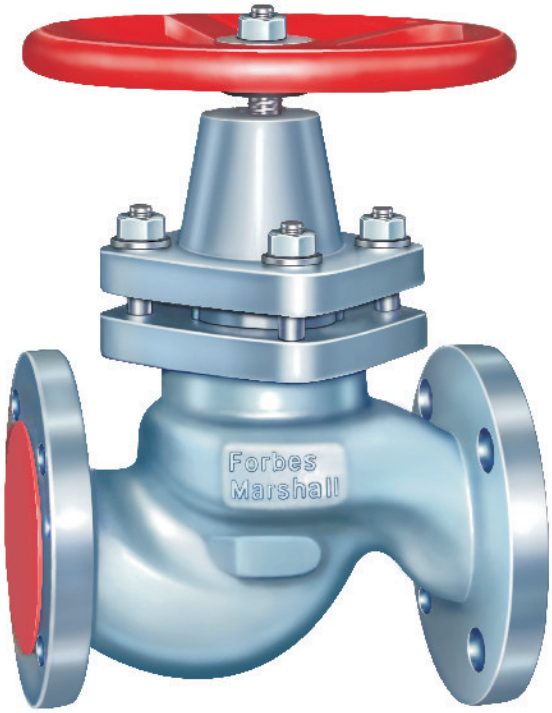
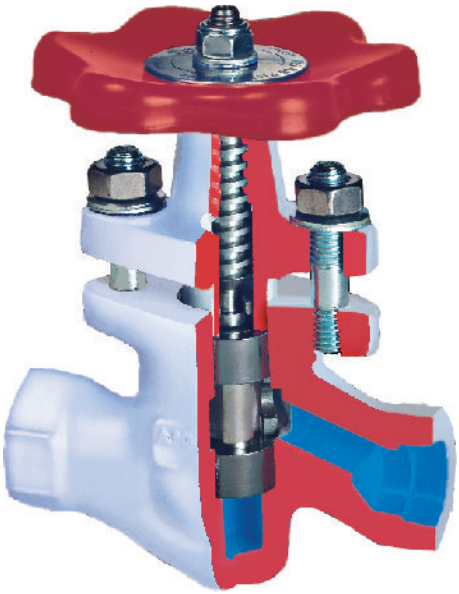
Forbes Marshall

Trusted Partners.
Innovative Solutions.



# Piston Valves

## Operation and Maintenance Manual

Energy Conservation | Environment | Process Efficiency

www.forbesmarshall.com

# Table of Contents

What's Inside

1.1 Description

1.2 Size & pipe connection

1.3 Limiting conditions

1.4 Installing the valve

1.5 Operation

1.6 Safety information

1.7 Maintenance

1.8 How to use extracting tool

1.9 How to use inserting tool

2.0 How to order spares

1.1 Description :

Piston valves provide perfect tightness and durable stability on different mediums such as steam, superheated steam, heat transfer fluid, alkalies etc.

1.2 Size and Pipe Connections :

Screwed BSPT/NPT ends.

Socket weld ends.

50NB/65NB/80NB/100NB/125NB/150NB/200NB (2",2½",3", 4",5",6",8")

Flange type : ANSI 150

Flange type : ANSI 300

Limiting Conditions as per IBR norms :

For 15,20,25 & 40NB (½",¾",1",1½) socket weld ends.

Maximum operating pressure : 78 bar g (1131.29 psig)

Maximum operating temperature : 425 C (797ºF)

Maximum hydraulic test pressure :156 bar g (2262.58 psig)

For 15,20,& 25NB (½",¾",1") screwed ends.

Maximum operating pressure : 78 bar g (1131.29 psig)

Maximum operating temperature : 425 C (797ºF)

Maximum hydraulic test pressure : 156 bar g (2262.58 psig)

For 32 - 40 NB (1¼,1½) screwed ends.

Maximum operating pressure : 41.5 bar g (601.90 psig)

Maximum operating temperature : 425 C (797ºF)

Maximum hydraulic test pressure : 83 bar g (1203.81 psig)

1.3 Limiting Conditions :

For 50NB/65NB/80NB/100NB/125NB/150NB/200NB (2",2½",3", 4",5",6",8")

Body design conditions : ANSI 300 Flanged ends

Maximum allowable pressure : 51 bar g (739.69 psig) @ 38 C (100.4ºF)

Maximum operating Pressure : 41.5 bar g (601.90 psig) @ 253 C (487.4ºF)

Maximum operating temperature : 425 C (797ºF) @ 28.8 bar g (417.70 psig)

Maximum hydraulic test Pressure: 83 bar g (1203.81 psig)

Body design conditions : ANSI 150 Flanged ends

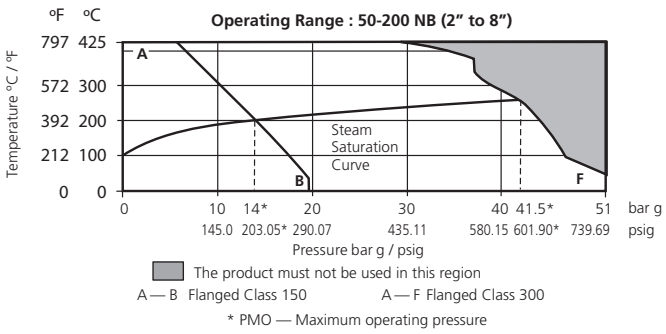
Maximum allowable pressure : 19.6 bar g (284.27 psig) @ 38 C (100.4ºF)

Maximum operating Pressure : 14 bar g (203.05 psig) @ 197 C (386.6ºF)

Maximum operating temperature : 425 C (797ºF) @ 5.5 bar g (79.77 psig)

Maximum hydraulic test Pressure : 28 bar g (406.1 psig)

Operating Range : 50-200 NB (2" to 8")




15/20/25 NB (½",¾",1")

30/40 NB (1¼,1½)

50 NB (2")

65-200 NB (2½-8")

On unpacking, check all the materials for any damages and suitability and ensure material to be as per packing list.

1.4 Installing the Valve :

Please ensure before installing the valve that the line is clear from all foreign particles such as welding fluxes, metals burrs and dirt. The valve should be fitted either in Vertical or Horizontal line with inlet as per the arrow direction on the valve body.

1.5 Operation :

To open the valve turn the hand wheel till it stops at the top and to close the valve turn hand wheel till it touches the bonnet. If any leakage is observed through the gland, tighten gland nut till leakage stops, if any leakage is observed between the body, bonnet face & outlet tighten opposite Nuts equally half or one turn until leakage stops. Never tighten nuts when valve is in open condition. Do not use Valve for throttling. It should be either fully open or fully close.

1.6 Safety Information :

Hazard analysis

Warning

The graphite sealing rings contain thin stainless steel support rings which may cause physical injury if not handled and disposed of carefully.

Welding:

a) Keep your head out of the fumes.

b) Use enough ventilation, exhaust at the arc or both, to keep fumes and gases away from your breathing zone and the general area.

c) Wear correct eye, ear and body protection

d) Do not touch live electrical parts

Safe operation of this product can only be guaranteed if it is properly installed, commissioned, used and maintained by qualified personnel in compliance with the User Manual. General installation and safety instructions for pipeline and plant construction, as well as the proper use of tools and safety equipment must also be complied with.

1.6.1 Intended use

Referring to the User Manual, Nameplate & Technical Instruction Sheet, check that the product is suitable for the intended use/application.

i) The products have been specifically designed for use on steam, air or water / condensate. Use on other fluids may be possible but, if this contemplated, Forbes Marshall should be contacted to confirm the suitability of the product for the application being considered.

ii) Check material suitability, pressure and temperature and their maximum and minimum values. If the maximum operating limits of the product are lower than those of the system in which it is being fitted, or if malfunction of the product could result in a dangerous over pressure or over-temperature occurrence, ensure a safety device is included in the system to prevent such over-limit situations.

Iii) Determine the correct installation situation and direction of fluid flow.

iv) Forbes Marshall products are not intended to

withstand external stresses that may be induced by any system to which they are fitted. It is the responsibility of the installer to consider these stresses and take adequate precautions to minimize them.

1.6.2 Access

Ensure safe access and if necessary a safe working platform (suitably guarded) before attempting to work on the product. Arrange suitable lifting gear if required.

1.6.3 Lighting

Ensure adequate lighting, particularly where detailed or intricate work is required.

1.6.4 Hazardous liquids or gases

Consider what is in the pipeline or what may have been in the pipeline at some previous time. Consider: flammable materials, substances hazardous to health, extremes of temperature in the pipeline

1.6.5 Hazardous environment around the product

Consider: explosion risk areas, lack of oxygen (e.g. tanks, pits), dangerous gases, extremes of temperature, hot surfaces, fire hazard (e.g. during welding), excessive noise, moving machinery.

1.6.6 The system

Consider the effect on the complete system of the work proposed. Will any proposed action (e.g. closing isolation valves, electrical isolation) put any other part of the system or any personnel at risk? Dangers might include isolation of vents or protective devices or the rendering ineffective of controls or alarms. Ensure isolation valves are turned on and off in a gradual way to avoid system shocks.

1.6.7 Pressure systems

Ensure that any pressure is isolated and safely vented to atmospheric pressure. Consider double isolation (double block and bleed) and the locking or labeling of closed valves. Do not assume that the system has depressurized even when the pressure gauge indicates zero.

1.6.8 Temperature

Allow time for temperature to normalize after isolation to avoid danger of burns. Consider whether protective clothing (including safety glasses) is required.

1.6.9 Tools and consumables

Before starting work ensure that you have suitable tools and / or consumables available. Use only genuine Forbes Marshall replacement parts.

1.6.10 Protective clothing

Consider whether you and /or others in the vicinity require any protective clothing to protect against the hazards of, for example, chemicals, high /low temperature, radiation, noise, falling objects, and dangers to eyes and face.

1.6.11 Permits to work

All work must be carried out or be supervised by a suitably competent person. Installation and operating personnel should be trained in the correct use of the product according to the User Manual. Where a formal 'permit to work' system is in force it must be complied with. Where there is no such system, it is recommended that a responsible person should know what work is going on and, where necessary, arrange to have an assistant whose primary responsibility is safety. Display 'warning notices' If necessary.

1.6.12 Handling

Manual handling of large and /or heavy products may present a risk of injury. Lifting, pushing, pulling, carrying or supporting a load by bodily force can cause injury particularly to the back. You are advised to assess the risks taking into account the task, the individual, the load and the working environment and use the appropriate handling method depending on

the circumstances of the work being done.

1.6.13 Residual hazards

In normal use, the external surface of the product may be very hot. If used at the maximum permitted operating conditions, the surface temperature may reach temperatures in excess of 425°C (797°F). Many products are not self-draining. Take due care when dismantling or removing the product from an installation.

1.6.14 Freezing

Provision must be made to protect products which are not self-draining against frost damage In environments where they may be exposed to temperatures below freezing point.

1.6.15 Safety information

The graphite stem sealing rings contain thin stainless steel support rings which may cause physical injury if not handled and disposed of carefully.

1.6.16 Disposal

Unless otherwise stated in the User Manual, this product is recyclable and no ecological hazard is anticipated with its disposal providing due care is taken.

1.6.17 Returning products

Customers and stockiest are reminded that while returning products to Forbes Marshall they must provide information on any hazards and the precautions to be taken due to contamination residues or mechanical damage.

1.7 Maintenance :

For 15-50NB (½"-2")

Maintenance of Piston valve is very easy and can be done when valve is in position and not in service. If any leakage is observed through the Bonnet hole tighten all nuts equally (refer 1.5). If leakage still does not stop then follow the procedure mentioned below. Keep Valve fully open remove nuts (7) & Belliville Washer (8) turn handwheel in clockwise direction till it touches the bonnet. Pull hand wheel carefully along with Bonnet to remove piston from Body. Avoid any damage to piston. Clean Piston with Soft Cloth. Remove top Sealing Rings (9) with the help of extracting tool, Remove Spacer (10) (which is free in the body) Remove Bottom sealing rings (9) with the help of Extracting tool. Replace new set of Bottom sealing rings Spacer and Top sealing rings stack with the inserting tool. Align piston with the Top sealing ring and push gently. Ensure that the belleville washers are placed properly in cup form and tighten all nuts with equal pressure when the Piston is at the end of bottom sealing rings. Please refer Page No. 8-11 for Extracting tool & inserting tool sealing ring stack & page 12 for component details. Maintain body and bonnet gap as per table 1

For 65-200NB (2½"-8")

Maintenance of Piston valve is very easy and can be done when valve is in position and not in service. If any leakage is observed through the gland tighten gland nut to stop the leakage through gland and to stop the leakage at outlet or between the body and the bonnet face tighten all nuts equally as explained earlier. If Leakage yet does not stop then follow the procedure mentioned below.

Keep Valve fully open remove nuts & Belleville Washer turn handwheel in clockwise direction till it touches the bonnet. Pull hand wheel carefully along with Bonnet to remove piston from Body. In case the bonnet assembly does not come out of the body use tapped hole for removing bonnet assembly as shown in Fig 1.Avoid any damage to piston. Clean Piston with Soft Cloth. Remove top sealing stack with the help of extracting tool, Remove Spacer (which is free in the body). Remove Bottom sealing stack with the help of extracting tool. Replace Bottom sealing stack, place spacer and replace top sealing stack with the inserting tool.

Insert Bonnet sealing ring (Graphite) carefully. Place Bonnet piston spindle sub assembly on clean table. To replace gland sealing rings remove nyloc nut and handwheel. Hold bonnet by hand and remove spindle-piston sub assembly by rotating spindle in clock wise direction with the help of screw driver. Remove gland nut and extract gland sealing stack with extracting tool. Insert new gland sealing stack with the inserting tool. Screw gland nut in the bonnet. Place bonnet on spindle piston sub assembly and rotate spindle in anticlockwise direction till it stops.

Align Bonnet piston sub assembly in the Top sealing stack and push it gently. Place the handwheel on the square of spindle, Place name plate and nyloc nut. Place Beleville washer in the cup form as shown in the diagram and hand tighten all the nuts. Now rotate handwheel in clockwise direction till it touches the bonnet. (Close position of the valve). Tighten all the nuts with equal pressure. Open isolation valve, if any leakage is observed through the gland tighten gland nut. In case leakage is observed at the outlet or between body face and bonnet tighten opposite nut equally half or one turn as explained earlier.

Please refer Page No. 8-11 for Extracting tool & inserting tool sealing ring stack & page 12 component details. For Lubrication use Molykote M30 lubricating oil. Lubricate frequently through spindle threads ,split nut and stem. Operate once or twice after lubrication.

1.8 How to use Extracting tool :

Insert extracting tool in the body dig extracting tool in the sealing rings & lever up to remove Top Sealing Stack as shown in Page No. 8-11. Remove spacer (which is free) from the body. Repeat the same process to remove bottom sealing Stack, as explained above.

1.9 How to use Inserting tool :

Insert Sealing Ring Stack on the inserting tool as shown in Page No. 8-11 & place the inserting tool inside the body perpendicular to the face. Ensure that sealing ring Stack is properly guided in the body bore. Now use a Mallet to push the inserting tool inside the body to place the bottom sealing stack. After placing bottom sealing stack, remove inserting tool from the body, place spacer inside the body (which is free in the body). Now repeat the same process to insert top sealing ring stack with the help of inserting tool.

**Gap between Body & bonnet face**
**TABLE 1**

| SIZE | inches | GAP(mm) |
|---|---|---|
| 15/20/25NB | ½,¾,1 | 6mm (0.23") |
| 32/40/50NB | 1¼,1½,2 | 9.5mm (0.37") |
| 65NB | 2½ | 17mm (0.66") |
| 80NB | 3 | 18mm (0.70") |
| 100/125NB | 4,5 | 20mm (0.78") |
| 150NB | 6 | 26mm (1.02") |
| 200NB | 8 | 30mm (1.18") |

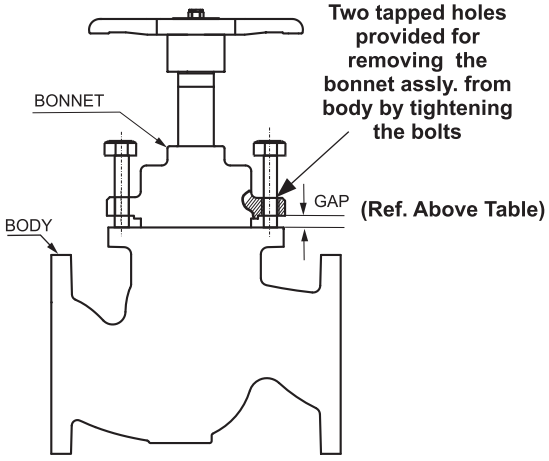
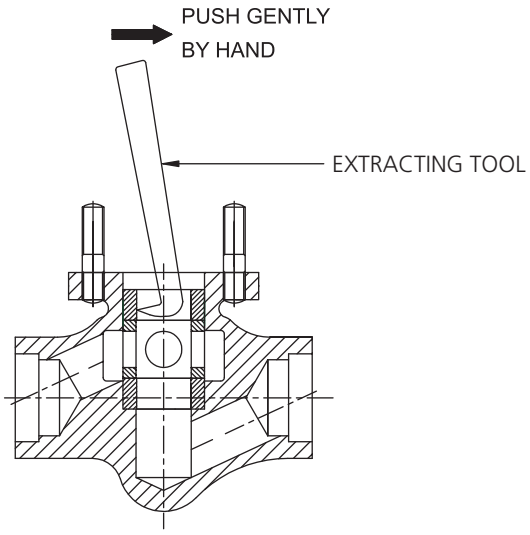


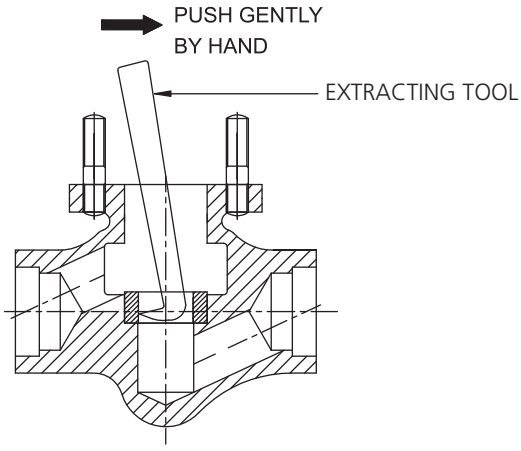

**Fig 1**

| SIZE | inches | TAPPING |
|---|---|---|
| 65/80/100/125NB | 2½,3,4,5 | M12 (0.472") |
| 150/200NB | 6,8 | M16 (0.629") |

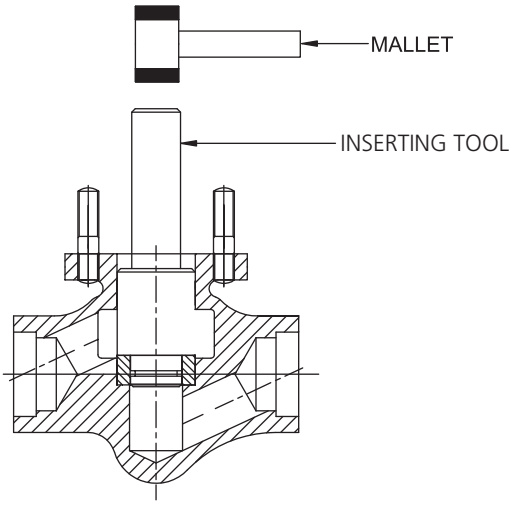
## For 15-40NB (½"-1½")



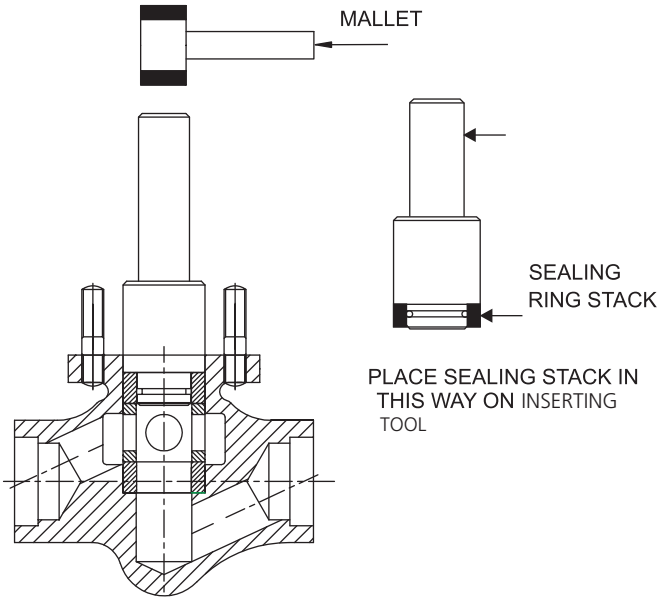

1 EXTRACT TOP SEALING RING STACK FIRST




2 REMOVE SPACER WHICH IS FREE IN THE BODY
EXTRACT BOTTOM SEALING RING STACK .

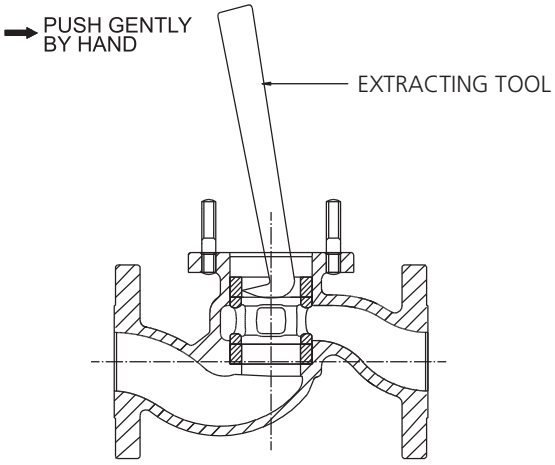



3 INSERT BOTTOM SEALING RING STACK FIRST

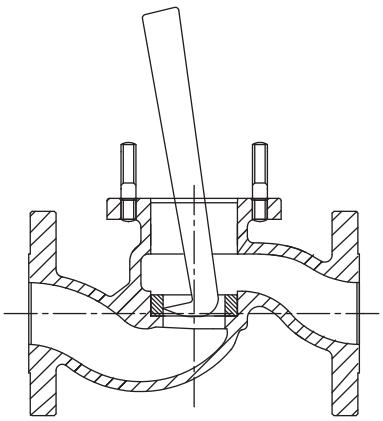



4 PLACE SPACER WHICH IS FREE IN THE BODY.
INSERT TOP SEALING RING STACK

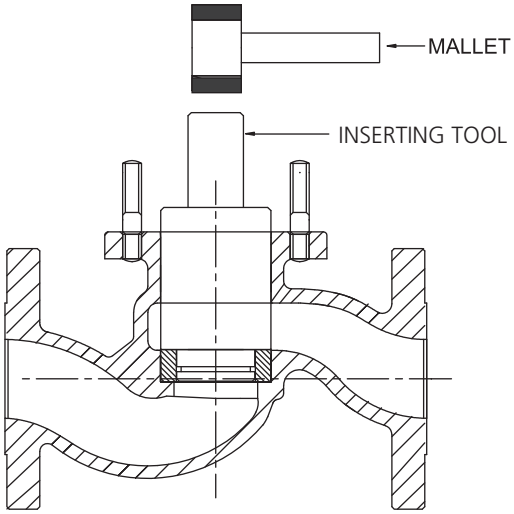
## For 50NB (2”)



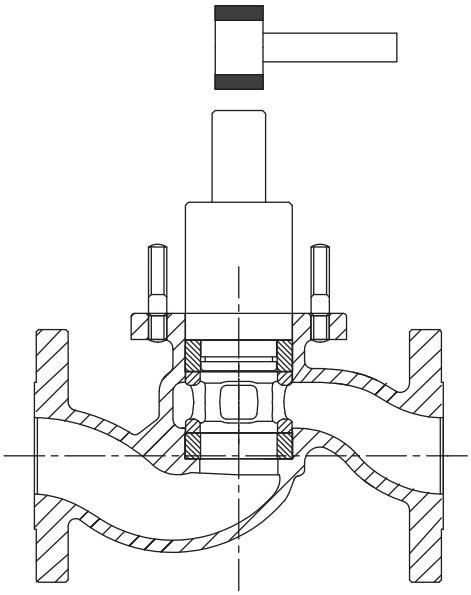

1 EXTRACT TOP SEALING RING STACK FIRST



2 REMOVE SPACER WHICH IS FREE IN THE BODY
EXTRACT BOTTOM SEALING RING STACK.

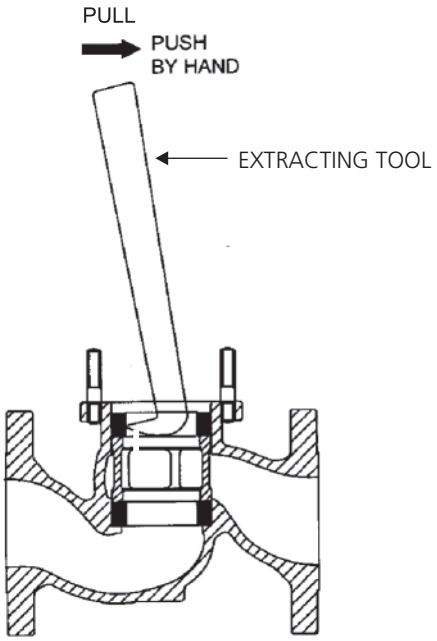



3 INSERT BOTTOM SEALING RING STACK FIRST

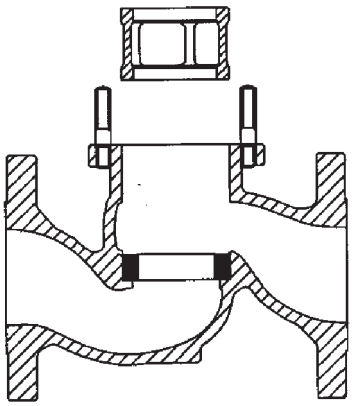


4 PLACE SPACER WHICH IS FREE IN THE BODY.
INSERT TOP SEALING RING STACK

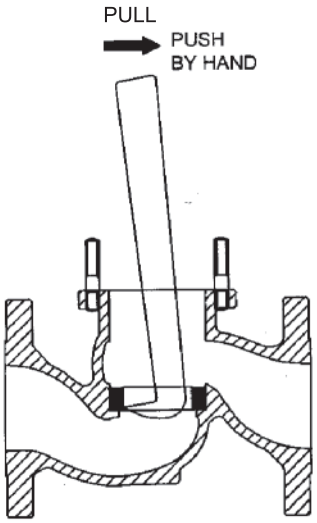
## For 65-200NB (2½”-8”)



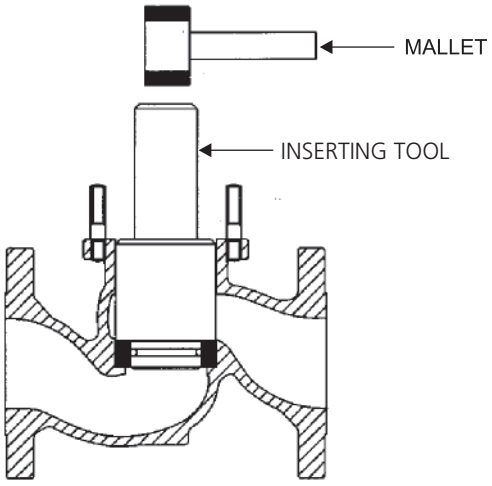

1 EXTRACT TOP SEALING STACK FIRST



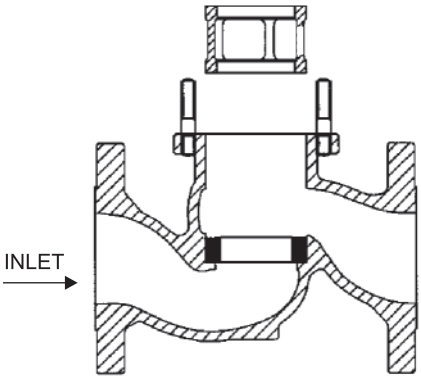
2 REMOVE SPACER (WHICH IS FREE) FROM THE BODY



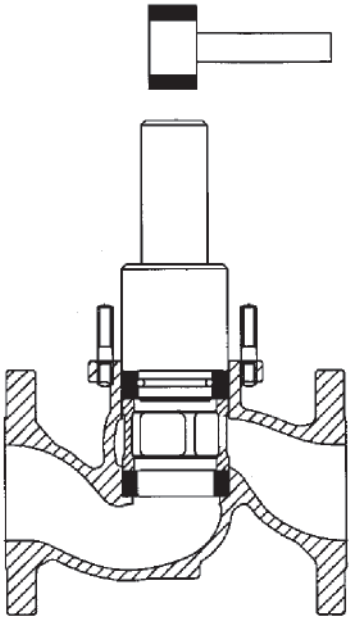

3 EXTRACT BOTTOM SEALING STACK



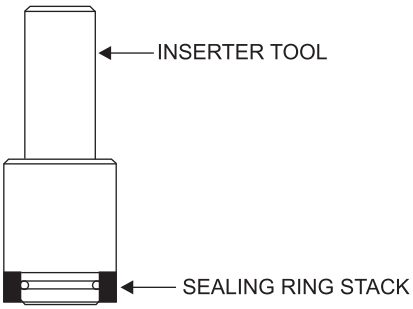

1 INSERT BOTTOM SEALING STACK



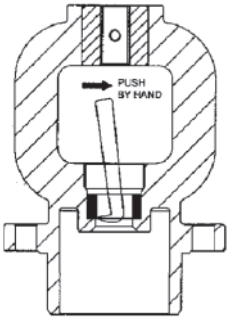

(2) INSERT SPACER (WHICH IS FREE) IN THE BODY KEEPING BLIND WALL OF SPACER AT THE INLET SIDE OF THE VALVE



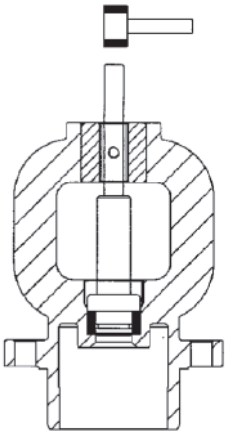
(3) INSERT TOP SEALING STACK




(1) PLACE SEALING STACK IN THIS WAY ON INSERTER TOOL

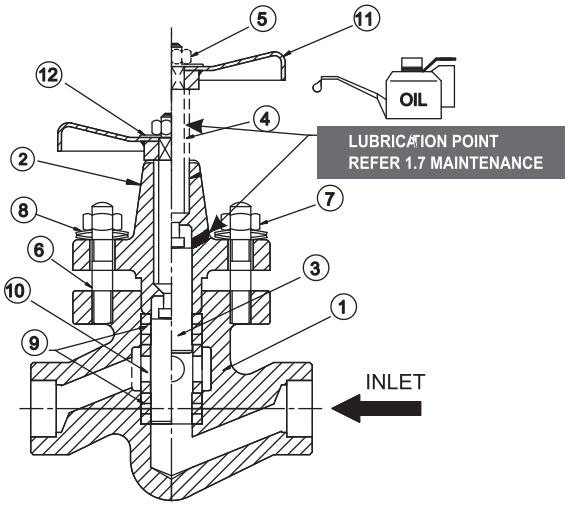



(2) EXTRACT GLAND SEALING STACK



(3) INSERT GLAND SEALING STACK

# COMPONENT LIST AND LUBRICATION DETAILS



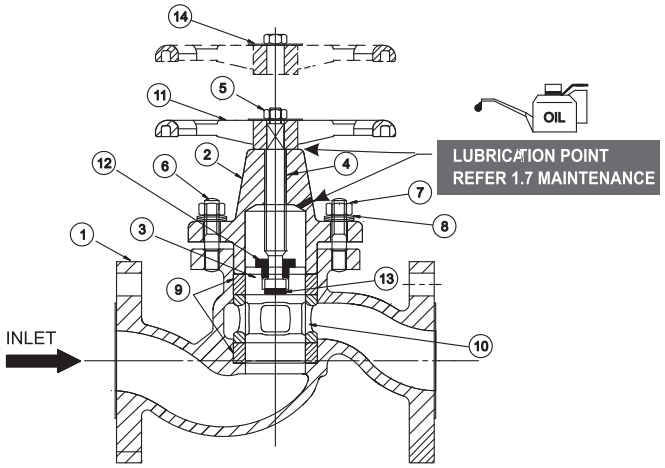

**15-25 NB (½"-1") Piston Valve**
**Always open & close Valve fully**
**Do not use Valve Key**

### Description of Component

| No. | Part |
|---|---|
| 1 | Body |
| 2 | Bonnet |
| 3 | Piston |
| 4 | Spindle |
| 5 | Nyloc Nut |
| 6 | Stud |
| 7 | Nut |
| 8 | B. Washer |
| 9 | Sealing Rings |
| 10 | Spacer |
| 11 | Handwheel |
| 12 | Name Plate |

### Recommended tightening torques for bonnet nuts

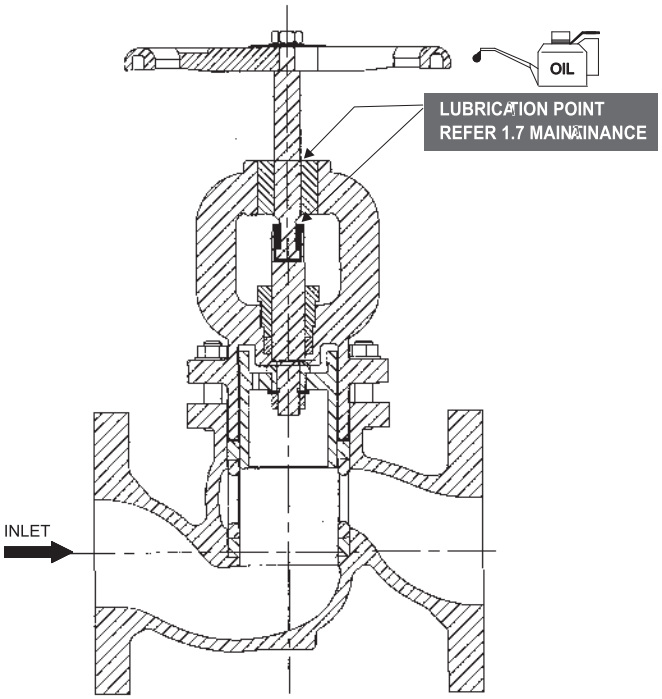
| SIZE | TORQUE |
|---|---|
| 15NB (½") | 3-5 Nm (26.55-44.25 Lbsf inch) |
| 20NB (¾") | |
| 25NB (1") | 5-7 Nm (44.25-61.95 Lbsf inch) |




**40-50 NB (1½"-2") Piston Valve**
**Always open & close Valve fully**
**Do not use Valve Key**

### Description of Component 32-50NB (1¼"-2")

| No. | Part |
|---|---|
| 1 | Body |
| 2 | Bonnet |
| 3 | Piston |
| 4 | Spindle |
| 5 | Nut |
| 6 | Stud |
| 7 | Nut |
| 8 | B. Washer |
| 9 | Sealing Rings |
| 10 | Spacer |
| 11 | Handwheel |
| 12 | Split Nut |
| 13 | Thrust Plate |
| 14 | Name plate |

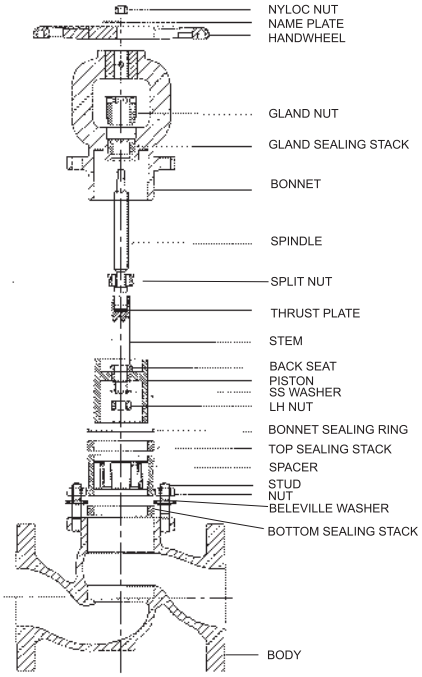



## OPEN POSITION
**(Always open valve fully)**

## 65-200 NB (2½"-8") Piston Valve
## Always open & close Valve fully
## Do not use Valve Key

### Recommended tightening torques for bonnet nuts

| SIZE | TORQUE |
|---|---|
| 65NB (2½") | 50-60 Nm (442.53-531.04 Lbsf inch) |
| 80NB (3") | |
| 100NB (4") | 70-80 Nm (619.55-708.05 Lbsf inch) |
| 125NB (5") | |
| 150NB (6") | 80-90 Nm (708.05-796.56 Lbsf inch) |
| 200NB (8") | |




**65-200NB (2½"-8")**
**EXPLODED VIEW**

**How to order spares**

Always order spares by using the description & P.C. No. given below & stating size

**15-50NB (½"-2")** Spare kit contains : Sealing ring stack
**65-200NB (2½"-8")** spare kit contains : Body sealing ring stack
Bonnet sealing ring
Gland sealing ring stack

Part codes for spares

| Sl. | Description | Part Code No. |
|---|---|---|
| 1 | 15/20 NB (2½",¾") Spare Kit | F3A2017591 |
| 2. | 25 NB (1") Spare Kit | F3A2017592 |
| 3. | 32/40NB (1¼",1½") Spare Kit | F3A2017678 |
| 4. | 50 NB (2") Spare Kit | F3A2017679 |
| 5 | 65 NB (2½") Spare Kit | F3A2019470 |
| 6. | 80 NB (3") Spare Kit | F3A2017740 |
| 7 | 100 NB (4") Spare Kit | F3A2017741 |
| 8 | 125 NB (5") Spare Kit | F3A2019421 |
| 9 | 150 NB (6") Spare Kit | F3A2017742 |
| 10 | 200 NB (8") Spare Kit | F3A2017743 |

Use only genuine Forbes Marshall components. Please call our local representative or Head office as per the contact details given.

# NOTES

# NOTES

Your local Forbes Marshall representative would be happy to provide you with further information and support.

Forbes Marshall

Trusted Partners.
Innovative Solutions.

## OFFICES AND REPRESENTATIVES

### AMERICA

**USA**
Forbes Marshall Inc. USA
480,California Avenue,
Suite 102,P.O. Box 60670
Palo Alto CA 94306
California,USA
Tel: +1 650 327 4227/ +1 650 321 4224
Fax: +1 650 327 4127/ +1 650 321 4454
Email: forbesmarshall@ix.netcom.com

Allagash International, Inc.
1000 Riverside Street,
Portland, Me. 04103
Tel: + 1 207-781-8831
Fax: + 1 207-781-8830

**CANADA**
Forbes Marshall Canada Inc.
191 Attwell Dr., Unit #2
Etobicoke, ON
M9W 5Z2
Canada
Tel: +416.679.0881
Fax: +416.679.0882
Email: canada@forbesmarshall.com

**COLOMBIA**
Forbes Marshall Colombia
CRA 58 # 167B-19
INT: 1 Portales Del Norte, Bogota
Tel: +57 316 721 1510
Email: fsforbes@gmail.com

### SOUTH ASIA

**INDIA**
Forbes Marshall Pvt. Ltd.
P.O. BOX # 29 Mumbai Pune Road,
Kasarwadi, Pune-411034
Tel: +91 (0) 20 39858555/
+91 (0) 20 27145595
Fax: + 91 (0) 20 27147413
Email: exp@forbesmarshall.com

**BANGLADESH**
Forbes Marshall Pvt. Ltd.
Rupsha Tower, C-3, 3rd Floor
7, Kemal Attaturk Avenue,
Road#17, Behind Brac Bank,
Dhaka - Bangladesh
Tel: +88 028811501/+88 01711529502
Email: bangladesh@forbesmarshall.com
rrnair@forbesmarshall.com

**SRI LANKA**
Forbes Marshall Lanka Pvt. Ltd.
12/5A, 1/1, Robert Gunawardane
Mawatha Kirulapone, Colombo-06.
Sri Lanka.
Tel: +94 11 2512997/4511127/28
Fax: + 94 11 4511128
Email: fmlanka@forbesmarshall.com,
wfernando@forbesmarshall.com

**NEPAL**
Ekta Engineering and Marketing Pvt. Ltd.
402,4th Floor, Bagmati Chamber,
Milan Marg, Teku Road,Tripureshwor,
Kathmandu, Nepal
Mob: +977 9851022039 / 9851036530
Tel: +977 (1)4247676/4238131
Email: ekta@ecomail.com.np

### ASIA PACIFIC

**THAILAND**
Forbes Marshall Pvt. Ltd.
Room No.403,4th Floor, House No.567,
Seri 6 Road Soi 51, Rama 9 Road,
Suan Luan, Bangkok 10250.Thailand.
Tel: +66 2 7203483/4 +66-81-9020690
Fax: +66 2 7203483,9435500
Email: thailand@forbesmarshall.com
vphillip@ksc.th.com

**INDONESIA**
Forbes Marshall Pvt. Ltd.
NC 8/11, Ji Lilin Raya, Kelapa Gading,
Jakarta ( Uttara), Indonesia
Tel: +62 8 15199 17178
Email: hbhat@forbesmarshall.com

**MALAYSIA**
Forbes Marshall Pvt. Limited
Tel: +62 8 15199 17178
Fax: +62 21 4530773
Email: hbhat@forbesmarshall.com

**VIETNAM**
Email: vphillip@ksc.th.com
Tel: +66 81 90 20690

**SOUTH KOREA**
Shin Woo F.A Co., Ltd.
#510 Leaders Tower
60-15 Gasan-Dong,M Geumchun-Gu,
Seoul Korea (153-801)
Mob: ++8211 732-7695
Tel: ++822 2026-6364 (Direct)
Fax : ++822 2026-6363
Email: shinwoofa@empal.com/
forbeskorea@empal.com

**SINGAPORE**
Forbes Marshall Pvt. Limited
Tel: +62 8 15199 17178
Email: hbhat@forbesmarshall.com

### AFRICA

**KENYA**
Forbes Marshall Pvt. Ltd.
PO Box - 58338-00200 – Nairobi,
Kenya
Tel: +254 734 763 913 /
+254 725 490 866
Email: africa@forbesmarshall.com

**ETHIOPIA**
Rapture Import & Export PLC
Kolfe Keranio Sub-City, Kebele13/14,
House Nr.624, P.O. Box 28447/1000
Addis Ababa, Ethiopia
Tel: +251-911-145524
Fax: +251-115-511479
Email: Biruk.Oasis@gmail.com

### MIDDLE EAST ASIA

**U.A.E ( Dubai)**
Forbes Marshall Pvt.Ltd.
P.B.No. 9608, Sharjah Airport Free Zone,
Sharjah UAE.
Mob: + (971) 50 4949084 + (971) 55 5222623
Email: : csequeira@forbesmarshall.com /
sequeira.cedric@gmail.com /
ctony@forbesmarshall.com

**IRAN:**
Forbes Marshall Pvt Ltd.
Unit 23. No.2, 18th Street, Golfam
Building, Naft Street, 4 Divari, End of
Ashrafi Esfehani, Pounak Tehran, Iran
Tel: +98 912 1304598
Email: m.m.rezaee@gmail.com /
mmrezaee@forbesmarshall.com

**EGYPT**
System Technique
17 El Mahrovky Street, Off Aswan Square,
Mohandseen, Cairo,
P.O.Box 141 El-Gezirah, Egypt
Mob: +201 68802964
Ph No - +202 3036935/52/81, +202 3045637
Fax: + 202 3036897
Email: mchakraborty@forbesmarshall.com