Installation and Maintenance Manual

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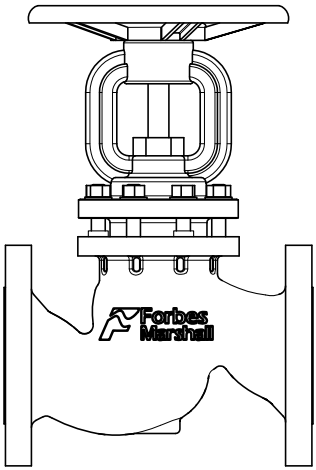
Piston Valve

PSVAL



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Energy Conservation I Environment I Process Efficiency

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Table of Contents

PLEASE NOTE - Throughout this manual this cautionary symbol is used to describe a potential damage or injury that might occur if the safety considerations are overlooked. This symbol denotes CAUTION, WARNING or DANGER.

1. Preface:

This manual is intended for anyone using, commissioning, servicing, or disposing the below mentioned products safely and efficiently.

Piston Valve [PSVAL]

Size: DN15 (½") / DN20 (¾") / DN25 (1") / DN32 (1 ¼") / DN40 (1 ½") / DN50 (2") / DN65 (2 ½") / DN80 (3") / DN100 (4") / DN125 (5") / DN150 (6") / DN200 (8")

PLEASE NOTE:

Throughout this manual the following cautionary symbol is used to describe a potential damage or injury that might occur if the safety considerations are overlooked.

2. Important Safety Notes:

Read this section carefully before installing/operating/maintaining the product. The precautions listed in this manual are provided for personnel and equipment safety. Furthermore, Forbes Marshall accepts no responsibility for accidents or damage occurring as a result of failure to observe these precautions. Note that the product is designed to perform for non-contaminated fluids only. A contamination in the form of chemical, foreign particle etc. can lead to problem with product performance and life of the product.

If these products in compliance with the operating instructions are, properly installed, commissioned, maintained and installed by qualified personnel (refer Section 2.7) the safety operations of these products can be guaranteed. General instructions for proper use of tools and safety of equipments, pipeline and plant construction must also be complied with.

2.1 Intended use:

Check if the product is suitable for intended use/ application by referring to the installation and maintenance instructions, name plates and technical information sheets.

i) The product is suitable for use as defined in the technical information sheet. In case the need arises to use the product on any other fluid please contact Forbes Marshall for assistance.

ii) Check for the suitability in conformance to the limiting conditions specified in technical information sheet of the product.

iii) The correct installation and direction of fluid flow has to be determined.

iv) Forbes Marshall products are not intended to resist external stresses, hence necessary precautions to be taken to minimize the same.

2.2 Accessibility and Lighting:

Safe accessibility and working conditions are to be ensured prior to working on the product.

2.3 Hazardous environment and media:

The product has to be protected from hazardous environment and check to ensure that no hazardous liquids or gases pass through the product.

2.4 Depressurizing of systems and normalizing of temperature:

Ensure isolation and safety venting of any pressure to the atmospheric pressure. Even if the pressure gauge indicates zero, do not make an assumption that the system has been depressurized. To avoid danger of burns allow temperature to normalize after isolation.

2.5 Tools and consumables:

Ensure you have appropriate tools and / or consumables available before starting the work. Use of original Forbes Marshall replacement parts is recommended.

2.6 Protective clothing:

Consider for the requirement of any protective clothing for you/ or others in the vicinity for protection against hazards of temperature (high or low), chemicals, radiation, dangers to eyes and face, noise and falling objects

2.7 Permits to work:

All work to be carried out under supervision of a competent person. Training should be imparted to operating personnel on correct usage of product as per Installation and Maintenance instruction. "Permit to work" to be complied with (wherever applicable), in case of absence of this system a responsible person should have complete information and knowledge on what work is going on and where required, arrange to have an assistant with his primary goal and responsibility being safety. "Warning Notices" should be posted wherever necessary.

2.8 Handling:

There is a risk of injury if heavy products are handled manually. Analyze the risk and use appropriate handling method by taking into consideration the task, individual, the working environment and the load.

2.9 Freezing:

Provision should be made to protect systems which are not self-draining, against frost damage (in environment where they may be exposed to temperatures below freezing point) to be made.

2.10 Returning products:

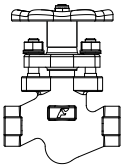
Customers and Stockist are reminded that, when returning products to Forbes Marshall they must provide information on any hazards and the precautions to be taken due to contamination residues or mechanical damage which may present a health, safety or environmental risk.

This information must be provided in writing including Health and Safety data sheets relating to any substances identified as hazardous or potentially hazardous.

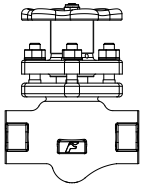
3. Brief Product Information:

3.1 Description:

Forbes Marshall Piston Valves, PSVAL, provide perfect tightness and durable stability on different media such as steam, superheated steam, heat transfer fluid, water and compressed air.



DN 15 / 20



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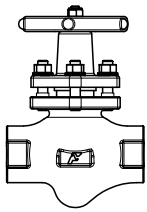
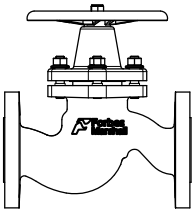
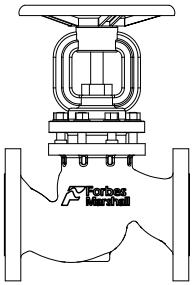


DN 32 / 40



DN 50



DN 65 to 200

Figure 1: Piston Valve

3.2 Sizes and Pipe Connection:

1. DN 15 / 20 / 25 / 32 / 40
   Screwed BSPT / NPT, socket weld ends, flanged to class 150 / 300 / 600 available on special request
2. DN 50 / 65 / 80 / 100 / 125 / 150 / 200
   Flanged to class 150 / 300
3. DN 50 / 65 / 80 / 100 / 125 / 150 / 200
   Flanged to PN16 / PN25 / PN40

   For higher sizes DN 250 and 300 contact Forbes Marshall

3.3 Limiting Conditions:

For DN 15 / 20 / 25 / 32 / 40 Socket weld ends	
Maximum operating pressure	78 bar g
Maximum operating temperature	425 deg c
Maximum hydraulic test pressure	156 bar g (IBR requirement)

For DN 15 / 20 / 25 Screwed ends	
Maximum operating pressure	78 bar g
Maximum operating temperature	425 deg c
Maximum hydraulic test pressure	156 bar g (IBR requirement)

For DN 32 / 40 Screwed ends	
Maximum operating pressure	41.5 bar g
Maximum operating temperature	425 deg c
Maximum hydraulic test pressure	83 bar g (IBR requirement)

Body design conditions : DN 15/20/25/32/40 Class 600 Flanged ends	
Maximum allowable pressure	41.5 bar g
Maximum operating pressure	425 deg c
Maximum operating temperature	83 bar g (IBR requirement)
Maximum hydraulic test pressure	156 bar g

Body design conditions : DN 50-200 PN 16 Flanged End	
Maximum allowable pressure	16 bar g at 38 deg C
Maximum operating pressure	16 bar g at 204 deg C
Maximum operating temperature	425 deg C at 9.1 bar g
Cold hydraulic test pressure	24 bar g

Body design conditions : DN 50-150 PN 25 Flanged End	
Maximum allowable pressure	25 bar g at 38 deg C
Maximum operating pressure	25 bar g at 226 deg C
Maximum operating temperature	425 deg C at 14 bar g
Cold hydraulic test pressure	38 bar g

Body design conditions : DN 50-200 PN 40 Flanged End	
Maximum allowable pressure	40 bar g at 38 deg C
Maximum operating pressure	39 bar g at 250 deg C
Maximum operating temperature	425 deg C at 22.8 bar g
Cold hydraulic test pressure	60 bar g

Body design conditions : DN 15-200 Class 150 Flanged ends	
Maximum allowable pressure	19.6 bar g at 38 deg C
Maximum operating pressure	14 bar g at 197 deg C
Maximum operating temperature	425 deg C at 5.5 bar g
Cold hydraulic test pressure	28 bar g (IBR requirement)

Body design conditions : DN15-200 Class 300 Flanged End	
Maximum allowable pressure	51 bar g at 38 deg C
Maximum operating pressure	41.5 bar g at 253 deg C
Maximum operating temperature	425 deg C at 28.8 bar g
Cold hydraulic test pressure	83 bar g (IBR requirement)

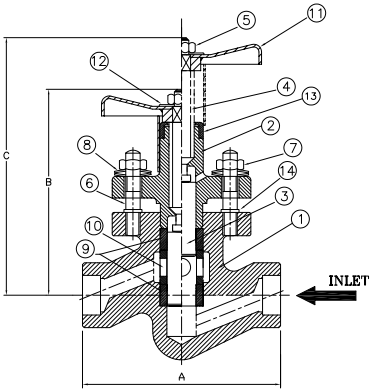


Figure 2: DN15, 20, 25 Piston Valve

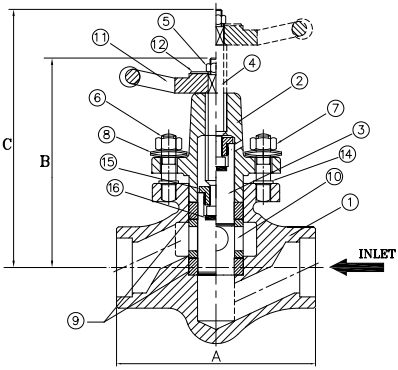


Figure 3: DN32, 40 Piston Valve

Note: Always open and close piston valve fully, do not use valve or 'F key.

Material: DN 15-40:

No.	Description	Material	Standard
1	Body	Forged Carbon Steel	ASTM A105N
2	Bonnet	Forged Carbon Steel	ASTM A105N
3	Piston	Stainless Steel	ASTM A 276 TYPE 304
4	Spindle	Stainless Steel	ASTM A 276 TYPE 410
5	Nyloc Nut	Carbon Steel	
6	Stud	Carbon Steel	ASTM A193 Gr. B7
7	Nut	Carbon Steel	ASTM A 194 Gr.2H
8	Belleville Washer	Spring Steel	50CrV4
9	Sealing stack	S.S. Reinforced Graphite	
10	Spacer	Stainless Steel	ASTM A 276 TYPE 410
11	*Handwheel	Sheet Metal / SG Iron	
12	Name Plate	Stainless Steel	ASTM A 240 TYPE 304
13	Grease Cap	Stainless Steel	SS 304
14	Gap ring	Stainless Steel	ASTM A 276 TYPE 410

***Note :For DN 15-25 Handwheel - Sheet Metal | For DN32-40 Hand wheel-S.G. Iron**

Additional material: DN 40

Sr.No.	Description	Material	
15	Split Nut	Brass	DIN En12164
16	Thrust Plate	Stainless Steel	ASTM A 275 TYPE 420

Dimensions: (approx. in mm):

Size (DN)	A	B	C
15	110	118	146
20	110	118	146
25	126	133	165
32	165	175	215
40	165	175	215

Flange Class: ***Tol ±1mm**

Size (DN)	A*			B	C
	Class 150	Class 300	Class 600		
15	252	265	265	118	146
20	252	265	265	118	146
25	260	278	278	133	165
32	305	317	320	175	215
40	305	317	320	175	215

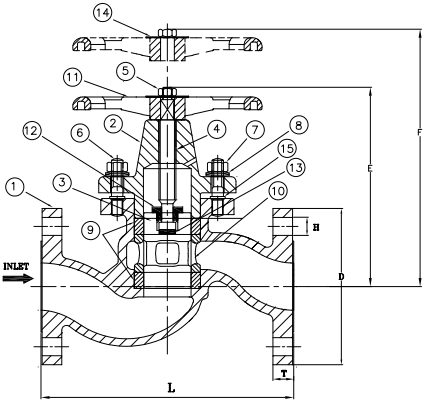


Figure 4: DN50 Piston Valve

Note: Always open and close piston valve fully, do not use valve or 'F key.

Material: DN 50

Sr. No.	Part	Material	Standard
1	Body	Cast steel	ASTM A 216 Gr. WCB
2	Bonnet	Cast steel	ASTM A 216 Gr. WCB
3	Piston	Stainless steel	ASTM A 276 Type304
4	Spindle	Stainless steel	ASTM A 276 Type410
5	Nyloc nut	Carbon steel	-
6	Stud	Carbon steel	ASTM A 193 Gr.B7
7	Nut	Carbon steel	ASTM A 194 Gr.2H
8	Belleville washer	Spring steel	50CrV4
9	Sealing Stack	S/S Reinforced Graphite	-
10	Spacer	Stainless steel	ASTM A 743 Gr.CA15
11	Handwheel	S.G. Iron	-
12	Split nut	Brass	DIN EN12164
13	Thrust plate	Stainless steel	ASTM A 276 Type420
14	Name plate	Stainless steel	ASTM A 240 Type304
15	Gap Ring	Stainless Steel	ASTM A276 TYPE 410

Dimensions (approx. in mm) : Size DN 50

ANSI Class	L	D	PCD	H	No. of Holes	T	E	F	Weight
150	203	152	121	19	4	19	210	262	14.5 kg
200	267	165	127	19	8	22	210	262	17.5 kg
PN 16/25	230	165	125	18	4	18	210	262	14.5 kg
PN 40	230	165	125	18	4	20	210	262	17.5 kg

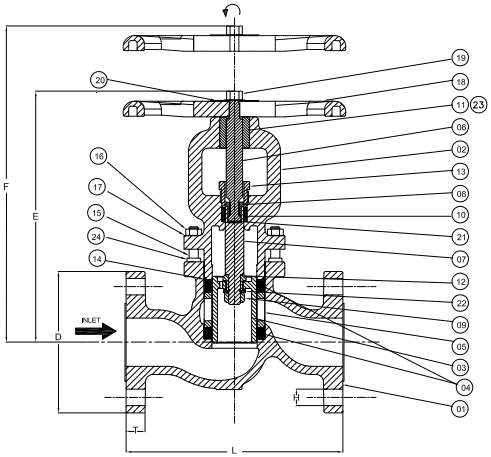


Figure 5: DN 65-200 Piston Valve

Note: Always open and close piston valve fully, do not use valve or 'F key.

Material: DN 65-200:

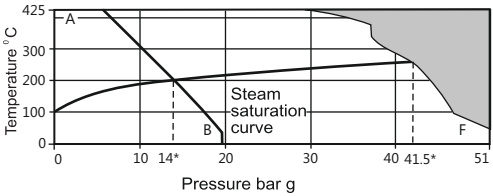
Sr. No.	Part	Material	Standard
1	Body	Cast steel	ASTM A 216 Gr. WCB
2	Bonnet	Cast steel	ASTM A 216 Gr. WCB
3	Piston	Stainless steel	ASTM A 351 CF8
4	Body Sealing Stack	S/S Reinforced graphite	-
5	Spacer	Stainless steel	ASTM A 743 CA 15
6	Spindle	Stainless steel	ASTM A 276 Type 410
7	Stem	Stainless steel	ASTM A 276 Type 304
8	Split nut	Brass	DIN En12164
9	LH Nut	Stainless steel	ASTM A 276 Type 304
10	Gland Sealing Slack	S/S Reinforced graphite	-
11	Threaded Bush	Ph. Bronze	-
12	Back Seat	Stainless steel	ASTM A 276 Type410
13	Hex. Gland Nut	Stainless steel	ASTM A 276 Type410
14	Bonnet sealing stack	Graphite	-
15	Stud	Carbon steel	ASTM A 193 Gr.B7
16	Nut	Carbon steel	ASTM A 194 Gr.2H
17	Belleville washer	Spring steel	50CrV4
18	Handwheel	S.G. Iron	-
19	Nyloc nut	Carbon steel	-
20	Name plate	Stainless steel	ASTM A 240 Type304
21	Thrust plate	Stainless steel	ASTM A 276 Type420
22	Washer	Stainless steel	ASTM A 240 Type304
23	Grub screw	Hardened steel	I.S. 12.9
24	Gap Ring	Stainless steel	ASTM A 276 Type 410

Dimensions (approx. in mm) : Size DN 65 to 200

Sizes (DN)	Pressure Class	L	D	PCD	H	NO. OF HOLES	T	E	F	Approx. Weight (Kg)
65	CLASS 300	292	191	149	22	8	25	335	400	31
65	CLASS 150	216	178	140	19	4	22	335	400	27
65	PN 16 / 25	290	185	145	18	8	18	335	400	27
65	PN40	290	185	145	18	8	22	335	400	31
80	CLASS 300	318	210	168	22	8	28	320	384	37
80	CLASS 150	241	191	152	19	4	24	320	384	31
80	PN 16 / 25	310	200	160	18	8	24	320	384	31
80	PN 40	310	200	168	18	8	20	320	479	37
100	CLASS 300	356	254	200	22	8	32	395	479	58
100	CLASS 150	292	229	191	19	8	24	395	479	47
100	PN 16 / 25	350	220	180	20	8	18	395	479	47
100	PN 40	350	235	190	24	8	22	395	479	58
125	CLASS 300	400	280	235	22	8	35	446	540	87
125	CLASS 150	356	254	216	22	8	24	446	540	70
125	PN 16 / 25	400	250	210	18	8	22	446	540	70
125	PN 40	400	270	220	26	8	26	446	540	87
150	CLASS 300	445	318	270	22	12	37	486	598	117
150	CLASS 150	406	279	241	22	8	26	486	598	90
150	PN 16 / 25	480	285	240	22	8	22	486	598	90
150	PN 40	480	300	250	26	8	28	486	598	117
200	CLASS 300	559	381	330	25	12	41	591	728	210
200	CLASS 150	495	343	298	22	8	28	591	728	164
200	PN 16	600	340	295	22	12	24	591	728	164
200	PN 40	600	375	320	30	12	34	591	728	210

3.4 Operating Range:

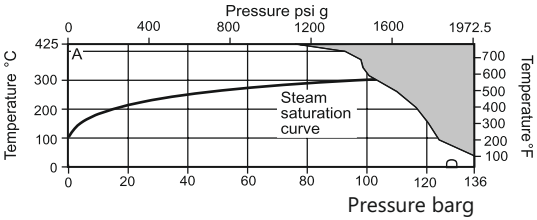
DN50-200



The product must not be used in this region.

A - B Flanged ANSI 150
A - F Flanged ANSI 300
* PMO- Maximum operating Pressure

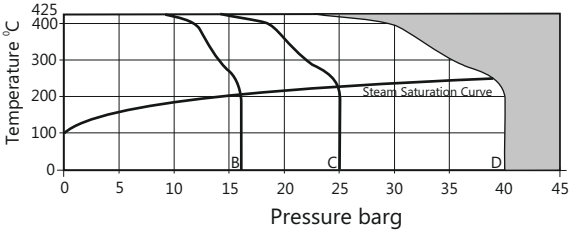
Class 800



The product must not be used in this region.

A - D Screwed and socket weld

DIN PSVAL



The product must not be used in this region.

A - B Flanged PN 16
A - C Flanged PN 25
A - D Flanged PN 40

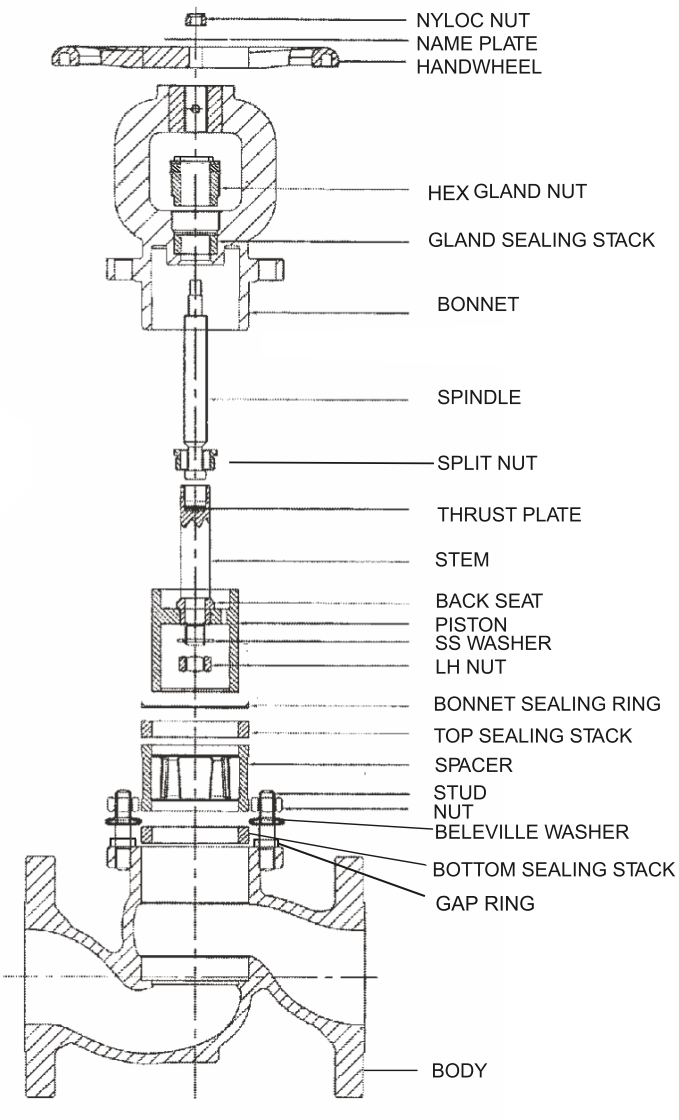


Figure 6 : Exploded View of DN65-200 Piston Valve

4. Operation: [Refer figure 5]

The piston valve is operated manually by a handwheel (18) it should be either fully open or fully closed. To open the piston valve turn the handwheel (18) in the anticlockwise direction until it stops completely. To close the piston valve turn the handwheel (18) until it stop rotating further.

Note: The piston valve spindle should be periodically checked to ensure adequate lubrication is present for efficient valve operation. For Lubrication 'Molykote M30' lubricating oil is recommended. When fitted on high temperature applications or where severe weather conditions prevail, the lubrication should be checked more frequently.

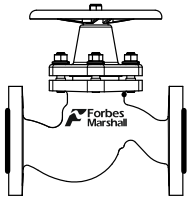
Note: Never tighten bonnet nuts when piston valve is in open condition. Do not use piston valve for throttling which result in excessive wear of internals. Operation of the handwheel (18) should always be by the hand, it is not recommended to use a valve key or F key. If the handwheel is over-tightened, damage of the piston valve internals may occur.

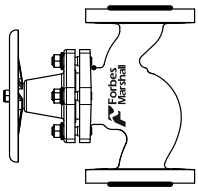
5. Installation Guidelines: [Refer figure 7 and 8]

Note: Before implementing any installations observe the 'Important Safety notes' in section 2. Referring to the installation and maintenance instructions, name – plate and technical information sheet check the product is suitable for intended installation.

1. The piston valve should be installed in the direction of fluid flow given by the arrow on the body. The preferred orientation is with the spindle vertical with handwheel on the top. The piston valve can be installed from the vertical to the horizontal plane.

   Note: Do not install the piston valve with handwheel on lower side as maintenance or lubrication of the piston valve will be difficult.





The preferred orientation for installation **The valve can be installed in vertical pipework**

Figure 7 : Correct orientation for installation

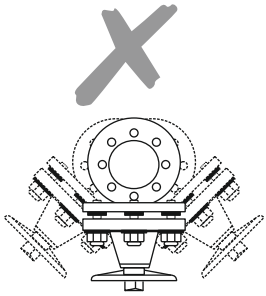


Figure 8 : Incorrect orientation for installation

2. Adequate space should be available while installation of the piston valve so that they can be conveniently operated and maintained.
3. Before installing a piston valve, check to ensure that the size, pressure rating, materials of construction, end connections, etc. are suitable for the service conditions of the particular application. Remove the cover plugs from the ports.

   Note: Lubricate the product before installation as indicated if stored for more than 6 months.
4. **Care must be taken to ensure before installing the piston valve that the line is clear from all foreign particles such as welding fluxes, metal burr and dirt and maintain cleanliness during installation since the introduction of foreign particles can result in damage to the piston and sealing stack.**
5. **When a socket weld piston valve is being installed the welding should be carried out to an approved procedure to a recognised standard. During welding the piston valve should be in the open position to allow maximum heat dissipation.**
6. Ensure that the discharged flow is directed to a safe place.

6. Start-up and Commissioning:

6.1. Flushing of lines:

As part of pre-installation all fluid handling equipment particularly piping should be thoroughly cleaned of scale and the internal debris which accumulates during construction. This is accomplished by blowing or flushing with air, steam, water and other suitable medium.

Note: For a detailed procedure on flushing of lines please visit Forbes Marshall website.

6.2. Commissioning:

After installation or maintenance ensure that the system is fully functioning by confirming fluid is passing through it.

1. After flushing of lines is complete, open the piston valve fully by rotating handwheel in anticlockwise direction.
2. Operation of the handwheel should always be by hand.
3. Check for leaks and attend if any.

7. Maintenance Guidelines:

Note: Before undertaking any maintenance of the product it must be isolated from both supply line and return line and ensure pressure is normalized to atmosphere. The product should then be allowed to cool. When re-assembling ensure that all joint faces are clean. Once completed open the product slowly and check for leaks.

7.1. Routine and preventive maintenance:

Please refer to the maintenance schedule mentioned in the table below to undertake routine maintenance of the piston valve.

SR. NO.	PARAMETERS TO BE CHECKED	FREQUENCY FOR CHECKING VARIOUS PARAMETERS					
	PISTON VALVE	Daily	Weekly	Monthly	Quarterly	Half yearly	Annually
1	Manually Operate the valve.			Y			
2	Lubrication of piston valves.				Y		
3	Visual inspection and cleaning of stem-piston threads.				Y		
4	Refilling of *Loctite Anti-Seize (in grease cap) for DN 15/20/25.						Y

*Loctite Anti-seize threaded compound 767 high performance conforms to ML-A-907-E.

7.2. Tool Kit:

To carry out maintenance of the piston valve refer the tools mentioned in the table below. .

Sizes	Component	Tool used & size
DN15 /20/25	M 10 Stud	Stud runner M10 x 1.5
	Nut	Box spanner of 17 mm (A/F)
	Nyloc nut	Box spanner of 13 mm (A/F)
	Sealing stack	Insertor tool (Available as spares)
	Sealing stack	Extractor tool (Available as spares)
DN32/40/50	M12 Stud	Stud runner M12 x 1.75
	Nut	Box spanner of 17mm (A/F)
	Sealing stack	Insertor tool (Available as spares)
	Sealing stack	Extractor tool (Available as spares)
DN65/80/100/125	M16 Stud	Stud runner M 16 x 2A
	Nut	Box spanner of 24 mm (A/F)
	Sealing stack	Insertor tool (Available as spares)
	Sealing stack	Extractor tool (Available as spares)
DN 150	M20 Stud	Stud runner M20 x 2
	Nut	box spanner of 30mm (A/F)
	Sealing stack	Insertor tool (Available as spares)
	Sealing stack	Extractor tool (Available as spares)
DN200	M24 Stud	Stud runner M24 x 3
	Nut	Box spanner of 36mm (A/F)
	Sealing stack	Insertor tool (Available as spares)
	Sealing stack	Extractor tool (Available as spares)
DN40/50/65/80	Split nut tightening	Open spanner of 20mm (A/F)
DN 100/125/150/200	Split nut tightening	Open spanner 24 mm (A/F)

7.3. Recommended tightening torques for bonnet nuts, gland nuts and Kv values

Size	Part No.	Component	Torque Range
DN15/20	7	Nut	3 – 5 Nm
DN25	7	Nut	5 – 7 Nm
DN32/40	7	Nut	18 – 20 Nm
DN50	7	Nut	20 – 25 Nm
DN65/80	16	Nut	50 – 60Nm
DN100/125	16	Nut	70 – 80Nm
DN150/200	16	Nut	80 – 90Nm

Table 1 : Recommended tightening torques for bonnet nuts

Size	Part No.	Component	Torque Range
DN65/80	13	Gland Nut	35 - 45Nm
DN100/125	13	Gland Nut	75 – 85 Nm
DN150	13	Gland Nut	80 – 90 Nm
DN200	13	Gland Nut	95 – 110 Nm

Table 2: Recommended tightening torques for gland nuts

Size	Kv Values
DN15/20	2.5
DN25	5.8
DN32/40	13
DN 50	41
DN65	51
DN80	77
DN100	131
DN125	194
DN150	221
DN200	438

Table 3: Kv Values

7.4. Maintenance of size DN15 -50 piston valve : [Refer Figure 2, 3 and 4]

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

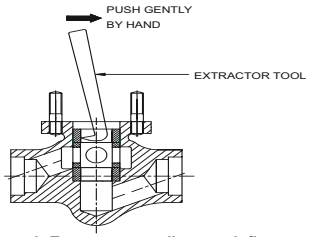
Maintenance of piston valve is very easy and can be done when valve is not in operation. If any leakage is observed through the bonnet hole, close the valve till handwheel (11) touches bonnet (2) then tighten all nuts (7) equally by half or one turn until leakage stops. (Refer Table 1 for recommended tightening torques).

Note: Never tighten nuts (7) when valve is in open condition.

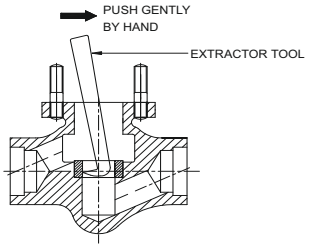
If leakage still does not stop then follow the procedure mentioned below.

1. Keep piston valve fully open remove nuts (7) & Belleville washer (8) turn handwheel (11) in clockwise direction till it stops at the top.
2. Pull handwheel (11) carefully along with bonnet (2) to remove piston (3) from body (1).
3. Avoid any damage to piston (3).
4. Clean piston (3) with lint free cloth.
5. Remove top sealing stack (9) with the help of extractor tool, remove spacer (10) [which is free in the body (1)] and remove bottom sealing stack (9) with the help of extractor tool. Replace with new set of bottom sealing stack (9), place spacer (10) and replace top sealing stack (9) with the insertor tool. Use mallet to apply light strokes on insertor tool ensuring they fit perfectly. (Refer figure 9 for extractor tool and insertor tool of piston valve for size DN15 – 40 and figure 10 for extractor tool and insertor tool of piston valve for size DN50)
6. Align piston (3) with the top sealing stack (9) and push gently and close the piston valve by rotating handwheel (11) in the clockwise direction until it touches the bonnet (2).
7. Ensure that the Belleville washer (8) are placed properly in cup form and tighten all nuts (7) with equal torque when the piston (3) is at the end of bottom sealing stack (9). (Refer Table 1 for recommended tightening torque).

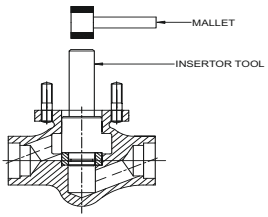
For piston valve of size DN15-40



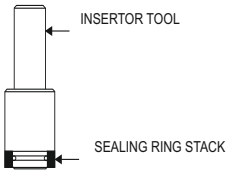
1. Extract top sealing stack first



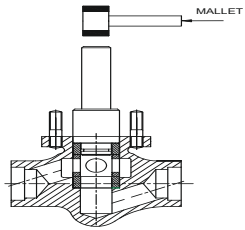
2. Remove spacer which is free from the body and then extract bottom sealing stack



3. Insert bottom sealing stack first



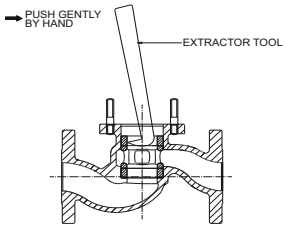
4. Place sealing stack in this way on Insertor tool



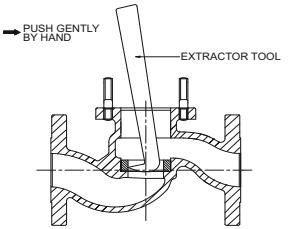
5. Place spacer which is free from the body and then insert top sealing stack

Figure 9 : View showing extractor tool and insertor tool for sealing stack of piston valve of size DN15–40

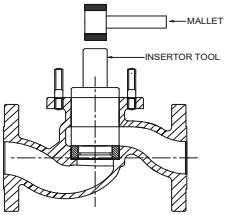
For piston valve of size DN50



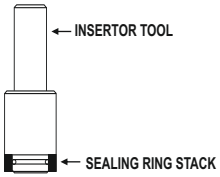
1. Extract top sealing stack first



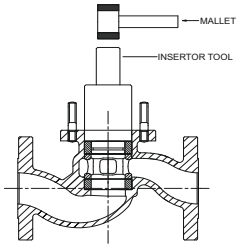
2. Remove spacer which is free from the body and then extract bottom sealing stack



3. Insert bottom sealing stack first



4. Place sealing stack in this way in insertor tool



5. Place spacer which is free from the body and then insert top sealing stack

Figure 10 : View showing extractor tool and insertor tool for sealing stack of piston size of DN50

7.5. Maintenance of piston valve of size DN65-DN200 : [Refer Figure 5]

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

Maintenance of piston valve is very easy and can be done when piston valve not in operation. If any leakage is observed through the gland, tighten gland nut (13) to stop the leakage through gland. If any leakage is observed through outlet or between the body (1) and the bonnet (2) first close the valve till handwheel (18) touches the bonnet (2) then tighten all nuts (16) equally by half or one turn until leakages stops. (Refer Table 1 for recommended tightening torques)

Note: Never tighten nuts (7) when valve is in open condition.

If leakage yet does not stop then follow the procedure mentioned below.

1. Keep piston valve fully open remove nuts (16) & Belleville washer (17) turns handwheel (18) in anti- clockwise direction until it touches the bonnet (2). Pull handwheel carefully along with bonnet (2) to remove piston (3) from body (1).
2. In case the bonnet assembly does not come out of the body (1) use tapped hole for removing bonnet assembly. Avoid any damage to piston (3).
3. Clean piston (3) with lint free cloth.

4. Remove body top sealing stack (4) with the help of extractor tool, remove spacer (5) [which is free in the body (1)] and remove body bottom sealing stack (4) with the help of extractor tool. Replace body bottom sealing stack (4), place spacer (5) and replace body top sealing stack (4) with the insertor tool. Use mallet to apply light strokes on insertor tool ensuring they fit perfectly. Insert bonnet sealing stack (14) carefully. (Refer figure 11 for extractor tool and insertor tool for piston valve of size DN65 – 200).
5. Place bonnet piston-spindle sub assembly on clean table.
6. To replace gland sealing stack (10) remove nyloc nut (19) and handwheel (18). Hold bonnet (2) by hand and remove spindle-piston sub assembly by rotating spindle (6) in clockwise direction with the help of screw driver.
7. Remove gland nut (13) and extract gland sealing stack (10) with extractor tool. Insert new gland sealing stack (10) with the inserter tool. Use mallet to apply light strokes on inserter tool ensuring they fit perfectly. (Refer Fig. 12 for extractor tool and insertor tool for piston valve of size DN65 – 200). Screw gland nut (13) in the bonnet (2). Place bonnet (2) on spindle-piston sub assembly and rotate spindle (6) in anticlockwise direction until it stops.
8. Align bonnet piston-spindle sub assembly in the body top sealing stack (4) and push it gently. Place the handwheel (18) on the square of spindle (6), place name plate (21) and nyloc nut (19). Place Belleville washer (17) in the cup form and hand tighten all the nuts. Now rotate handwheel (18) in clockwise direction until it touches the bonnet (2). (Close position of the valve).
9. Tighten all the nuts (16) equally. Open isolation valve, if any leakage is observed through the gland tighten gland nut (13). In case leakage is observed at the outlet or between body face (1) and bonnet (2) tighten nut equally half or one turn as explained earlier.

For piston valve of size DN65 – 200

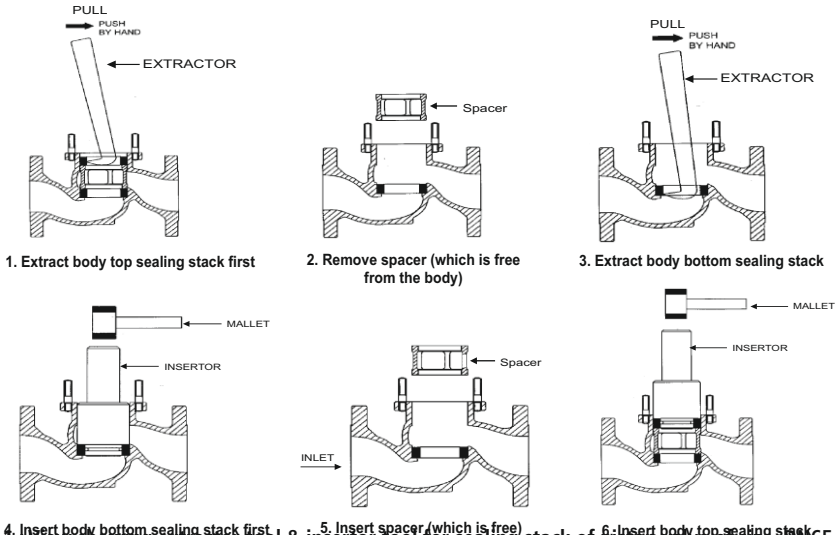


Fig. 11 : View showing extractor tool & insertor tool for sealing stack of piston valve of size DN65 - 200

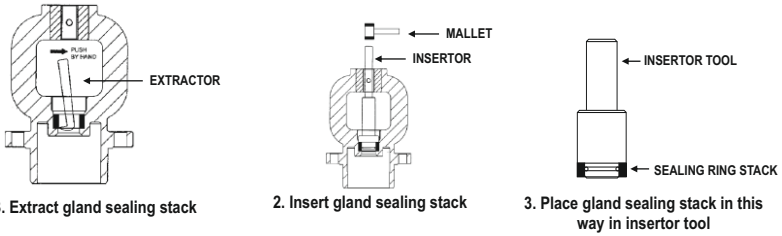


Fig. 12 : View showing extractor tool & insertor tool for gland sealing stack of piston valve of size DN65 - 200

7.6. Lubrication Procedure for Piston Valves of all sizes: [Refer figure 13]

Clean the valve unit before lubrication. For lubrication use *Molykote M30 lubricating oil. For piston valve of sizes (DN15–50) lubricate spindle through the hole provided in the bonnet and spindle threads on quarterly basis and for piston valve of sizes (DN 65-200) lubricate between the spindle and threaded bush at the upper part of bonnet & stem and spindle at the lower part of bonnet on quarterly basis asmentioned in section 9.

Note: *Molykote M30 lubricating oil is not available please use equivalent lubricating oil with specification as shown in table 4.

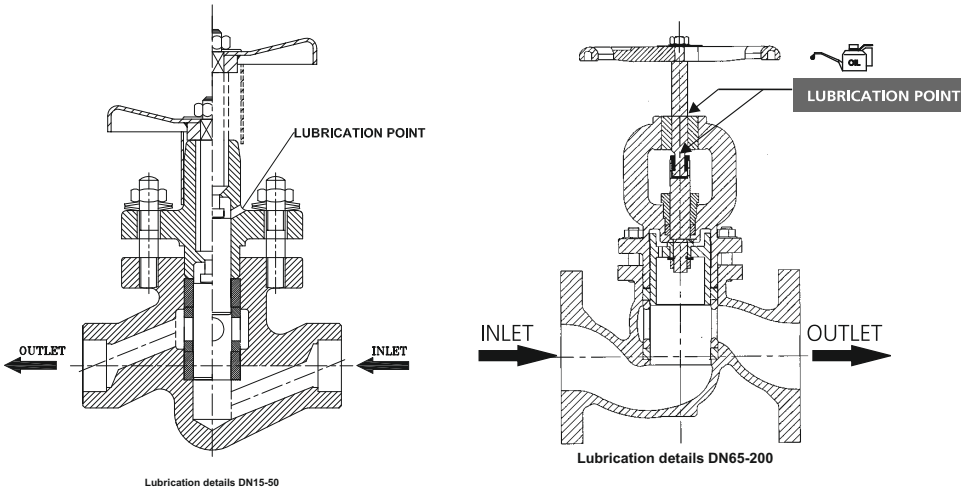


Figure 13 : Lubrication for piston valve

8. Troubleshooting:

If the expected performance is unachievable after installation of the piston valve, check the following points for appropriate corrective measures.

Failure Mode	Possible Cause	Remedy
Inadequate flow rate at outlet.	The piston valve is not completely open.	Ensure the piston valve is completely open.
Fluid leakage from end connection.	End connection is not tight.	Tighten the end connection with proper torque for flange end and tighten the screwed end piston valve.
Fluid leakage from bonnet and body.	Sealing stack worn out.	For piston valve of sizes DN15-50 if any leakage is observed through bonnet hole, first close the valve till handwheel touches bonnet and then tighten all the nuts equally by half or one turn until leakage stops. (Refer table 1 for recommended tightening torque.) If leakage does not stop dismantle the valve, check if sealing stack is worn-out. If worn-out replace with new set of sealing stack. **Note: Never tighten nuts when valve is in open condition.** For piston valve of sizes DN65 –200 if any leakage is observed through the gland, tighten gland nut half or one turn until leakage stops. To stop the leakage between body and bonnet, first close the valve till handwheel touches bonnet and then tighten all the nuts equally by half or one turn until leakage stops. (Refer table 1 for recommended tightening torque). If leakage does not stop dismantle the valve, check if gland sealing stack, bonnet sealing stack & body sealing stack is worn-out. If worn-out replace with new one. **Note: Never tighten nuts when valve is in open condition.**
	Piston is damaged or corroded.	Check if piston is damaged due to scouring, corrosion of the piston valve. If damaged replace with new piston kit.
Excessive force is required to turn the handwheel.	Seizing of the piston valve.	Lubricate the piston valve using *Molykote M30 lubricating oil on quarterly basis for sizes DN15- 50 lubricate spindle through the hole provided in the bonnet and spindle threads and for sizes DN65-200 lubricate between the spindle and threaded bush at the upper part of bonnet and stem and also spindle at the lower part of the bonnet.

Note: Never attempt to modify the product. When replacing old parts with new parts, use the spare parts listed in section 9.

*Molykote M30 lubricating oil is not available please use equivalent lubricating oil with specification as shown in table 4.

Specification of Molykote M30			
Colour			Black
Composition			Synthetic oil Molybdenum disulphide Dispersant
Density	**Density at 20°C (68°F) (Standard - DIN 51 757)**		1.0 g/ml
Viscosity	**Base oil viscosity at 40°C (104°F) (Standard - DIN 51 562)**		120mm^3/s
Temperature	**Service temperature range**		Oil lubrication up to +200°C (397°F)
			Dry lubrication up to +450°C (842°F)
Load –carrying capacity, wear protection.	**Four-ball tester (VKA)**	**Weld Load (Standard – DIN 51 562 pt.2)**	2000 N
		Wear scar under 800 N (Standard – DIN 51 350 pt.3)	1.02 mm
		Almen-Wieland machine OK load.	20000 N
Storage life			1 years

Table 4: Specification of Molykote M30

9. Available Spares: [Refer figure 2, 3, 4 and 5]

Always order spares part by using the description and Spare Code No. given below & stating size

Sr. No.	Spares	Part No.	Spare Codes
1	Set of sealing stack for DN15/20 piston valve	9	F3A2017591
2	Set of sealing stack for DN25 piston valve	9	F3A2017592
3	Set of sealing stack for DN40 piston valve	9	F3A2017678
4	Set of sealing stack for DN50 piston valve	9	F3A2017679
5	Set of sealing stack for DN65 piston valve	4,10,14	F3A2019470
6	Set of sealing stack for DN80 piston valve	4,10,14	F3A2017740
7	Set of sealing stack for DN100 piston valve	4,10,14	F3A2017741
8	Set of sealing stack for DN125 piston valve	4,10,14	F3A2019421
9	Set of sealing stack for DN150 piston valve	4,10,14	F3A2017742
10	Set of sealing stack for DN200 piston valve	4,10,14	F3A2017743
11	Inserter kit for DN15/20 piston valve	Refer figure 9	F3A2017990
12	Insertor kit for DN25 piston valve	Refer figure 9	F3A2017991
13	Insertor kit for DN32/40 piston valve	Refer figure 9	F3A2017992
14	Insertor kit for DN50 piston valve	Refer figure 10	F3A2017993
15	Insertor kit for DN80 piston valve	Refer figure 11	F3A2017994
16	Insertor kit for DN100 piston valve	Refer figure 11	F3A2017995
17	Insertor kit for DN150 piston valve	Refer figure 11	F3A2017996
18	Insertor kit for DN125 piston valve	Refer figure 11	F3A2019418
19	Insertor kit for DN65 piston valve	Refer figure 11	F3A2019433
20	Insertor kit for DN200 piston valve	Refer figure 11	F3A2019435
21	Extractor Tool for sizes DN15-DN200 piston valve	Refer figure 9,10,11	F3A2019471
22	Piston spare kit for DN15/20 piston valve	3,4	F3A2017744
23	Piston kit for DN25 piston valve	3,4	F3A2017746
24	Piston kit for DN40 piston valve	3,4,18,19	F3A2017747
25	Piston kit for DN50 piston valve	3,4,12,13	F3A2017748
26	Piston kit for DN65 piston valve	3,6,7,8,9,12,20,22	F3A2017749
27	Piston kit for DN80 piston valve	3,6,7,8,9,12,20,22	F3A2017750
28	Piston kit for DN100 piston valve	3,6,7,8,9,12,20,22	F3A2017751
29	Piston kit for DN125 piston valve	3,6,7,8,9,12,20,22	F3A2017752
30	Piston spare kit for DN150 piston valve	3,6,7,8,9,12,20,22	F3A2017753
31	Piston spare kit for DN200 piston valve	3,6,7,8,9,12,20,22	F3A2017754

How to Order:
Example: DN 15 Piston Valve with socket weld ends.

How to Order Spares:
Order spares as per the code no. specified in the user manual.

10. Warranty Period:

As per ordering information and agreements in the contract.

Doc# FMSS/0415/UM-PSVAL/V1.R0

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Forbes Marshall
B-85, Phase II, Chakan Indl Area
Sawardari, Chakan
Tal. Khed, Dist. Pune 410501. INDIA.
Tel : +91 02135 393400

Forbes Marshall Steam Systems Pvt. Ltd.
(Formerly Spirax Marshall Pvt. Ltd.)
Opp 106th Milestone
Bombay Poona Road, Kasarwadi,
Pune 411 034. INDIA.
Tel.: 91(0)20-27145595, 39858555
CIN No : U27109PN1959PTC011334

Email : seg@forbesmarshall.com

www.forbesmarshall.com