

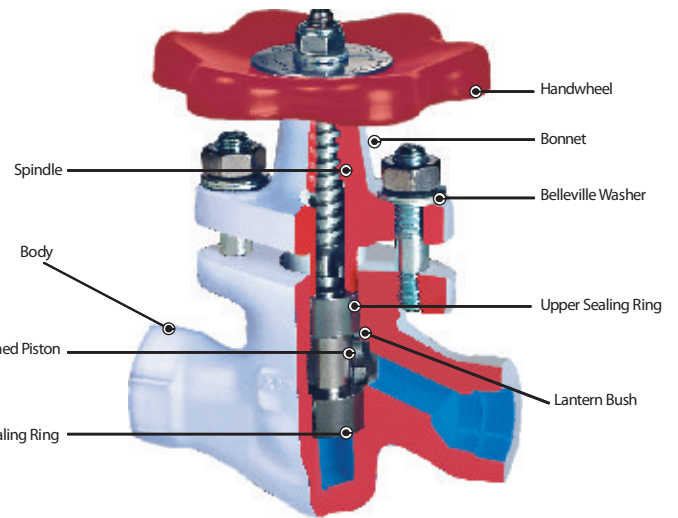
# Piston Valves

Zero leakage Valves

For over six decades, Forbes Marshall has been building steam engineering and control instrumentation solutions that work for the process industry. Today, we have evolved into a leader in process efficiency and energy conservation through technology partnerships and focused investments in manufacturing and research. Our joint ventures with the world's leading names enable us to deliver quality solutions in 14 countries. Forbes Marshall is probably the only company in the world to have extensive expertise in both steam and control instrumentation. This dual expertise has allowed us to engineer industry-specific systems that focus on energy efficiency and utilities management for sectors as diverse as textiles, food processing, paper, power and chemicals.

Our teams are peopled by some of the finest engineers in the land. These highly trained professionals have developed innovative solutions and significantly reduced process costs for our customers. Our business practices and processes have combined into a singular philosophy of being trusted partners who provide innovative solutions. It's a philosophy we are proud to live up to.

Forbes Marshall began sixty years ago as a company offering steam generation solutions in association with Spirax Sarco of the UK. Our partnerships have grown to include other well reputed industry leaders like KROHNE, Germany and now Vyncke Energietechnik, who are leaders in biomass boilers. For decades, we have been designing, manufacturing and supplying steam engineering products and solutions to customers worldwide.



**15NB, 20NB, 25NB, 32NB, 40NB**  
(1/2", 3/4", 1", 1 1/4", 1 1/2")

**Description**

Forged carbon steel Piston Valves provide perfect tightness and durability on different media such as steam, superheated steam and condensate, heat transfer fluid, and compressed air.

**Size and Pipe Connections**

15NB, 20NB, 25NB, 32NB, 40NB  
1/2", 3/4", 1", 1 1/4", 1 1/2"  
Screwed BSPT / NPT ends.  
Socket weld ends.

**Limiting Conditions**

Maximum operating conditions for socket weld ends with ANSI 800 rating and 15/20/25 NB screwed ends  
PMO - max. operating pressure : 78 bar g (1131 psig)  
TMO - max. operating temperature : 425°C (797°F)  
Cold hydraulic test pressure : 156 bar g<sup>2</sup> (2262 psig)

Maximum operating conditions for screwed ends 32/40 NB  
PMO - max. operating pressure : 41.5 bar g  
TMO - max. operating temperature : 425°C (797°F)  
Cold hydraulic test pressure : 83 bar g

**50NB, 65NB, 80NB, 100NB, 125 NB, 150NB, 200NB**  
(2", 2 1/2", 3", 4", 5", 6", 8")

**Description**

Cast carbon steel Piston Valves provide perfect tightness and durability on different media such as steam, superheated steam and condensate, heat transfer fluid, and compressed air.

**Size and Pipe Connections**

50NB, 65NB, 80NB, 100NB, 125NB, 150NB, 200NB  
2", 2 1/2", 3", 4", 5", 6", 8"  
Flange type : ANSI B16.5 with class 150 / 300 rating

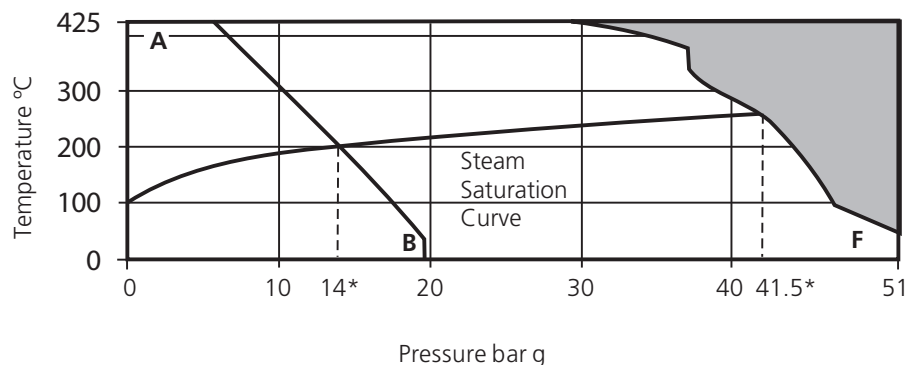
**For ANSI 150 Rating**

Maximum allowable pressure : 19.6 bar g (284 psig) @ 38°C (100°F)  
PMO - max. operating pressure : 14 bar g (203 psig) @ 197°C (387°F)  
TMO - max. operating temperature : 425° C (797°F) @ 5.5 bar g (80 psig)  
Maximum hydraulic test pressure : 28 bar g (406 psig)

**For ANSI 300 Rating**

Maximum allowable pressure : 51 bar g (740 psig) @ 38°C (100°F)  
PMO - max. operating pressure : 41.5 bar g (602 psig) @ 253°C (487°F)  
TMO - max. operating temperature : 425° C (797°F) @ 28.8 bar g (418 psig)  
Maximum hydraulic test pressure : 83 bar g (1203.5 psig)

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



■ The product must not be used in this region

A — B Flanged Class 150

A — F Flanged Class 300

\* PMO — Maximum operating pressure

## Leakage is out, the Piston Valve is in

### What is a Piston Valve?

The Piston Valve is a seatless and glandless valve. At the heart of the Piston Valve are the Piston and Sealing Rings. A burnished piston seals against metal reinforced graphite rings to achieve bubble tight shutoff. This unique design ensures, long life even at high temperatures - upto 425°C.

### Features:

- Burnished Piston and metal reinforced graphite sealing rings
- ANSI Class VI (i.e. bubble-tight) shut-off
- Minimum inventory of spares
- Low co-efficient of friction and low operating torque
- Inline serviceable for long life
- Larger effective sealing area - 600% more than Globe Valve

- Zero leakage assured across the gland and the seat
- Durability - piston unexposed to media
- Absence of gland and valve key
- Fire proof
- Maintenance friendly
- Self cleaning
- Self lubricating
- Applications - Steam, Superheated Steam and condensate, Heat Transfer Fluid, Compressed Air
- TUV certified ISO 9001 company
- CRN Approved
- PED Approved
- Complies with API 598
- In accordance to API 602 standards

## Valve Leakage - Two Types

### Leakage to Atmosphere

Leakage happens in all Gate / Globe and Ball Valves. This leakage to atmosphere is also called gland leakage.

Leakage is visible. The loss of product / energy and steam through these leaks are visible to the human eye and is easy to quantify.

Solutions are available to counter gland leakage.

### Solution

Conventional solution - Bellow Sealed Valve

Smart solution - Piston Valve

### Comparison with Bellow Sealed Valve

Bellow sealed valves have formed/welded bellows instead of a gland. Bellows puncture over a period of usage - very much like the bellows in mechanical seals. Such valves reduce gland leakage, but don't reduce inline leakage.

The piston Valve is a Glandless Valve. A burnished piston seals against metal reinforced graphite rings. Ensures zero leakage and long life.

### In Line Leakage

In line leakage is also known as seat leakage - It happens in all metal seated valves by design (metal seated valves confirm to Class 2 / Class 4 leakage)

But Yes ! There is a solution - the Piston Valve.

Soft seated valves also suffer from this over a period of time. This loss however is not visible and is hard to quantify.

It is seatless and has leakage class VI bubble tight shut-off.

You actually DO NOT SEE how much is leaking! Even the best below-sealed valves have this problem by virtue of design.

## Performance Parameters of Different Types of Isolation Valves

Parameter	Type of Valve			
	Gate	Ball	Globe	FM Piston Valve
Size of effective sealing area	High	Very High	Low	Very High
Replace gland seal	Y	Y	Y	Y**
Replace internals	Y	Y	N / Y	Y**
Replace seat	N	Y	N / Y*	Y**
Leakage	High	Low	Medium	NIL
Purchase cost	Low	Medium / High	Medium / High	High
Cost of ownership over 5 to 10 years	High	Medium	High	Low

\* Valve to be removed from line. \*\* Can be done inline (Valve need not be removed)

**Energy audits** of steam systems done at various sites have revealed that valve leakage is a serious concern in the industry. In a typical 5 year old plant, over 30% of the isolation valves leak.

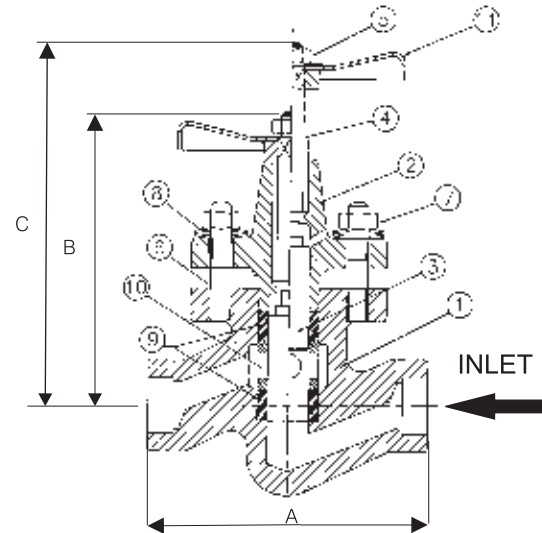
**Cost of Ownership** covers not only the purchase cost, but the cost of maintaining inventory of spare valves, spare packings / sealings & seats, replacement, leakage and manpower costs.

**PISTON VALVES HAVE THE LOWEST COST OF OWNERSHIP**

# Forbes Marshall-Piston Valve-Forged Carbon Steel

## Material: 15 - 25 NB (½"-1") Piston Valves

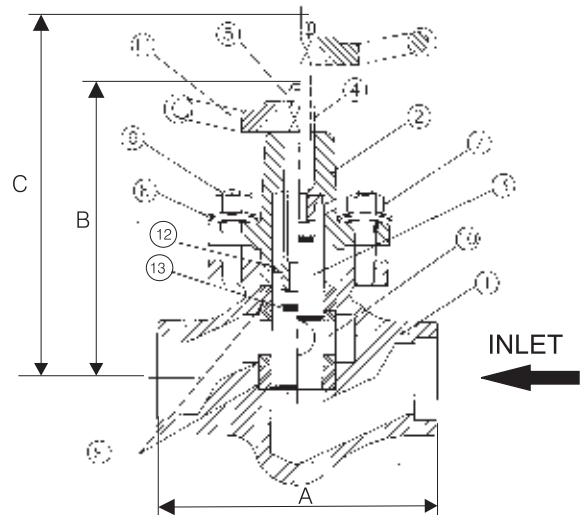
No.	Part	Material	
1	Body	Forged Carbon Steel	ASTM A 105 N
2	Bonnet	Forged Carbon Steel	ASTM A 105 N
3	Piston	Stainless	ASTM A 276 Type 304
4	Spindle	Stainless	ASTM A 276 Type 410
5	Nyloc Nut	Carbon Steel	Carbon Steel
6	Stud	Carbon Steel	ASTM A 193 Gr. B7
7	Nut	Carbon Steel	ASTM A 194 Gr. 2H
8	B. Washer	Spring Steel	50Cr V4
9	Sealing Rings	S / S Reinforced Graphite	
10	Spacer	Stainless Steel	ASTM A 276 Type 410
11	Handwheel	Sheet Metal	



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

## Material: 32 - 40 NB (1 ¼"-1½") Piston Valves

No.	Part	Material	
1	Body	Forged Carbon Steel	ASTM A 105 N
2	Bonnet	Forged Carbon Steel	ASTM A 105 N
3	Piston	Stainless	ASTM A 276 Type 304
4	Spindle	Stainless	ASTM A 276 Type 410
5	Nyloc Nut	Carbon Steel	Carbon Steel
6	Stud	Carbon Steel	ASTM A 193 Gr. B7
7	Nut	Carbon Steel	ASTM A 194 Gr. 2H
8	B. Washer	Spring Steel	50Cr V4
9	Sealing Rings	S / S Reinforced Graphite	
10	Spacer	Stainless Steel	ASTM A 276 Type 410
11	Handwheel	SG Iron	
12	Split Nut	Brass	
13	Thrust Plate	Stainless Steel	ASTM A 276 Type 420



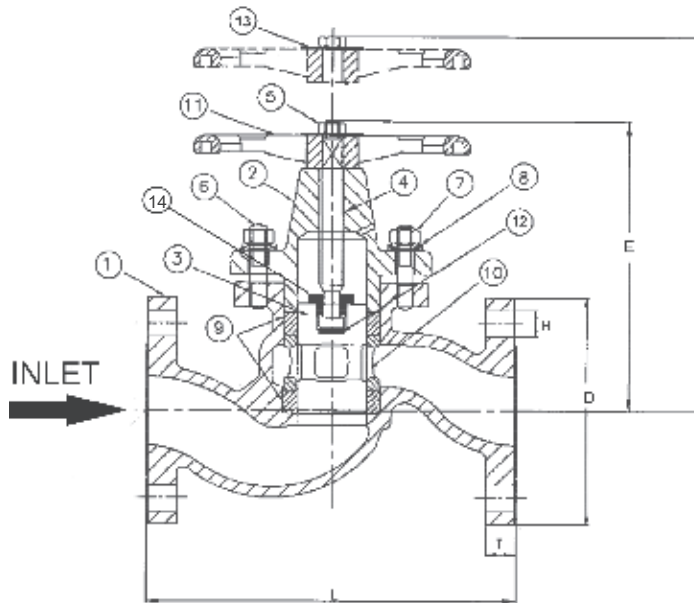
32 - 40 NB (1 ¼" - 1½") Piston Valve  
Always open & close Valve fully  
Do not use Valve Key

Dimensions: In mm/inches (approximate)

SIZES		END CONNECTION	A		B		C		Approx. Net Weight	
MM	IN		MM	IN	MM	IN	MM	IN	Kg	Lbs
15NB	½"	SC / SW	110	4.33	118	4.65	146	5.75	2	4.41
20NB	¾"	SC / SW	110	4.33	118	4.65	146	5.75	2.4	41
25NB	1"	SC / SW	126	4.96	133	5.24	165	6.50	3.5	7.7
32NB	1 ¼"	SC / SW	165	6.50	175	6.89	215	8.46	8	17.64
40NB	1 ½"	SC / SW	165	6.50	175	6.89	215	8.46	8	17.64

Due to continuous development of our products, we reserve the right to modify our product design without prior notice.

## Forbes Marshall - Piston Valve - Cast Steel



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

### Material : 50 NB (2") Piston Valve

No.	Part	Material	
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 Type 304
4	Spindle	Stainless Steel	ASTM A 276 Type 410
5	Nyloc Nut	Carbon Steel	
6	Stud	Carbon Steel	ASTM A 193 Gr.B7
7	Nut	Carbon Steel	ASTM A 194 Gr.2H
8	B. Washer	Spring Steel	50 CrV4
9	Sealing Ring	S/S Reinforced Graphite	
10	Spacer	Stainless Steel	ASTM A 743 Gr.CA 15
11	Handwheel	S.G. Iron	
12	Thrust Plate	Stainless Steel	ASTM A 276 Type 420
13	Name Plate	Stainless Steel	
14	Split Nut	Brass	

### Dimensions: 1m mm/inches(approximate)-ANSI 150

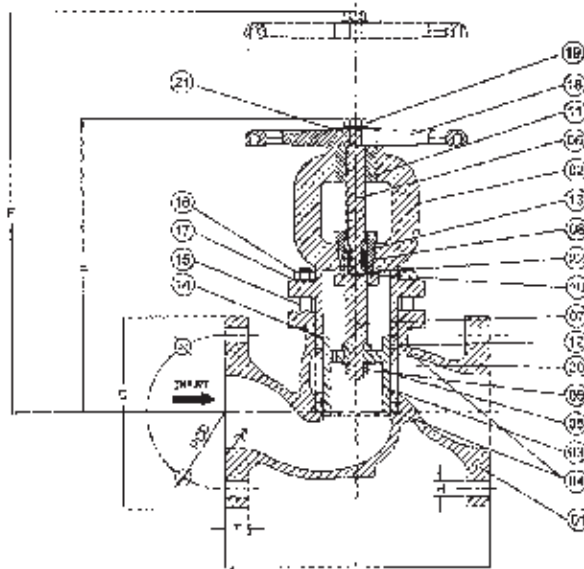
SIZES		ANSI CLASS	L		D		PCD		H		No. of Holes	T		E(Close)		F(Open)		Approx. Net Weight	
MM	IN		MM	IN	MM	IN	MM	IN	MM	IN		MM	IN	MM	IN	MM	IN	KG	Lbs
50NB	2"	150#	203	8.00	152	5.98	12.60	4.78	19	0.8	4	19	0.75	210	8.27	262	10.31	14.5	32

### Dimensions: 1m mm/inches(approximate)-ANSI 300

SIZES		ANSI CLASS	L		D		PCD		H		No. of Holes	T		E(Close)		F(Open)		Approx. Net Weight	
MM	IN		MM	IN	MM	IN	MM	IN	MM	IN		MM	IN	MM	IN	MM	IN	KG	Lbs
50NB	2"	300#	267	10.51	165	6.50	127	5.00	19	0.8	8	22	0.87	210	8.27	262	10.31	17.5	30

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# Forbes Marshall - Piston Valve - Cast Steel



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

### Material : 65 - 200 NB (2½" - 8") PISTON VALVE

No.	Part	Material
1	Body	Cast Steel
2	Bonnet	Cast Steel
3	Piston	Stainless Steel
4	Body Sealing Stackon	S/S Reinforced Graphite
5	Spacer	Stainless Steel
6	Spindle	Stainless Steel
7	Stem	Stainless Steel
8	Split Nut	Brass
9	LH Nut	Stainless Steel
10	Gland Sealing Stack	S/S Reinforced Graphite
11	Threaded Bus	Ph. Bronze
12	Back Seat	Stainless Steel
13	Gland Nut	Stainless Steel
14	Bonnet Sealing Ring	Graphite
15	Stud	Carbon Steel
16	Nut	Carbon Steel
17	Beville Washer	Spring Steel
18	Handwheel	S.G. Iron
19	Nyloc Nut	Carbon Steel
20	Washer	Stainless Steel
21	Name Plate	Stainless Steel
22	Thrust Plate	Stainless Steel

### Dimensions: 1m mm/inches(approximate)-ANSI 150

SIZES		ANSI CLASS	L		ØD		PCD		ØH		No. of Holes	T		E(Close)		F(Open)		Approx. Net Weight	
MM	IN		MM	IN	MM	IN	MM	IN	MM	IN		MM	IN	MM	IN	MM	IN	Kg	Lbs
65NB	2½"	150#	216	8.50	178	7.00	140	5.50	19	0.75	4	22	0.87	335	13.19	400	15.75	27	29
80NB	3"	150#	241	9.50	191	7.50	152	5.99	19	0.75	4	24	0.94	320	12.6	384	15.12	31	68
100NB	4"	150#	292	11.50	229	9.02	191	7.50	19	0.75	8	24	0.94	395	15.55	479	18.86	47	103
125NB	5"	150#	356	14.02	254	10.00	216	8.50	22	0.87	8	24	0.94	446	17.56	540	21.46	70	154
150NB	6"	150#	406	15.98	279	10.98	241	9.49	22	0.87	8	26	1.02	486	19.13	598	23.54	90	198
200NB	8"	150#	495	19.49	343	13.50	298	11.73	22	0.87	8	28	1.10	591	23.17	728	28.66	164	362

### Dimensions: 1m mm/inches(approximate)-ANSI 300

SIZES		ANSI CLASS	L		ØD		PCD		ØH		No. of Holes	T		E(Close)		F(Open)		Approx. Net Weight	
MM	IN		MM	IN	MM	IN	MM	IN	MM	IN		MM	IN	MM	IN	MM	IN	Kg	Lbs
65NB	2½"	300#	202	11.50	191	7.52	142	5.87	22	0.87	8	25	0.08	335	13.19	400	15.75	31	68
80NB	3"	300#	318	12.52	210	8.27	168	6.61	22	0.87	8	28	1.1	320	12.60	384	15.12	37	82
100NB	4"	300#	356	14.02	254	10.00	200	7.87	22	0.87	8	32	1.26	395	15.55	479	18.86	58	128
125NB	5"	300#	400	15.75	280	1.02	235	9.25	22	0.87	8	35	1.38	446	17.56	540	21.46	87	192
150NB	6"	300#	445	17.52	318	12.52	270	10.63	22	0.87	12	37	1.46	486	19.13	598	23.54	117	258
200NB	8"	300#	559	22.01	381	15.00	330	12.00	22	0.87	12	41	1.61	591	23.27	728	28.66	210	463

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# Quality Certificates



## Piston Valve Selection Guide

1 Product Code	PSVL											
2 Size	15NB	20NB	25NB	32NB	40NB	50NB	65NB	80NB	100NB	125NB	150N	200NB
3 End Connection	1/2"	3/4"	1"	1/4"	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	8"
	BSPT	A	A	A	A							
	NPT	B	B	B	B							
Screwed (SC)												
Socket Welded (SW)	I	I	I	I	I							
ANSI 150						Q	Q	Q	Q	Q	Q	Q
ANSI 300						M	M	M	M	M	M	M
4 Material	F	F	F	F	F	C	C	C	C	C	C	C

Not in standard product range, confirmation required when ordering.

END Connection	BSPT	NPT	Socket Welded	ANSI 150	ANSI 300	Material Description
Code	A	B	1	Q	M	F Forged Carbon Steel C Cast Carbon Steel

### How to order

Forbes Marshall 150NB(6"), Cast Steel ANSI 150 Piston valve  
product Description : 1 2 3 4 → PSVAL150QC

### Available Spares:

Sealing Rings (15-40NB,50NB)  
Body Sealing Stack Set, Bonnet Sealing Ring & Gland Sealing Stack.(65-200NB)

How to order spares:  
Order spares as per the code no. specified in the 'User Manual'.

### Installation:

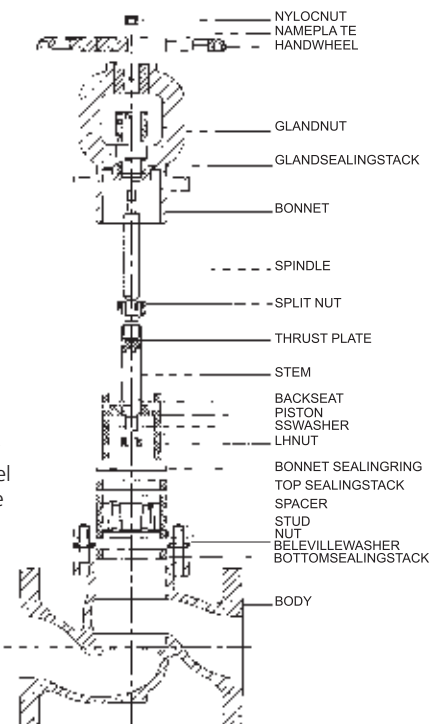
The Valve is designed for installation in a vertical line or horizontal line with inlet as per the arrow direction. To open the valve turn hand wheel until it stops at the top and to close turn hand wheel until it touches the bonnet. Do not use 'F' Key. If any leakage is observed during operation at the outlet, close valve fully and tighten opposite nuts equally half or one turn until leakage stops. Piston valves to be kept fully open while welding to the pipelines.

### Safety Information:

#### Pressure

Before attempting any maintenance of the valve, ensure that pressure is isolated and safety vent to atmosphere. Do not assume that the system is depressurized even when the pressure gauge indicates zero.

END Connection	BSPT	NPT	Socket Welded	ANSI 150	ANSI 300	Material Description
Code	A	B	1	Q	M	F Forged Carbon Steel C Cast Carbon Steel



EXPLODEDVIEW

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



Trusted Partners.  
Innovative Solutions.

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