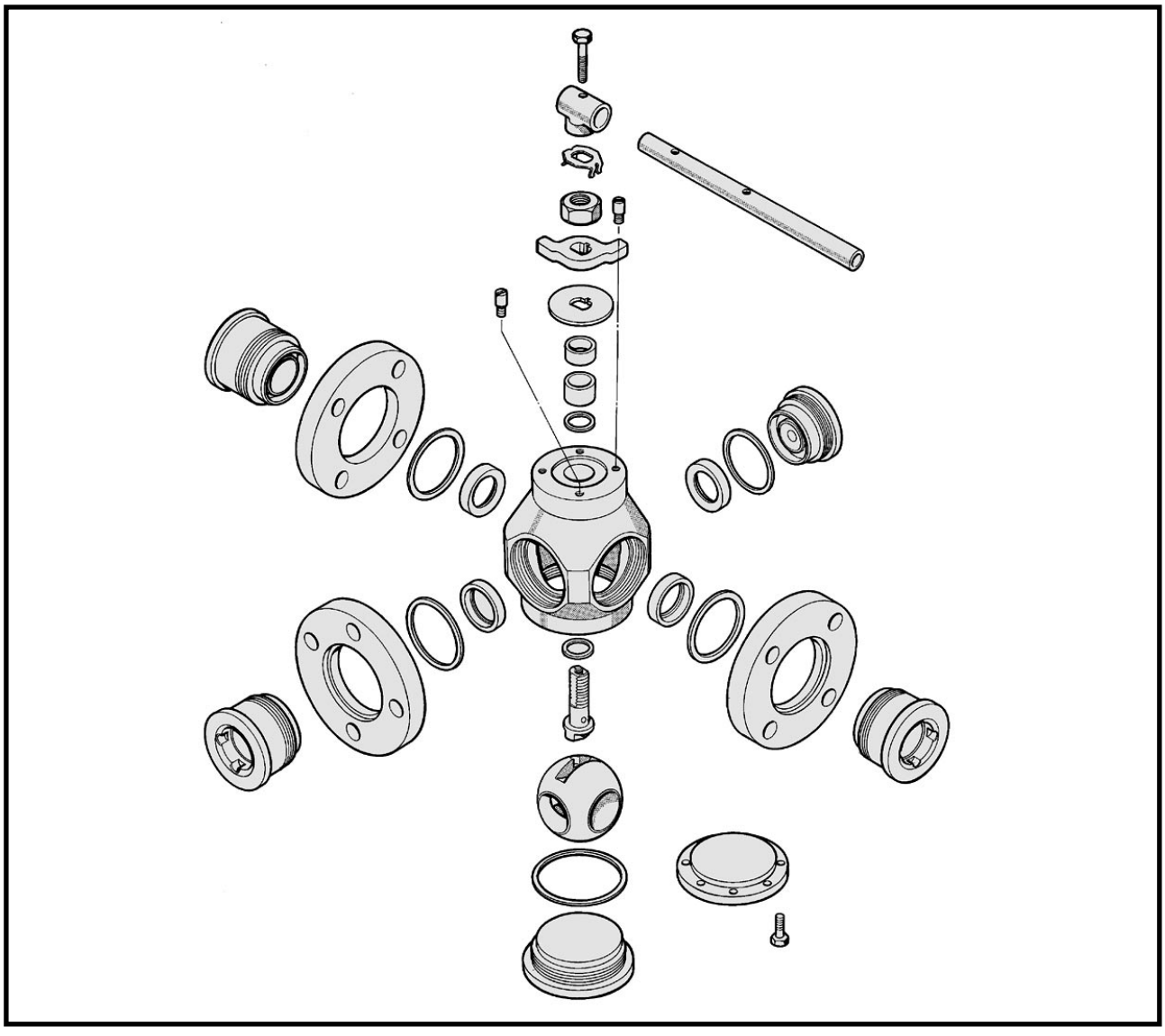
Installation, Operating & Maintenance Instructions

18 / 19 Series Multiway Valves



CE

BSI REGISTERED

UKAS QUALITY MANAGEMENT 003

FM 00707

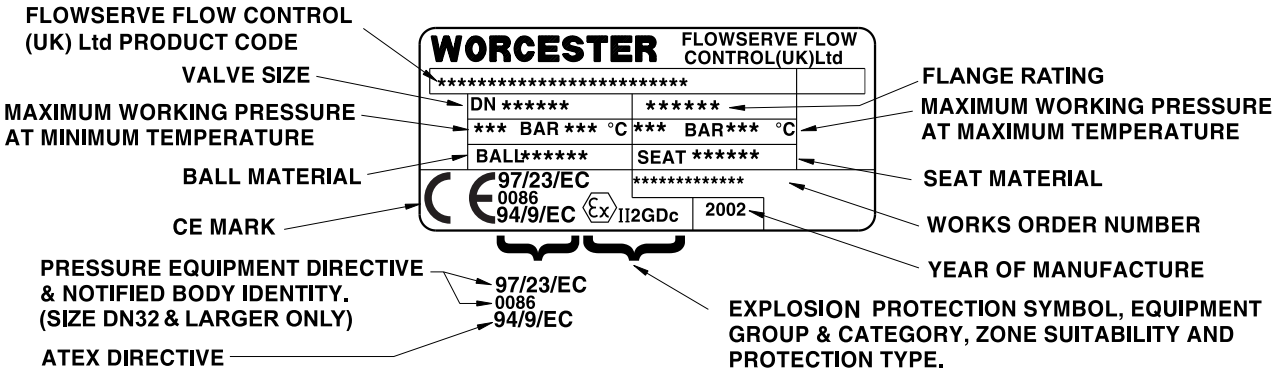
1 STORAGE AND PRESERVATION

All valves are despatched in the open position and it is recommended that they are left in this position during storage. All protective packaging should remain in position until the valve is to be installed.

Valves should be stored in a clean, dry environment.
Carbon steel valves are manganese phosphated and coated with a de-watering oil. This coating is non-toxic and is quite safe on edible or potable products.

2 VALVE MARKINGS

Each valve has the following identification information plate attached to the side of the body:



2.1 Pressure Equipment Directive: If the identity plate carries the Pressure Equipment Directive number '97/23/EC' and the Notified Body identity number '0086' beside the 'CE' mark, the product complies with the Pressure Equipment Directive 97/23/EC and the Pressure Equipment Regulations 1999 (SI 1999/2001). Without these numbers, the product is classified as 'SEP' (Sound Engineering Practice) and may only be used within the limitations defined in tables 6, 7, 8 & 9 of Schedule 3 of the Pressure Equipment Regulations.

2.2 ATEX Directive: If the identity plate carries the ATEX Directive number '94/9/EC' followed by the Explosion Protection Symbol and codes identifying the equipment group and category, the zone suitability and protection type beside the CE mark, the product complies with the ATEX Directive and The Equipment and Protective Systems for Use in Potentially Explosive Atmospheres Regulations 1996.
Definition of identity plate marking above:
'II' = Equipment Group; '2' = Equipment Category; 'G' = Gas Zone suitability (Zones 1 & 2); 'D' = Dust Zone suitability (Zones 21 & 22); 'c' = type of protection i.e. constructional safety (prEN 13463-5).
Surface Temperature: As per EN 13463-1:2001(E) paragraph 14.2.g, the temperature class or maximum surface temperature cannot be marked on the product as it is dependant on the operating conditions. However the maximum allowable operating temperature for the product is marked on the identification plate.

2.3 Should the valve soft trim materials be changed during the course of its operational life it is necessary for this change to be refelected on the identification plate i.e. material change may impact pressure and temperature limitations.
Refer to Flowserve Flow Control (UK) Ltd. Technical Sales for details.

2.4 Material traceability markings are hard marked on the valve body and connector.

3 HEALTH AND SAFETY

When installing or maintaining valves:

a) Conduct a risk assessment and eliminate or reduce hazards to an acceptable level.

b) Work in accordance with Safe Systems of Work.

c) Observe all site Health and Safety Rules in particular Permit to Work and Hot Work procedures.

d) Wear all necessary Personal Protective Equipment.

e) Never remove or maintain a valve or joint unless the line has been fully de-pressurised, drained and where necessary, purged of toxic / explosive / flammable media. Always operate the valve to the open position to ensure that no trapped pressure exists within the cavity.

f) Never handle valves that have been used on harmful substances unless they have been completely decontaminated and certified safe to handle.

g) Never use a valve on a duty which exceeds its prescribed operating parameters. Refer to Flowserve Flow Control (UK) Ltd Technical Sales for performance curves or further information.

h) Never modify or alter valves unless the manufacturer has been consulted or recommends such changes.

i) The valves wrenches are only designed for use in operating the valves and must not be used to carry them by. Failure to observe this warning may result in operator injury.

j) Due to the large physical size and weight of some sizes of this product, always use correct lifting methods and equipment when installing, removing and maintaining the product, and that it is correctly supported in its final operating location.

k) Due to the variety of duties on which this product can be employed, it is the end users responsibility to ensure the compatibility of the media with the materials of construction of the product for each specific application (i.e.corrosion and erosion which may affect the integrity of the pressure containing envelope).

l) Before equipment is installed in areas which may be subject to seismic activity or extreme climatic conditions consult Flowserve Flow Control (UK) Ltd. Technical Sales.

m) End Flanges: The end flange design of this product has been verified by either 1998/2001 ASME Boiler and Pressure Vessel Code Section VIII Division 1 calculation method, by Finite Element Analysis in accordance 1998/2001 ASME Boiler and Pressure Vessel Code Section VIII Division 2 - Alternative Rules, or by experimental testing as defined in pr EN 12516-3 Valves Design Strength - Part 3 Experimental Method.

Gaskets: The gaskets used in all methods are Spiral Wound to BS4865 for PN rated flanges, and ASME B16.20 for Class rated flanges. These have Gasket Factors and Design Stresses of 2.5 and 10000psi respectively for Carbon Steel gaskets, and 3.0 and 10000psi for Stainless Steel gaskets as defined in the 1998/2001 ASME Boiler and Pressure Vessel Code Section VIII Division 1.

3 HEALTH AND SAFETY (cont.)

If gaskets are used with higher Gasket Factors and Design Stresses than those stated above, please consult Flowserve Flow Control (UK) Ltd Technical Sales.

Bolting: End flanges have been verified by the methods stated above, using bolt design stress values based on those for ASTM A193 B8 Cl. 2 as defined in 1998/2001 ASME Boiler and Pressure Vessel Code Section II - Materials - Part D - Properties.

n) Lethal Service. In accordance with the design verification code (1998/2001 ASME Boiler and Pressure Vessel Code Section VIII Division 1) a casting quality factor of 1.0 is allowable for all products except those intended for 'lethal service'. All products for such service must have had non-destructive examination carried out in accordance with Appendix 7 of the code. Refer to Flowserve Flow Control (UK) Ltd Technical Sales.

o) If the processes or environments that the products are used in are likely to cause temperatures (high or low) that may cause injury to personnel if touched, then adequate insulation/protection must be fitted.

p) If the equipment is to be used on unstable gas duty, ensure that the operational parameters as indicated on the product identification plate cannot be exceeded.

q) This equipment should be protected by other devices to prevent over-pressurisation. (i.e. caused by external fire etc).

r) This equipment must be installed in a system that is designed to prevent excessive forces acting on the flanges, connections, etc.

4 PREPARATION FOR INSTALLATION

When dispatched, valves contain a mineral oil which aids the bedding in of the valve. This may be removed if found unsuitable. Special variants may contain other lubricants or be dry built.

Some valves contain a Silica gel bag inside the ball cavity to absorb humidity during storage. These must be removed before installation, as must all other protective packaging.

For valves up to and including 50mm Full Bore (65mm Reduced Bore) it is important to ensure that the gland nut locking clip is retained at all times. If, during installation, it is noted that the locking clip is not in place, the gland nut must be adjusted to the correct torque and a new locking clip fitted.

Significant problems can arise with any valve installed in an unclean pipleline.
Ensure that the pipeline has been flushed free of dirt, weld spatter, etc. before installation.
The working area should be clean and clear of any debris which could contaminate the valve.

Graphite seals should be handled with care due to their delicate nature.

If transit seals are fitted inside the valve, these must be discarded and replaced with the additionally suported body seals.

5 INSTALLATION INSTRUCTIONS

5.1 FLANGED VALVES

a) Installation of flanged valves should follow prevailing site standards. Where such standards do not exist the following should be used as a guideline.

   i) Flanged joints require compressive loading onto the gasket material as the normal line pressure forces tend to separate the joint. There should be no misalignment between the valve and mating faces.

   ii) Pipework should have the correct gap to allow for the valve face to face length plus assembled gasket material thickness.

   iii) Ensure the pipeline and flanged faces are clean and free of any debris which may be detrimental to flange sealing.

   iv) Bolting should be of the correct size, length and material for the duty.

   v) Locate the valve between the pipe ends and slide in the gaskets. It may be necessary to lever the mating flanges gently apart to allow for easy fitting of the gasket. Care should be taken to prevent damage to the sealing surfaces. Correct lifting equipment must be used when handling valves for operator safety.

   vi) Assemble all bolts and loosely tighten. Diametrically and evenly tighten the bolts to the correct torque required for the specific gasket material.

b) It is recommended that the valves are left in the open position during fitting.

5.2 SCREWED END VALVES

Do not dismantle these valves to install. Ensure that the valve and pipeline end threads are clean. Apply a suitable thread sealant to the pipe threads and screw into the valve being careful not to over tighten tapered threads. Do not use the valve wrench or stem as a lever to tighten the valve on the pipe thread.

5.3 WELD END VALVES

a) Remove body screws and body connectors from body.

b) Extract seat carriers complete with seat and all associated seals.

c) Carefully remove ball assembly plate and body seal, allowing ball to be removed from body.

d) Re-assemble valve ends to body (in correct orientation) using 2 diagonally opposed screws. Place the valve into position and tack weld only.

e) Remove body from valve ends and complete the welds ensuring that valve end faces are protected from weld splatter.

f) When cool, clean valve end faces, fit ball, seat carriers and new body seals where applicable. Ease the valve body between the body connectors being careful to avoid damage to the seals and mating faces and replace body screws, tightening them diagonally to the specified torque.

g) Check for correct operation and leak tightness if practical.

6 OPERATION

6.1 USE

Worcester ball valves provide bubble tight shut off when used in accordance with the published pressure/temperature chart.

It is not good practice to leave a standard ball valve in the partially (throttled) position as this may cause damage and seat life may be reduced. Flow control ball valves are available which contain seats designed for this purpose.

Any media which may solidify, crystallise or polymerise should not be allowed to stand in the ball cavity since this is detrimental to valve performance and life.

6.2 MANUAL OPERATION

The basic type of wrench which is fitted to valves 15-25mm Full Bore (20-32mm Reduced Bore) is of sheet steel. The larger sizes of valves have a cast wrench head and tubular handle secured to the stem by a wrench bolt. All sizes have separate stop plates and flow direction indicators.

Depending on the port configuration, flow is directed from one port to another by turning the wrench through 90º or 180º. The flow direction indicator shows the media flow path.

When operating the valve the use of excessive side loading on the wrench should be avoided.

6.3 REMOTE OPERATION

Where automation of valves is required, Worcester can supply pneumatic and electric actuators to cover a wide range of operating torques.

Operation will be in accordance with installation, operation and maintenance instructions for the relevant actuator.

7 MAINTENANCE

7.1 GENERAL

With self wipe ball / seats Worcester valves have long, trouble free lives and maintenance is seldom needed. The following checks will help extend life further and reduce plant problems:
Routine checks / maintenance:

i) Every 25000 cycles or 3 months: Check for any signs of leakage (see 7.2, 7.3 & 7.4 below) and that all fasteners (including the gland nut) and joints are tightened to their correct torque value (see final section of this I.O.M.).

ii) Infrequent operation: The valve should not be left standing without operation for more than 1 month. After this period the valve should be operated through three full cycles.

7.2 CROSS-FLOW BETWEEN OPEN AND CLOSED PORTS

Check that the valve is correctly ported by ensuring that the flow indicator plate is aligned with the required flow path. If it is, then any leakage will be due to damage to the body, connector, insert, seat or ball sealing surfaces and it will be necessary to dismantle the valve to repair it. (See section 9).

7.3 STEM LEAKAGE

Remove the wrench assembly as detailed in section 9 or the actuator as detailed in the relevant actuator I.O.M., followed by the gland nut locking clip (valves up to and including 50mm Full Bore, 65mm Reduced Bore), and retighten to the recommended torque. If the leakage persists then it will be necessary to dismantle the valve to establish the cause and/or replace gland packings and thrust seals.

7.4 BODY/INSERT/CONNECTOR JOINT LEAKAGE

SECREWED INSERTS: If leakage occurs here, it will be necessary to remove the valve from line. Remove the insert and establish whether the body and insert seal faces have been damaged. Replace the body seal, refit and tighten the insert to to the recommended torque value. (See section 9).
BOLT-ON CONNECTORS: If leakage occurs here, check the interface bolting is tightened to the recommended torque values and tighten if necessary. If leakage still occurs it will be necessary to remove the valve from line and replace the body seal and to establish whether the seal faces of the body and connector have been damaged. (See section 9).

8 REPAIR KITS

Repair kits are available for all Worcester valves. Details of their contents are found in the Instruction sheet supplied with the kit.

If other parts are required, it is usually recommended that the complete valve is replaced, although piece parts are available. Parts from different sized / rated valves must not be interchanged.

Only Worcester authorised spare parts should be used. This includes basic components such as fastenings. If the valve is altered in any way, without the consent of Flowserve Flow Control (UK) Ltd. then Flowserve Flow Control (UK) Ltd. will accept no responsibility.

9 REFURBISHMENT INSTRUCTIONS

Prior to commencing any work on the valve or removing it from line, refer to the 'Health & Safety' Instructions.
NEVER remove or maintain a valve or joint unless the line has been fully de-pressurised, drained and where necessary, purged of toxic / explosive / flammable media.

9.1 REMOVAL FROM LINE

a) Ensure that the valve is correctly supported before attempting to release the securing bolting.

b) In the case of screwed and weld end versions, the body screws should be removed and the valve body section taken out of line leaving the end connectors in place.

c) For flanged versions, the end flange bolting should be removed and the entire valve taken out of line.

d) The valves should be then taken to a clean, secure working place.

9.2 DISMANTLING

a) Flanged Valves. Flange Insert Removal: 15 to 50mm Full Bore and 20 to 65mm Reduced Bore: The flange port inserts should be removed using the appropriate four-pin drive adaptor. On these sizes of valves it should be possible to remove the inserts using standard workshop air torque / impact wrenches. Remove and discard all seats and body seals.

b) Flanged Valves. Flange Insert Removal: 65 to 150mm Full Bore and 80 to 200mm Reduced Bore: Due to the input torque requirement, it will be necessary to use a torque multiplier or hydraulic drive tool, in conjunction with the appropriate drive adaptor. It is recommended that the drive tool assembly is firmly clamped in position during the initial breaking out of the insert threads to ensure that the drive adaptor does not 'cam-out' of the flange port inlet drives. A small flypress or similar is particularly suited to this job. Should the drive tool require a reaction point, it is recommended that this is located on the clamping device to prevent accidental damage to the components. Remove and discard all seats and body seals.

c) Screwed / Weld End Types: Extract the push-in seat carriers complete with associated seats and body seals. Discard the seats and seals.

d) Ball Assembly Plate Removal: For valves up to and including 50mm Full Bore and 65mm Reduced Bore, it will be necessary to use the appropriate four-pin drive tool and wrench. For larger valves the ball assembly plate is secured by bolts, and requires no special tools. Remove the ball and body seal, and discard the seal.

e) To dismantle the stem assembly: For valves up to and including 25mm Full Bore and 32mm Reduced Bore, remove the following:
Wrench Nut
Flow Indicator
Wrench
Stop Plate
Gland Nut Locking Clip
Gland Nut
Disc Springs
Gland

9.2 DISMANTLING (cont.)

For valves 40mm Full Bore / 50mm Reduced Bore and larger, remove the following:
Wrench Bolt
Wrench Head and Tube
Gland Nut Locking Clip (40 - 50mm Full Bore / 50 - 65mm Reduced Bore only)
Gland Nut
Stop Plate
Flow Indicator
Gland

Withdraw the stem from inside the body and remove the stem thrust seal from the body recesses. The gland packing and stem location washer (where fitted) can now be removed from the top body recess.

All components not replaced by items in the repair kit should be thoroughly cleaned and stored in a secure area. All sealing surfaces on the body, inserts, connectors, blanking plates, ball assembly plates, ball and stem should be checked for corrosion, erosion and scratches. If any damage is found, or if there is any doubt over the suitability of the part, then it must be replaced.

g) Cleaning of parts may be carried out using a suitable degreasing agent. Hard deposits can be removed using wire wool. Again, care should be taken not to damage any of the sealing surfaces.

9.3 REBUILDING

Before rebuilding, ensure that the repair kit and/or components used are suitable for the valve requirement. When rebuilding, *CLEANLINESS IS ESSENTIAL* for long valve life.

a) Stem Assembly - Valves up to and including 25mm Full Bore / 32mm Reduced Bore:

Fit a new stem thrust seal onto the stem shoulder and insert this into the body stem bore from inside the body cavity.

Fit the new gland packing into the top body recess, over the top of the stem, followed by the gland and new disc springs (with their outer edges touching).

Fit the gland nut, and using the wrench (or other means) to prevent the stem from turning, tighten it down to the recommended torque.

Operate the stem several times and readjust the gland nut to the specified figure. The locking clip must then be fitted correctly, either across the corners or on the flats of the gland nut. Always tighten the gland nut to the next position to correctly locate the clip (see Fig. 1). Over-tightening the gland nut will only reduce the life of the stem assembly. Fit the stop plate, wrench, flow indicator and wrench nut and turn the stem to fully engage the stop pin.

9.3 REBUILDING (cont.)

b) Stem Assembly - Valves 40mm Full Bore / 50mm Reduced Bore and larger

Fit a new stem thrust seal onto the stem shoulder and insert this into the body stem bore from inside the body cavity.

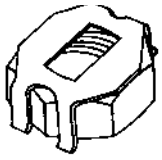
Fit the stem location washer and the new gland packing/s into the top body recess, over the top of the stem, followed by the gland, flow indicator and stop plate.

Fit the gland nut, and using the wrench (or other means) to prevent the stem from turning, tighten it down to the recommended torque.

Operate the stem several times and readjust the gland nut to the specified figure. For valves 40 - 50mm Full Bore / 50 - 65mm Reduced Bore, the locking clip must then be fitted correctly, either across the corners or on the flats of the gland nut. Always tighten the gland nut to the next position to correctly locate the clip (see below). Over-tightening the gland nut will only reduce the life of the stem assembly.

Turn the stem to fully engage the stop pin.

Correct



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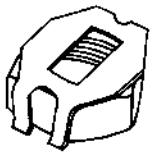

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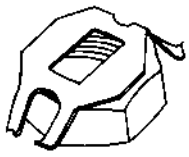


Incorrect

c) Insert the ball into position by sliding it into the body onto the stem tang, ensuring that the foolproof pin engages correctly with the ball. With a new seal fitted, the ball assembly plate is now positioned into the body and tightened to the specified torque.

d) The new seats and body seals can now be fitted to the inserts / seat carriers. The application of a little suitable lubricant (such as mineral oil, a silicon based lubricant or clean grease such as petroleum jelly) to the seats and seals will help hold them in position and aid 'bedding-in' of the completed valve assembly. **NOTE:** ensure that the lubricant used is compatible with the pipeline media.

Ensure that the ball is correctly ported, i.e. not partially open/closed, otherwise seat damage will occur.

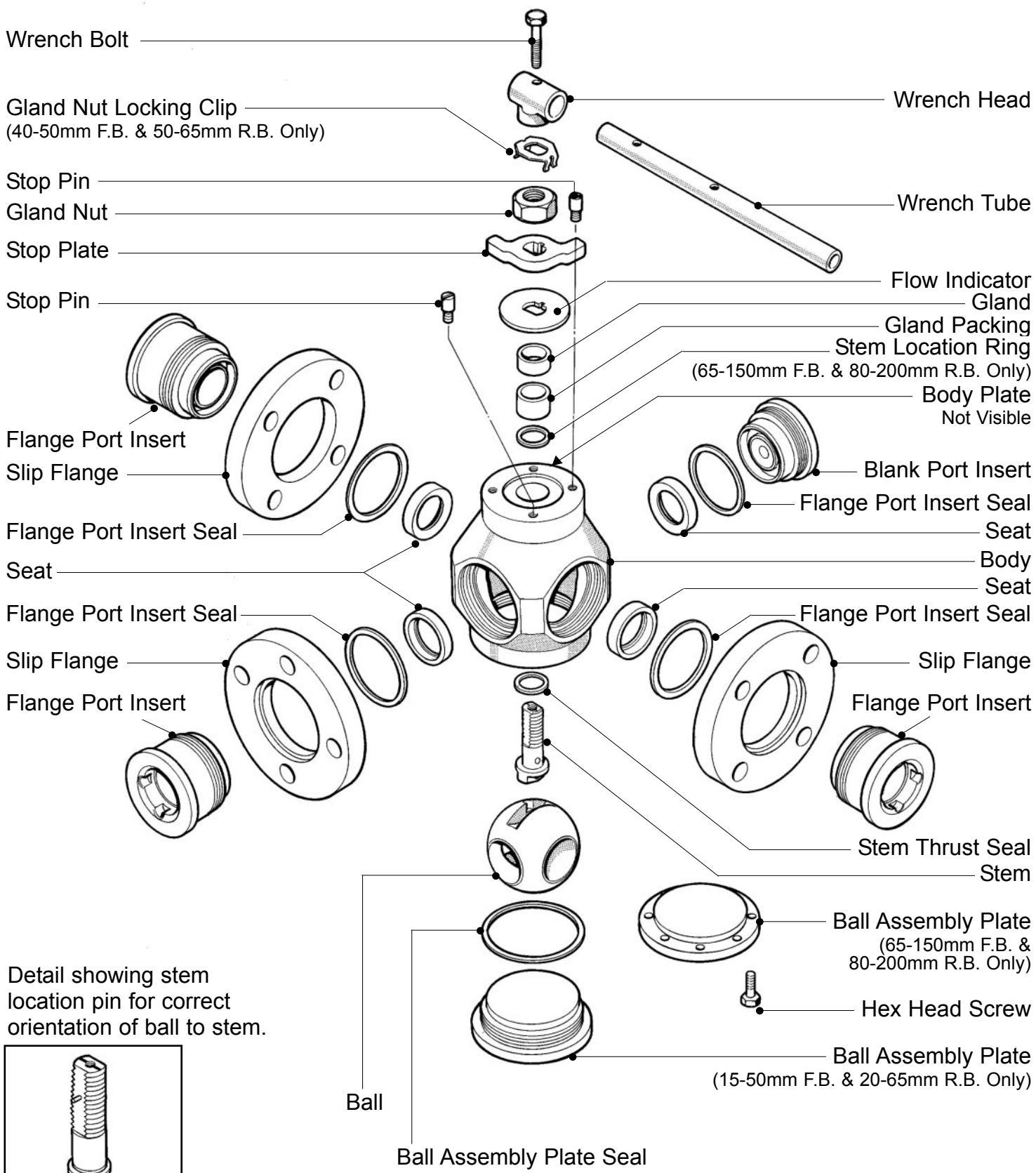
Flanged Valves: Position the slip-on flange onto the insert, locate into the body and tighten to the specified torque using the appropriate 4-pin drive adaptor and drive tools.

Screwed / Weld End Valves: Insert the seat carriers into the body. Slide the assembled body back in between the body connectors being careful not to damage the seals/sealing faces. Replace the body screws, and tighten diagonally and evenly to the specified torque.

e) If practical, check for leak tightness and operating torque.

SCREWED INSERT TYPE

This Stem/Wrench Build is Typical for Valves 40mm Full Bore (50mm Reduced Bore) and Larger

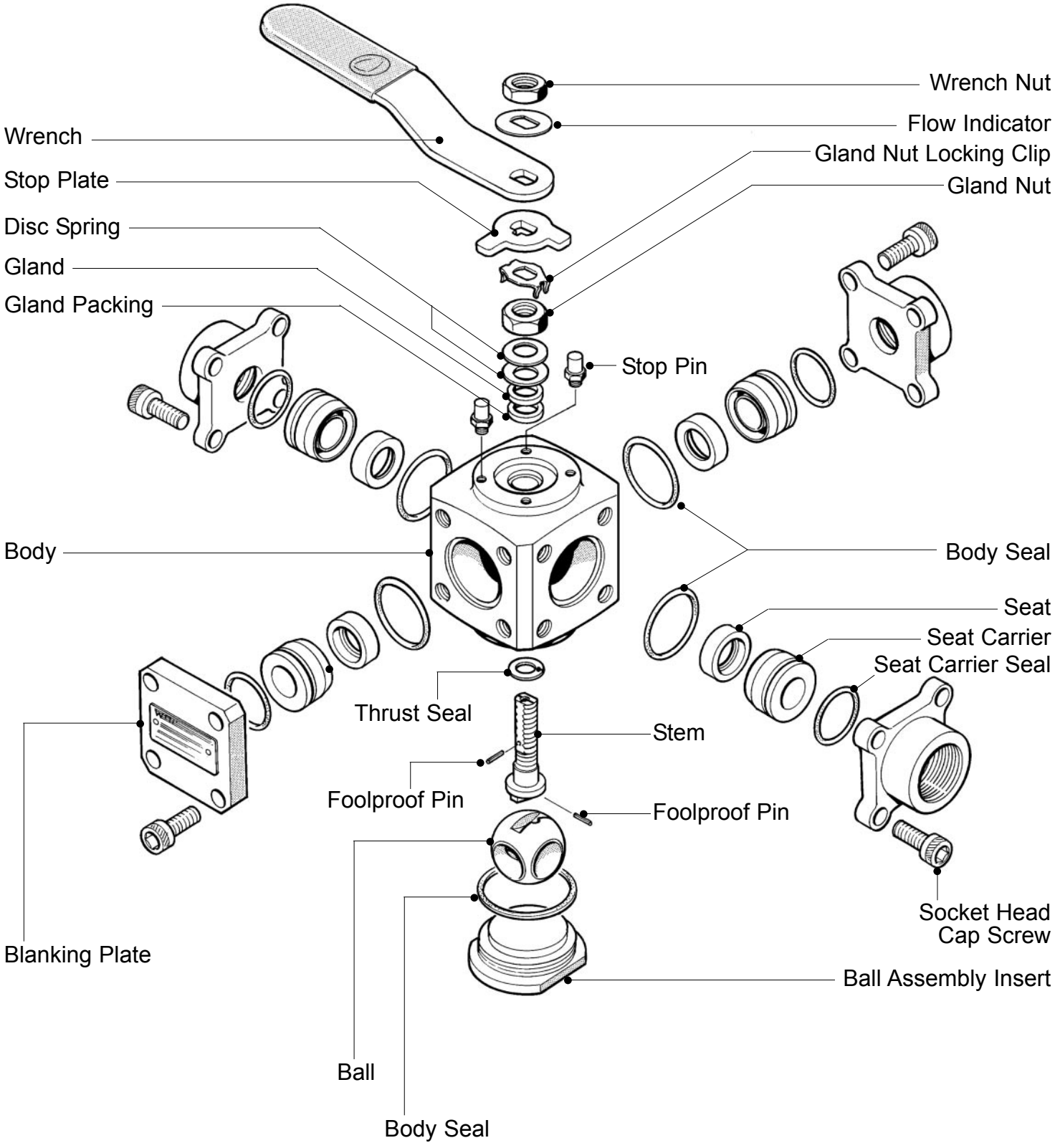


Detail showing stem location pin for correct orientation of ball to stem.

NOTE: For 15-50mm F.B. & 20-65mm R.B. valves, one gland packing is used. For 65-150mm F.B. & 80-200mm R.B. valves, two are used.

BOLTED CONNECTOR TYPE

This Stem/Wrench Build is Typical for Valves Up To and Including 25mm Full Bore (32mm Reduced Bore)



VALVE ASSEMBLY TORQUES

DEFINITIONS

Insert Torque - The torque required to give metal to metal contact with the body and the flange port insert and the ball assembly insert.

Bolt Torque - The torque required to give metal to metal contact with the body and the body connectors (screwed and weld varieties), and the ball assembly plate (sizes 65mm Full Bore / 80mm Reduced Bore and larger).

Stem Assembly Torque - The torque required to operate the assembled stem before the ball and seats are fitted.

Gland Nut Torque - The tightening torque to be applied to the gland nut to achieve the stem assembly torque. **Note:** these figures are only to be used with valves fitted with locking clips and **must not** be used for tightening self locking gland nuts.

NOMINAL SIZE		FLANGE PORT SCREWED INSERT TORQUE (Nm)	SCREWED/WELDED BODY CONNECTOR BOLT TORQUE (Nm)	BALL ASSEMBLY INSERT TORQUE (Nm)	BALL ASSEMBLY PLATE BOLT TORQUE (Nm)
REDUCED BORE	FULL BORE				
20mm (¾")	15mm (½")	65 - 75	26	65 - 75	
25mm (1")	20mm (¾")	70 - 80	27	70 - 80	
32mm (1¼")	25mm (1")	80 - 90	28.5	80 - 90	
50mm (2")	40mm (1½")	90 - 100	37	90 - 100	
65mm (2½")	50mm (2")	300 - 310	51	300 - 310	
80mm (3")	65mm (2½")	700 - 740	45		45
100mm (4")	80mm (3")	900 - 1065	125		125
150mm (6")	100mm (4")	1500 - 1700			150
200mm (8")	150mm (6")	1800 - 2000			180

NOMINAL SIZE		GLAND NUT TORQUE		STEM ASSEMBLY TORQUE
REDUCED BORE	FULL BORE	GRAPHITE BUILD	PTFE BUILD	
20mm (¾")	15mm (½")	6 - 10	8 - 12	4 - 6
25mm (1")	20mm (¾")	6 - 10	8 - 12	4 - 6
32mm (1¼")	25mm (1")	8 - 12	13 - 18	6 - 8
50mm (2")	40mm (1½")	15 - 20	19 - 24	8 - 11
65mm (2½")	50mm (2")	15 - 20	19 - 24	8 - 11
80mm (3")	65mm (2½")			18 - 22
100mm (4")	80mm (3")			18 - 22
150mm (6")	100mm (4")			23 - 28
200mm (8")	150mm (6")			23 - 28

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