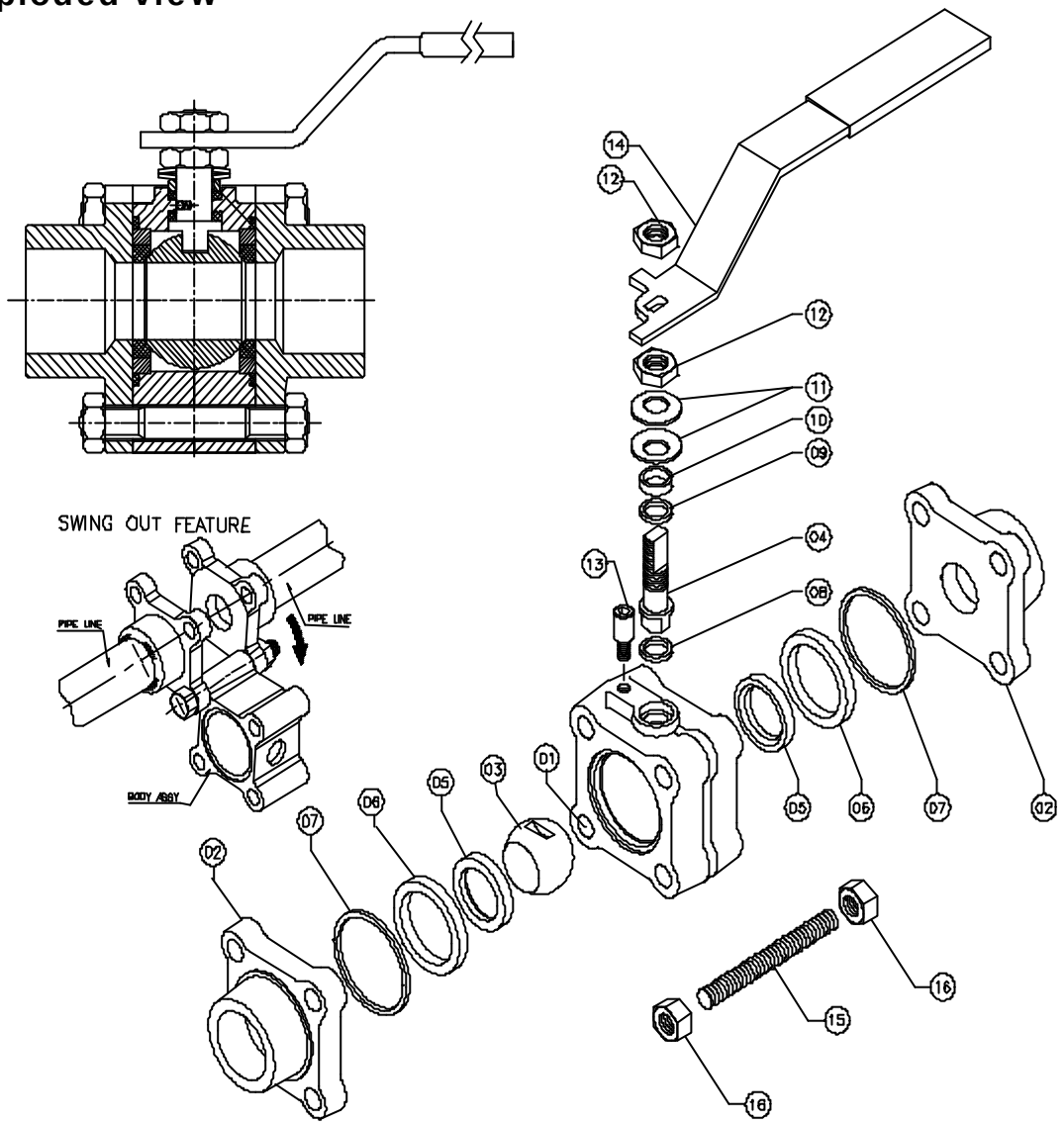
2. Coat the studs (14) with anti-corrosive paste.
3. Insert the stem seal bottom on the stem.
4. Install the stem from inside the body.
5. Fit the stem seal top, the spacer ring and the disc springs on the stem.
6. Place & tighten the stem nut, so that the disc springs are in tension.
7. Fit the handle to stem & tighten the second stem nut.
8. Align the two stem flats parallel with the body bore.
9. Insert the ball in the stem in closed position. Gently rock the ball to make sure the stem is centered in the ball slot.
10. Install seats along with seat ring on either side of ball.
11. Fit the body gaskets in the body recess on both sides.
12. Swing the body into the valve pipe ends.
13. Fit all the studs & tighten the nuts.
14. Rotate the ball slowly back & forth to a full quarter turn. This will allow the seat to assume its permanent position & shape against the ball & the body. A fast turning motion may damage the seat before it has a chance to form a proper seal.

    Note: *When the handle is re-assembled on the valve, it may be necessary to adjust handle to ensure proper setting of the ball in the open and closed position.*

CAUTION !

Follow safety rules & regulations to avoid personal injury or equipment damage.

Exploded view



Parts & Fastener Torques

ITEM	PART NAME
01	Body
02	Pipe End
03	Ball
04	Stem
* 05	Seat
06	Seat Ring
* 07	Body Gasket
* 08	Stem Seal Bottom
* 09	Stem Seal Top
10	Spacer Ring
11	Disc Spring
12	Stem Nut
13	Stop Pin
14	Handle
15	Studs
16	Nuts

RECOMMENDED TIGHTENING TORQUES, Kg.m (N.m)

Thread Size	Property Class 8.8	Property Class 10.9	Property Class B7/B7M/B8/B8M
M8	2 (20)	2.9 (28)	0.6 (6)
M10	4 (40)	5.7 (56)	1.2 (12)
M12	7 (69)	10 (98)	2.2 (22)
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Note: *Ensure that all the nuts/bolts are tightened to the torque values as specified in this Table.*

* Recommended spare parts.

Note: *Always use the genuine spare parts to make sure that the valve functions as intended.*

Customer	
Project	
Consultant	
P. O. No. and Date	
Work Order No.	
Date of Last Dispatch	
Date of Commissioning	

Guarantee :

"Our liability in respect of any defect in or failure of the goods supplied or for any loss, injury or damage attributable thereto is limited to making goods by replacement or repair defects which under proper use appear therein and arise solely from faulty materials and workmanship within a period of 18 calendar months after the original goods shall have been first dispatched or 12 calendar months from the date of commissioning, whichever is earlier provided that such defective parts are returned free to our works for examination. The undertaking shall exclude any and every other obligation."

In case of service / repair, please contact our nearest Branch Office / Factory.

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