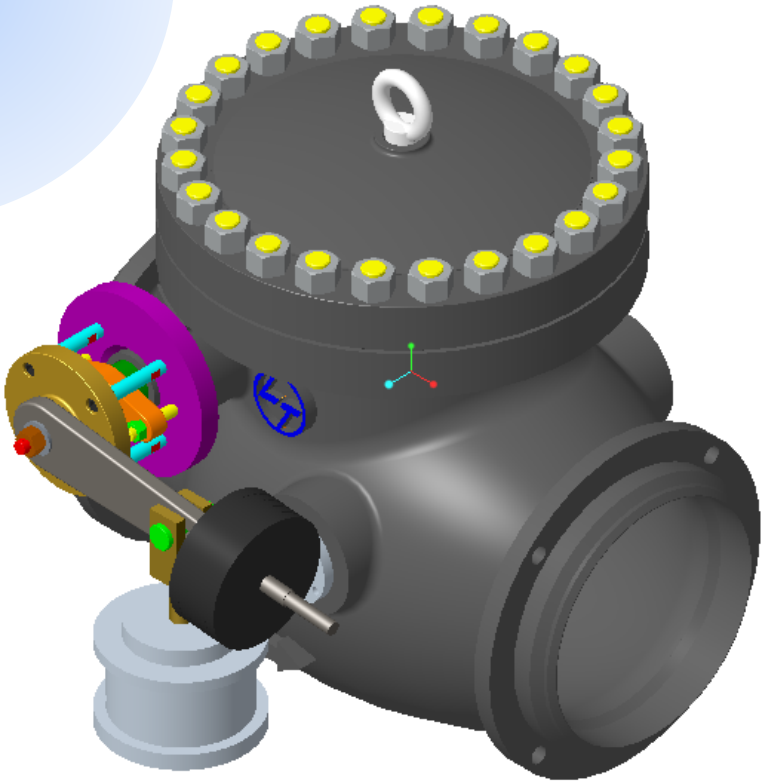
L&T Valves



Installation, Operation & Maintenance Manual

Bolted Bonnet Check Valve

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1 Introduction

1.1 Scope

This manual covers the Installation, Operation and Maintenance (IOM) procedures of *L&T Valves Limited's* Low Pressure Bolted Bonnet Check Valves..

The Low Pressure range of Check Valves is designed in accordance with BS1868 and ASME B16.34, Standard and Special, Pressure Class ratings from 150 to 600.

Mail us at: contactus@lntvalves.com

Visit us at: www.lntvalves.com

2 General Safety

2.1 Precautions

a) Work shall be carried out in accordance with safe systems and all site health and safety rules shall be observed.

b) Line pressure shall always be **fully de-pressurized and drained** before,

   i. Gasket or Packing removal

   ii. Removing the valve from the line for maintenance and inspection

c) When installing or maintaining valves, conduct a risk assessment and eliminate or reduce hazards to an acceptable level.

d) Due to the variety of duties in which this product can be employed, the end user shall ensure the compatibility of the media with the material of construction of product for each specific application.

e) Before the equipment is installed in areas, which may be subject to extreme seismic activity, consult L&T Valves with available data.

f) **Do's & Don'ts**

   i. Wear all necessary protective equipment for conducting the work.

   ii. Never remove or maintain a valve or joint unless the line has been fully drained and de pressurized.

   iii. Ensure that the valves are used within the pressure temperature service conditions as per **ASME B16.34 Section 2**. Also refer the Identification Plate for pressure and temperature limits. In case of additional assistance, consult with L&T Valves

3 Basic Construction of a Valve

L&T's Standard Check valves are swing check valves used to prevent back flow. The fluid flow is in a straight line comparable to that in a gate valve. This valve is kept open by the flow. In the event of back flow or flow stoppage, the disc swings back to close automatically.

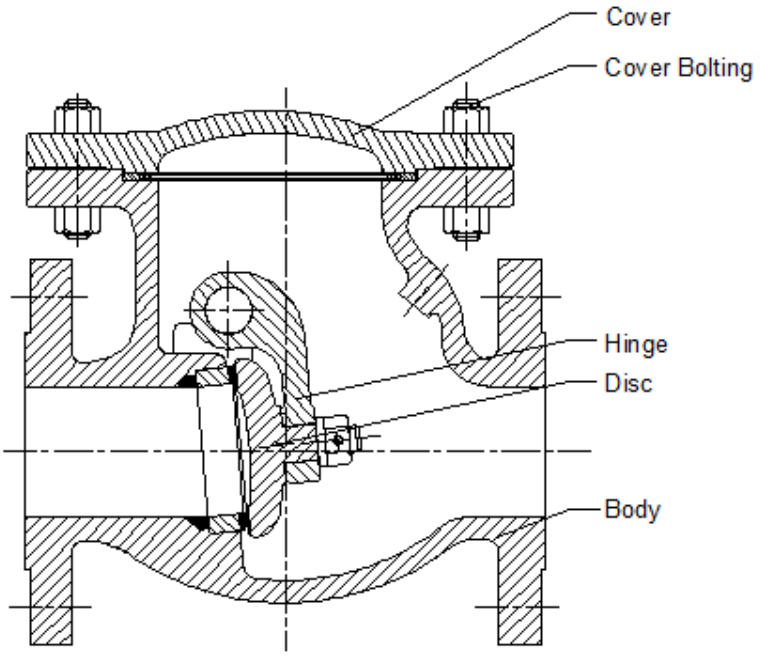

Figure 1 – Construction of a typical L&T Bolted cover Check Valve

4 Identification Plate marking

Every valve is provided with a stainless steel identification plate fixed to the yoke or the bonnet flange. The details on the identification plate are as follows:

LARSEN & TOUBRO LIMITED
COIMBATORE, INDIA

ASME B16.34

TYPE	CHECK	BODY	WCB
SIZE	10"	STEM	CR 13
ASME CL.	300	DISC	CR 13
Pr.@38°C	51.1 bar	SEAT	HF
CAT NO.	LE3B–8	S.NO.	––
BW SCH	40	YEAR	2013
TAG NO.	##		

Valves Shall not be used for more than the pressure indicated with temperature as indicated in identification plate.

5 Storage / Handling

5.1 All valves are shipped with end protectors in place to protect them from mechanical damages from dust or rough handling and these shall be taken off just before installation.

5.2 All valves are shipped in the closed position with a stopper in place to restrict the movement of the disc during shipment and handling.

5.3 Valves shall be stored in a clean dry environment and suitably covered to prevent ingress of moisture and dust.

5.4 All valves shall be handled with slings across the body of the valve.

6 Planning & Responsibilities

6.1 When installing or maintaining valves.

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

6.3 Follow safe systems of works.

6.4 Observe all site health and Safety rules.

6.5 Due to the variety of duties in which this product can be employed, it is the end users responsibility to ensure the compatibility of the media with the material of construction of product for each specific application.

7 Preparation

7.1 The stopper, provided to restrict the movement of the disc during shipment and handling, shall be removed from the valve, before installation.

7.2 When shipped, rust preventive oil is applied on the valve bore and other exposed machined surfaces. This can be removed with a commercial solvent if necessary.

7.3 Check that the valve internals are clean and free of dirt, grit and other extraneous particles.

7.4 In flanged end valves the raised face should be cleaned and free of any damage / score mark.

7.5 In BW end valves ensure that the end preparation is in line with the mating part and free from any damage / nicks etc.

7.6 Ensure that the pipeline has been flushed free of dirt, weld spatter etc before installation.

7.7 Use proper gaskets and bolting as per the standard recommendations for installing the valves on the line.

7.8 For BW end valves, field joints connecting valves & pipes shall be done by qualified welders using approved WPS/PQR to recognized standards like ASME Sec IX.

7.9 All valves are pressure tested at the factory. Should customer desire a test before installation, ensure test pressures are as per the ASME B16.34 section 7 and API 598 requirements. Excessive clamping load shall be applied on body while testing.

Caution:

Ensure the wooden stopper (provided inside the valve to restrict the movement of the disc during shipment and handling) is removed before installation.

8 Installation

a. Swing check valves shall be installed with the flow opening the disc. Arrow mark on the valve casting indicates the correct direction of flow.

b. These check valves can be used in vertical lines or horizontal lines. In vertical lines, they shall be used for upward flow only.

c. Installation of valves shall follow prevailing site standards. The following will also be considered.

8.1 Installation of valves with Flanged End Construction

a. The valve ends and the pipe ends / flanges should be aligned.

b. Pipe work in flanged construction shall have the correct gap to allow for the valve face-to-face and assembled gasket thickness.

c. Flange fasteners for end flanges shall be of the correct size, length and material for the service conditions. As a minimum the material shall be compatible to one used for valve Cover bolting.

d. Assemble all bolts and hand tight. Evenly tighten the bolts at diametrically opposite end to the correct torque required for the specific gasket material.

8.2 Installation of valves with BW End Construction

a. The valve ends and the pipe ends shall be aligned.

b. Pipe work in BW end construction shall also have the correct gap to allow the end-to-end dimension of the valve.

c. Correct welding material shall be used as per approved procedures for welding.

Caution:

Swing check valves must not be installed at the outlet of a reciprocating pump. The pulsating flow will destroy the sealing surfaces and valve internals.

9 Operation

9.1 Self-Activating

Generally, swing check valves are of self-activating type. They open or close depending upon the flow direction and velocity of the fluid. However at high pressures, in order to avoid disc slamming against the seat, dashpots are used.

9.2 Dashpot

The Dashpot arrangement is used to have a cushioning effect on the disc while it is opening or closing. This operation is generally automatic by make use of the line pressure itself, thereby eliminating the requirement for any human intervention.

Linear dashpot is designed to dampen the movement of swing check valve Disc assembly, only during the closing stroke of last 5° to 10°.

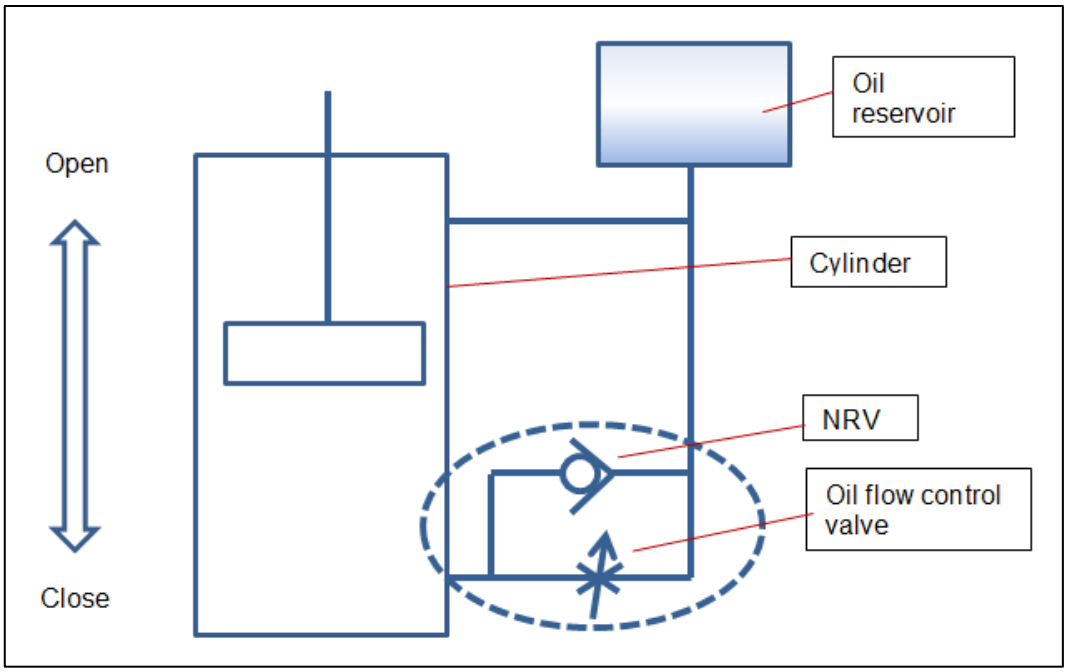

Figure 2 – Circuit diagram of dashpot arrangement

Note:

Swing check valves must not be installed at the outlet of a reciprocating pump. The pulsating flow will destroy the sealing surfaces and valve internals.

10 Inspection & Maintenance

A periodic inspection and maintenance schedule should be established for each valve. The time frame given for the implementation of the schedule should be used as a guide only in establishing routine inspection and maintenance schedules. Exact time periods for performing these procedures cannot be provided due to the unknown nature of the service conditions for each valve.

10.1 Periodic Inspection

A periodic inspection should be performed on each valve on a suitable interval say 6 months. A periodic inspection should include the following:

a) If the Check valve has a Dashpot arrangement, examine the valve Hinge-pin for cleanliness and lubrication.

b) Open and close the valve. The actions should be smooth without any binding of the Hinge-pin through full rotation.

c) If valve is in service and under pressure:

i) Examine the body to cover connection for leakage through the gasket. If leakage is found, tighten the cover nuts evenly in a star pattern until the leakage stops. If the leakage persists, see Clause 10.6.

ii) Examine the End Plate connection (in case of Dashpot arrangement) for leakage through the gasket. If leakage is found, tighten the end plate nuts evenly in a star pattern until the leakage stops. If the leakage persists, see Clause 10.6.

iii) Check the Hinge-pin packing for any leakage during the opening/closing action. If leak is found tighten the gland nuts alternately with no more than a quarter turn on each nut until the leakage stops. If leakage persists, refer Clause 10.6.

iv) Inspect the exterior of the valves for cleanliness. Remove any dirt, grime or oil from the valve body and cover.

10.2 Lubrication

a) Only specified lubricating grease or compound shall be used on valve components

b) Adequate amount of lubrication shall be used avoiding excessive application

c) On the threaded area of the studs and seating face of the hexagon nuts, the following Molycote 1000 or equivalent anit-seize compound shall be used.

d) For valves that use additional arrangement such as Damper / Dashpot/ Actuator the lubricant should be replenished every three months. If extreme service conditions dictate, a more frequent lubrication schedule is recommended.

e) For normal valves, lubrication should be at least once a year.

10.3 Gland Packing Tightening and Leakage Check

Note:

Valves with a dashpot/damper/actuator arrangement have a gland packing arrangement between the body and the hinge pin that needs to be tightened to prevent leakage. The following procedure applies to this type of arrangement.

a) Do not replace the packing during service.

b) When the valve is in service and has been brought to the operating temperature the packing shall be checked for leakage. If leakage occurs, adjust the packing by tightening the gland flange nuts uniformly.

c) During the tightening process give half a turn to every nut

d) If the gland is still leaking even after adequate tightening the valve shall be scheduled for inspection and repair during the next shut down or the line pressure shall be relieved before direct replacement on the line.

10.4 Gland Packing Replacement

> **Caution:**
>
> To prevent injury ensure that all pressure is removed from the valve both

a) Remove the Dashpot /Actuator. Refer **Clause 11** for their removal.

b) Remove the Hex Socket Cap Screws and the Yoke Plate.

c) Check the originally tightened torque of the gland nuts that are seated on the Gland Flange, during operation, and record the value.

d) Remove the gland nuts. Take out the gland flange and gland.

e) Remove the existing or defective packing rings with a sharp tool or packing remover.

> **Caution:**
>
> Do not scratch or score the machined surfaces of the Hinge-Pin or packing

f) Examine the machined surfaces of the Hinge Pin and packing chamber. Remove any scratches, scoring or burrs with emery cloth or hand filing. Clean the hinge pin with a solvent soaked rag.

g) Count the original number of rings.

h) The gland packing ring arrangement is shown in Figure 11. The number of rings used may vary according to the size & class.

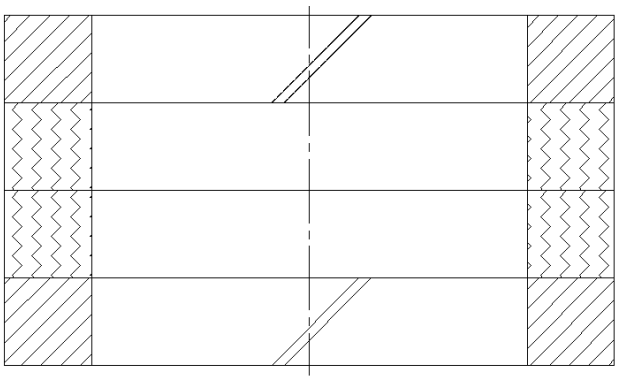

Figure 3 – Packing Arrangement

i) Installing the new packing – Cut each Braided ring at a 45° angle and stagger the joints at 180°; Install rings individually by sliding them over the stem and into the packing chamber.

j) Compress each packing into the packing chamber using the gland before inserting the next.

k) When the packing chamber becomes filled with the packing, reassemble the parts.

l) Tighten the gland nuts to the recorded original tightness. If the current tightened torque is considerably more than the original value, loosen each nut for a quarter turn and recheck the tightening torque.

m) When a valve after packing replacement has been returned to service, inspect the packing area for leakage and ensure adequate sealing using the procedure under Clause 10.3 of this manual.

10.5 Recommendation for dashpot

a) For smooth operation of the dashpot system. It is essential that the Dashpot cylinder and accumulator is filled with oil, without any air entrapment.

b) Whenever the dashpot system is commissioned or whenever the dashpot piping is dismantled for carrying out any servicing or maintenance work, it has to be ensured that the complete system is filled with oil.

c) During regular operation, it is recommended to check oil level once in every six months.

d) If any jerks are noticed during the movement of this cylinder, oil has to be filled in the cylinder as explained above.

e) Oils needs to be replaced once in 2 years, under normal working conditions.

f) Oil recommended - HYDROL 15 / Equivalent

g) Procedure for oil filling in Dashpot

Keep the check valve in closed position. A port is provided in the top of the oil reservoir. Connect the port to a Hydraulic source (Hand pump unit or Hydraulic Power Pack with Hydrol 15 or equivalent). Pump the oil slowly into the system. When the Dashpot top chamber is filled up, refit the plug. Operate the dashpot (by pushing the lever up and down) 2 or 3 times and inspect the oil level by opening the plug, if the oil level is not full repeat the procedure as above and fit the plug.

10.6 General Troubleshooting

Issue	Probable cause	Solution
Leakage through the Hinge Pin packing	a) Gland nuts are loose. b) Gland is binding against the hinge pin or packing chamber wall. c) Inadequate amount of packing rings. d) Packing is hard and dry. e) Packing was not properly cut and staggered. f) Hinge Pin is damaged.	a) Tighten gland nuts. b) Ensure gland is cantered and evenly tightened. c) Install additional packing rings. d) Replace with new packing. e) Replace with new packing. f) Repair or replace as required. g) Use the values in Appendix I Table 1 to tighten the gland studs.
Problems during valve operation	a) Gland packing is exerting excessive force on the hinge pin. b) Hinge Pin is damaged	a) Optimize the torque on gland nuts. b) Examine the Hinge pin for defects. Repair or replace as required.

	c) Internal components may be damaged	c) Disassemble the valve. Inspect and repair as needed.
Seat Leakage	a) Internal components are damaged or have worn out.	a) Disassemble the valve and Inspect internal components.
Leakage through valve body-cover	a) Gasket is damaged or worn out	a) Disassemble the valve and Inspect the gasket
Leakage through the end plate packing.	a) End plate nuts are loose. b) End plate is binding against the support shaft or packing chamber wall. c) Inadequate amount of packing rings. d) Packing is hard and dry. e) Support shaft is damaged.	a) Tighten end plate nuts. b) Ensure end plate is centred and evenly tightened. c) Install additional packing rings. d) Replace with new packing. e) Repair or replace as required.
Dashpot ram is not opening after it is pressed down.	Insufficient accumulator pressure or insufficient oil.	Increase the Accumulator gas pressure & fill oil.

11 Disassembly

The General procedure for Disassembly of L&T Pressure Seal Check valves is explained in this section.

11.1 Removal of Dashpot assembly

a) Remove the Nut & Washer that fastens the lever.

b) Remove the Clevis Pin which clamps the lever with the Y joint.

c) Remove the keys in the lever by rotating the lever upwards

d) Unscrew and remove the Hex Socket Cap Screws between the Yoke Plate and the Pillar.

e) Loosen the Gland Studs and Nuts.

f) Carefully remove damper/Actuator.

g) Then unscrew and remove the Hex Socket Cap Screws of the pillar and remove the yoke plate and pillars.

h) Remove the gland nuts, studs, gland flange and gland.

i) Remove the packing followed by the bush.

11.2 Removal of Dashpot Hinge-pin

a) Remove the Cover and gasket.

b) Remove the End Plate by removing the Studs & nuts.

c) Use the socket head cap screw to remove the Support Shaft.

d) The gasket shall be removed.

e) The Hinge-disc assembly shall be taken upwards.

f) Now the Hinge pin is free to be taken away followed by the bush.

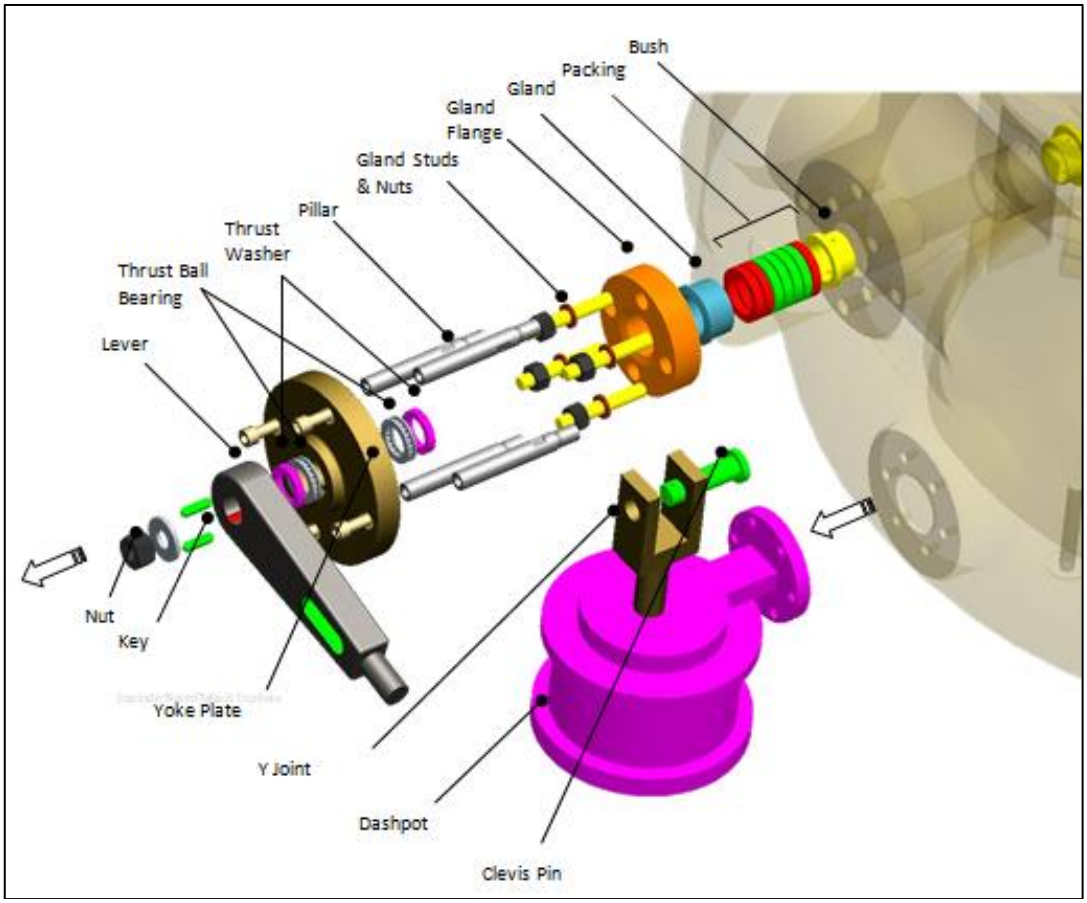

Figure 4 – Removal of dashpot arragement

12. Recommended Spare parts

The importance of planning is the key for good plant operation. Part of that planning involves making sure that replacement parts needed to repair valves is available at the jobsite when required. Developing and implementing a standard valve maintenance plan will quickly pay for itself by eliminating costly downtime, unscheduled outages, etc.

Having parts immediately available from plant storeroom inventory is obviously the best way to accomplish those objectives. Since it is impractical to have every part that might be needed to accomplish a given repair in stock at all times, guidelines for establishing meaningful inventory levels are summarized in the table below:

Sl. No.	Part Name	Qty. of Parts/ Same Size & type of Valve
1	Packing	1/10
2	Gasket	1/10

Packing is applicable only for Special arrangements like Dashpot.

Consult the Recommended Spare Parts list to define the parts to be included in the inventory plan. Select the desired parts and determine those required for proper maintenance of the valve in the plant.

13. How to Order Parts

During normal working hours, call us at the no given in the last page of this manual. To assure the correct parts for your valve, include the following;

1. Valve size & Class
2. Type
3. Catalogue number - including any prefix and/or suffixes
4. L&T Valves GAD no. (if name plate is inaccessible)

This information is located on the valve nameplate. The nameplate is attached to the Body / Bonnet flange. All requests for replacement parts for the valves should be forwarded to the address mentioned in the last page of this manual.

Appendix I

Table 1: Tightening Torque for Gland Bolting

Valve Size	Class	Hinge Pin Dia (mm)	Stud size (in)	Force Acting on Packing (N)	No. of studs	Torque reqd. per stud (Nm)
30"	150	63.5	1	7000	2	18
32"	150	63.5	1	7000	2	18
34"	150	76.2	1	8128	2	21
36"	150	76.2	1	8128	2	21
38"	150	76.2	1	8128	2	21
14"	300	44.45	3/4	9510	2	19
18"	300	44.45	3/4	9510	2	19
20"	300	44.45	3/4	9510	2	19
24"	300	57.15	7/8	16256	2	37
28"	300	63.5	1	18138	2	47
14"	600	44.45	3/4	18850	2	36
16"	600	44.45	3/4	18850	2	36
18"	600	57.15	7/8	32050	2	72
14"	900	44.45	3/4	28192	2	54
16"	900	44.45	3/4	28192	2	54
24"	2500	63.5	1 1/4	149240	2	474
16"	3100	50.8	7/8	108080	4	121
18"	3100	50.8	7/8	108080	4	121

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