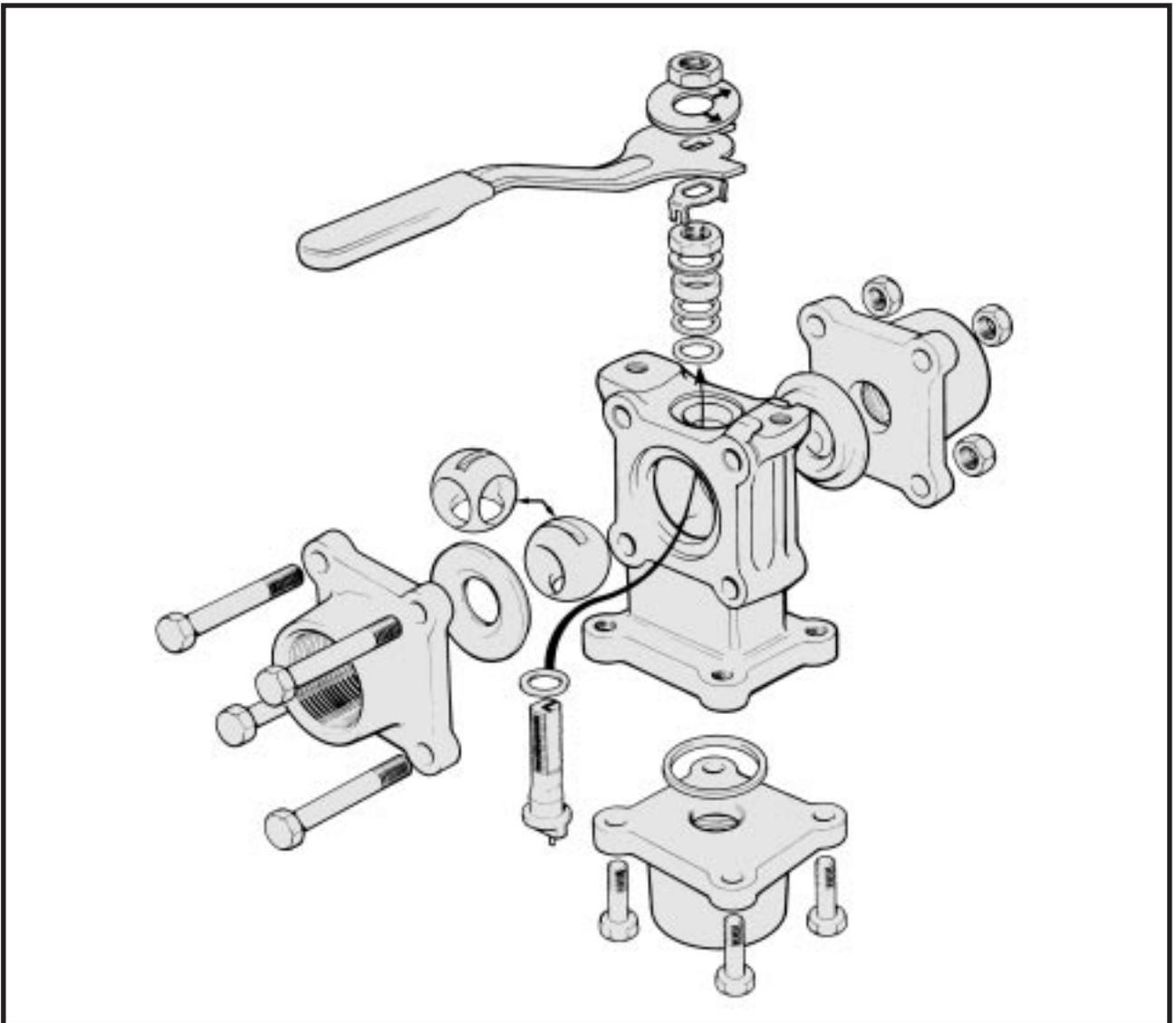




# Installation, Operating & Maintenance Instructions

## 13 / 14 Series



FM 00707

# 1 STORAGE AND PRESERVATION

When despatched, all valves are in the open position, and it is recommended that they be left in this position during storage. All protective packaging, end port plugs/caps, flange covers etc should remain in position until the valve is due to be installed.

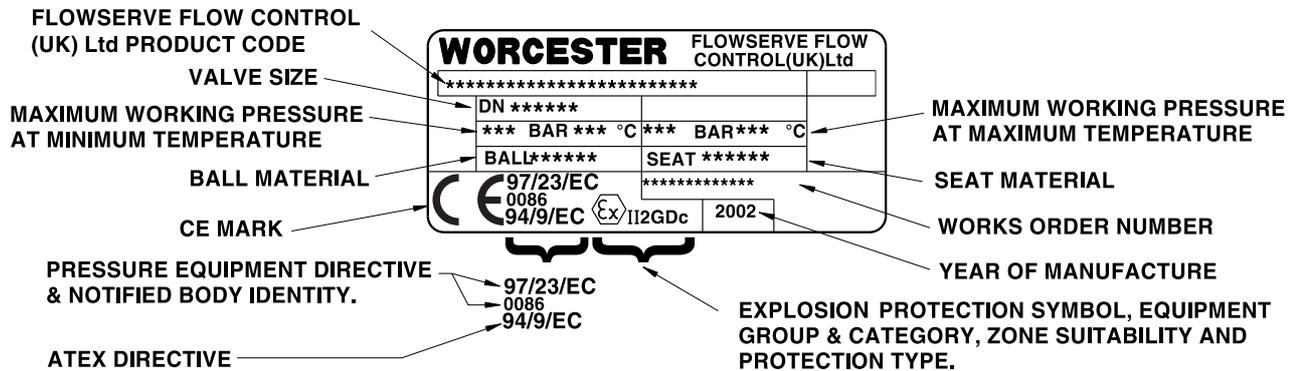
Valves should be stored in a clean, dry environment.

Carbon steel valves are coated in a de-watering oil. This coating is non-toxic and is quite safe on edible or potable products.

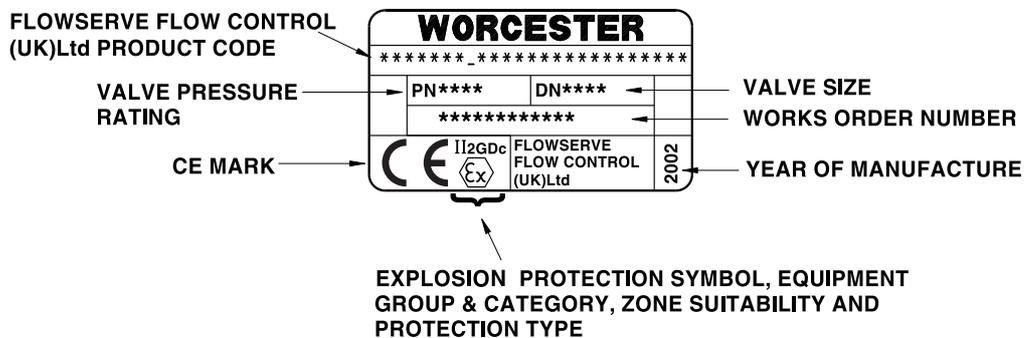
## 2 VALVE MARKINGS

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

### 3-Piece Valves 32mm (1¼") and larger:



### 3-Piece Valves 25mm (1") and smaller:



**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, for valve sizes DN32-DN50, the maximum/mimimum allowable operating temperatures for the product is marked on the identification plate. Refer to the product brochure and/or Flowserve Flow Control (UK) Ltd. Technical Sales for allowable temperature limits for all other sizes.

**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.

**2.5** There is a safety information label placed over the wrench.

### 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 and/or recommends such changes.
- i) The valve wrenches are designed only for use in operating the valves and must not be used for carrying them. 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 effect 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) 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.
- n) 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.
- o) If the equipment is to be used on unstable gas duty, ensure that the operational parameters as indicated on the product identification plate, or in the product brochure, or as advised by Flowserve Flow Control (UK) Ltd. Technical Sales cannot be exceeded.
- p) This equipment should be protected by other devices to prevent over-pressurisation. (i.e. caused by external fire etc).
- q) 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

The working area should be clean and clear of any debris that would contaminate the valve.

When despatched, 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 are 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.

If the wrench has been removed for storage (or actuation) it is important to ensure that the gland nut locking clip is retained. 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 pipeline. Ensure that the pipeline has been flushed free of dirt, weld spatter etc. before installation.

If PTFE coated stainless steel body seals are used, care must be taken when handling them to avoid scratching the PTFE coating and also to ensure that their widest face is sitting on the valve body.

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

# 5 INSTALLATION INSTRUCTIONS

## 5.1 SCREWED END VALVES:

Do not dismantle these valves to install. Ensure that the pipeline and valve 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 onto the pipe thread.

## 5.2 WELD END VALVES:

- a) Fully assembled weld end valves (butt and socket), must only be tack-welded into position, as the full weld heat will damage the seats and seals. Note: the ball must be in the open position adjacent to the connector when being welded.
- b) After tack welding, remove the body assembly from the pipeline as per section **9.1 a & b**. Store in a clean, secure location.
- c) Complete the welding procedure after protecting the connector end faces from weld spatter.
- d) When cool, replace the body assembly as per section **9.2 i - l**. The body seals are replaced with the ones supplied.

# 6 OPERATION

## 6.1 USE

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

It is not good practice to leave a soft seated ball valve in the partially open (throttled) position as this will damage the seats and reduce valve life. Flow control ball valves, which contain seats for this purpose, are available from Flowserve Flow Control (UK) Ltd.

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

## 6.2 MANUAL OPERATION:

When operating the valve, avoid using excessive side loading on the wrench.

The 13 Series valves: This 3-port valve provides flow from either of two opposing ports to a common outlet. Media is switched from one inlet port to the other by 90° operation.

The 14 Series valves: As 13 Series except the operation is 180°. The mid position allows full isolation.

## 6.3 REMOTE OPERATION:

Where automation of the valve is necessary, Flowserve Flow Control (UK) Ltd. can supply pneumatic and electric actuators to cover a wide range of operating torque requirements.

# 7 MAINTENANCE

## 7.1 GENERAL

With self wipe ball / seats and patented pressure equalising slots, 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 IN-LINE LEAKAGE

Check that the valve is fully closed. If it is, then any leakage will be due to damage to the body, connector, ball or seat sealing surfaces and it will be necessary to repair it (refer to Section 9).

## 7.3 STEM LEAKAGE

Remove the wrench assembly, or the actuator (as detailed in the relevant actuator I.O.M.), followed by the gland nut locking clip and retighten the gland nut to the recommended torque. If leakage still persists then it will be necessary to dismantle the valve to establish the cause and/or to replace the stem thrust seal and gland packing/s (refer to Sections 9 and 10).

## 7.4 BODY / CONNECTOR JOINT LEAKAGE

Check the tightness of the body bolting and tighten to the recommended torque values if necessary. If leakage still occurs it will be necessary to remove the valve from line to 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 can be found on the instruction sheet supplied with the kit.

If other parts are required, it is usually recommended that the complete valve be 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 DISMANTLING (all variations except 'DC')

- a) Remove the four lower body / connector bolts and the four main body / connector bolts.
- b) With the wrench in the in-line position, the end connectors must be sprung apart far enough to clear the protruding ball, and slide the body from pipeline. Take care not to damage the ball and the body and connector sealing faces.
- c) Remove the seats, body seals and lower connector seal and discard. (Note: 'T' series valves have one piece seat / seals.)
- d) Turn the wrench to the cross-line position and remove the ball ensuring that it does not mark against the body.  
If the valve is being dismantled to cure through leakage (i.e. to replace ball and seats), and there is no steam leakage, then it is not necessary to go any further with dismantling.
- e) To dismantle the stem assembly, remove:  
Wrench Nut  
Flow Indicator  
Wrench  
Stop Plate (if fitted)  
Gland Nut Locking Clip  
Gland Nut  
Disc Springs  
Gland
- f) Withdraw the stem from inside the body and remove the stem thrust seal from inside the body recess. Note; with 15mm(1/2") valves, the wrench flats on the stem must be aligned across the valve to allow withdrawal of the stem. The gland packing can now be removed from the body top recess.
- g) 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, connectors (including fire-safe spigot), 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.
- h) 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.

## 9.2 REBUILDING

- a) Before rebuilding, ensure the repair kit and/or components used are suitable for the valve requirement. When rebuilding, cleanliness is essential for long valve life.
- b) Fit a new stem thrust seal on to the stem shoulder and insert this into the body stem bore from inside the body cavity.
- c) Insert the new gland packing/s into the top body recess, over the top of the stem, followed by the gland and new disc springs (with their outer edges touching).
- d) Fit the gland nut, and using the wrench (or other means) to prevent the stem from turning, tighten it down, fully compressing the disc springs. Operate the stem several times, then tighten the gland nut to the torque specified in Section 10.
- e) The locking clip must be fitted correctly: either across the corners or the flats of the gland nut. The gland nut can be tightened to the next position to correctly locate the clip (see below). NOTE: Over tightening will only reduce the life of the stem assembly.



Correct



Correct



Incorrect



Incorrect

- f) Fit the stop plate (if required), wrench, flow indicator and wrench nut to the stem assembly and turn to the wrench cross-line position.
- g) Insert the ball into position by sliding it onto the stem tang. Turn the valve to the wrench in-line position to stop the ball from falling out and from fouling the end connectors when the valve is placed back into the pipeline.
- h) The new seats and body seals can now be fitted.  
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.
- i) The body connectors must have their faces cleaned before refitting of the valve can proceed. As with removal, the body connectors must be sprung apart slightly to get the body assembly into position and avoid damaging the ball, seats, seals and sealing faces.
- j) Centralise the body, replace the body bolts and tighten diagonally and evenly to the torque specified in Section 10.
- k) Replace the four lower body / connector bolts and tighten as above.
- l) If practical, check for leak tightness and operating torque.

# 10 VALVE ASSEMBLY TORQUES

## 10.1 Bolting Torques

It is a requirement of all body bolts to give a metal to metal contact between the body and the inner surface of the body connectors.

Hexagonal Headed Bolts			Socket Head Cap Screws		
Valve Nominal Size		Recommended Torque (Nm)	Valve Nominal Size		Recommended Torque (Nm)
Reduced Bore	Full Bore		Reduced Bore	Full Bore	
15mm (1/2")	-	11 - 13	15mm (1/2")	-	24 - 28
20mm (3/4")	15mm (1/2")	13 - 15	20mm (3/4")	15mm (1/2")	25 - 28
25mm (1")	20mm (3/4")	24 - 28	25mm (1")	20mm (3/4")	27 - 31
32mm (1 1/4")	25mm (1")	28 - 32	32mm (1 1/4")	25mm (1")	31 - 35
40mm (1 1/2")	32mm (1 1/4")	33 - 37	40mm (1 1/2")	32mm (1 1/4")	35 - 39
50mm (2")	40mm (1 1/2")	38 - 42	50mm (2")	40mm (1 1/2")	49 - 53

## 10.2 Gland Nut Torques

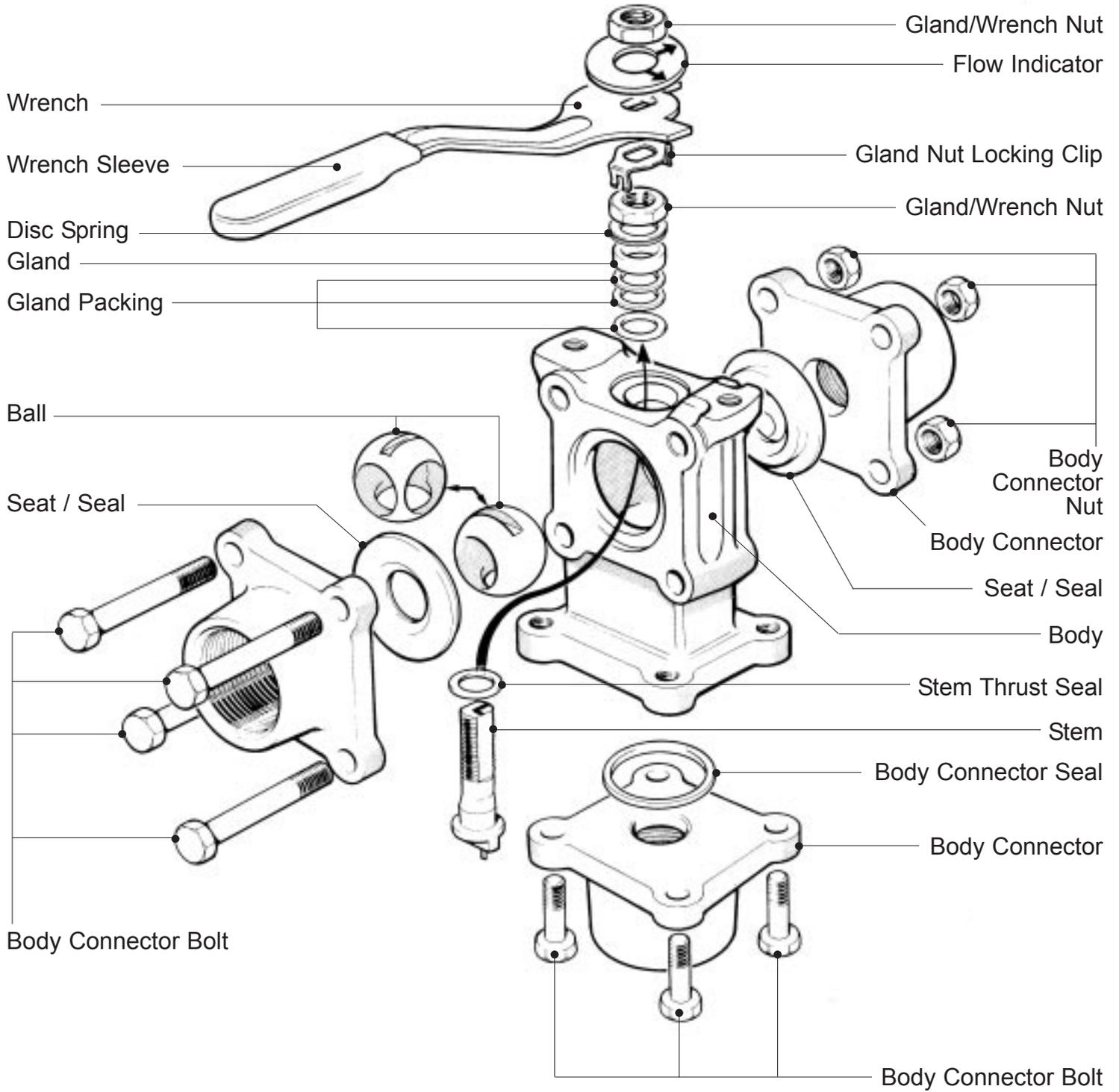
These are the figures for tightening plain gland nuts, which are used in conjunction with gland nut locking clips. They are not to be used for tightening self locking gland nuts.

Graphite Seals			PTFE Seals		
Valve Nominal Size		Recommended Torque (Nm)	Valve Nominal Size		Recommended Torque (Nm)
Reduced Bore	Full Bore		Reduced Bore	Full Bore	
15mm (1/2")	-	5 - 7	15mm (1/2")	-	6 - 9
20mm (3/4")	15mm (1/2")	5 - 7	20mm (3/4")	15mm (1/2")	6 - 9
25mm (1")	20mm (3/4")	6 - 10	25mm (1")	20mm (3/4")	8 - 12
32mm (1 1/4")	25mm (1")	6 - 10	32mm (1 1/4")	25mm (1")	8 - 12
40mm (1 1/2")	32mm (1 1/4")	8 - 12	40mm (1 1/2")	32mm (1 1/4")	13 - 18
50mm (2")	40mm (1 1/2")	8 - 12	50mm (2")	40mm (1 1/2")	13 - 18

## 10.3 Stem Assembly Torques

The following figures are for your guidance only. The torques quoted are those to operate the stem assembly before the ball and seats are fitted.

Valve Nominal Size		Recommended Torque (Nm)
Reduced Bore	Full Bore	
15mm (1/2")	-	3 - 5
20mm (3/4")	15mm (1/2")	3 - 5
25mm (1")	20mm (3/4")	4 - 6
32mm (1 1/4")	25mm (1")	4 - 6
40mm (1 1/2")	32mm (1 1/4")	6 - 8
50mm (2")	40mm (1 1/2")	6 - 8





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