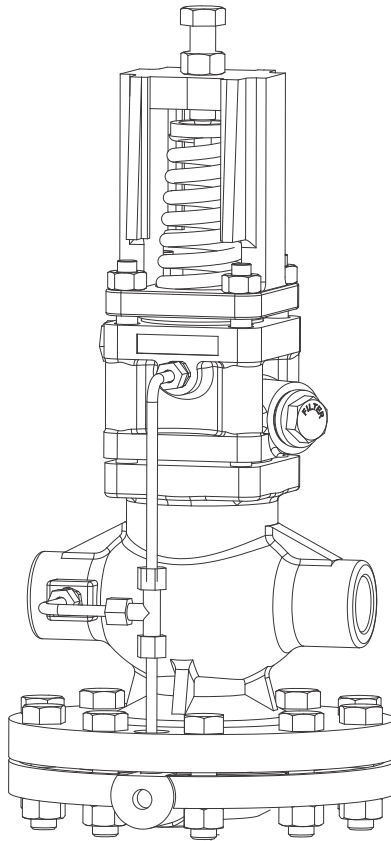


# Installation and Maintenance Manual

## Forbes Marshall Pilot Operated Pressure Reducing Valve

### FMPRV41



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## **1. Preface:**

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

### **Forbes Marshall Pilot Operated Pressure Reducing Valve [FMPRV41]**

**Sizes:** DN15 (1/2"), DN 20 (3/4"), DN 25 (1"), DN 40 (1 3/4") and DN 50 (2")

#### **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 Product Disposal:**

It is necessary to dispose this product only in accordance with local regulations at the authorized, qualified collecting point specified for equipment's and its parts—Please refer the part details mentioned in the material table of this manual. Please follow all waste disposal guidelines (Management & Handling) as published by local governing authorities in India & abroad

**2.11 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:

The Forbes Marshall Pilot Operated Forbes Marshall Pilot Operated Pressure Reducing Valve, FMPRV41 is a SG iron pilot operated Forbes Marshall Pilot Operated Pressure Reducing Valve suitable for steam or compressed air.

#### 3.2 Sizes and End Connections:

DN 15, 20, 25, 40 and 50

Screwed: BSPT / NPT for DN 15, 20, 25, 40 & 50

Flanged: BS 10 table "F/H" for DN 40 and 50

DN15 FMPRV41 LC versions available

#### 3.3 Body design conditions:

PMA-Maximum allowable pressure	17 bar g
TMA-Maximum allowable temperature	232°C
Spring Range	0.2 to 17 bar g

#### 3.4 Limiting Conditions:

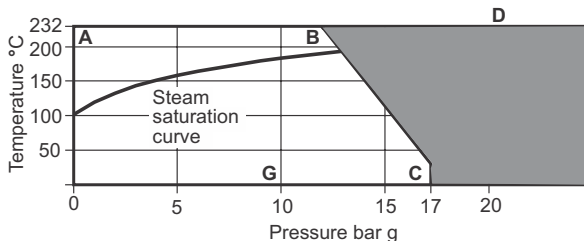
END CONNECTION	MAX OPERATING PRESSURE(PMO)	MAX OPERATING TEMPERATURE(TMO)
CLASS150/125	13 bar g @ 220 deg C	220 deg C @ 13 bar g
BS10TAB F	13 bar g @ 220 deg C	220 deg C @ 13 bar g
PN16	11.5 barg @ 220 deg C	220 deg C @ 11.5 barg
BS10TAB H	13 bar g @ 220 deg C	220 deg C @ 13 bar g
BSPT/NPT	17 bar g @ 232 deg C	232 deg C @ 17 bar g
BSP	12 bar g @ 232 deg C	232 deg C @ 12 bar g

TMO-Maximum Operating Temperature

PMO -Maximum Operating Pressure

Cold Hydraulic Test Pressure : 39 bar g times Operating Pressure

#### 3.5 Operating Range:



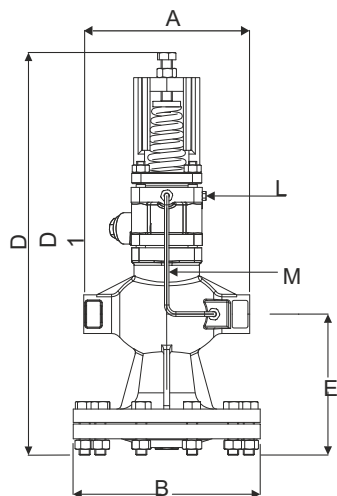
The product **must not** be used in this region.



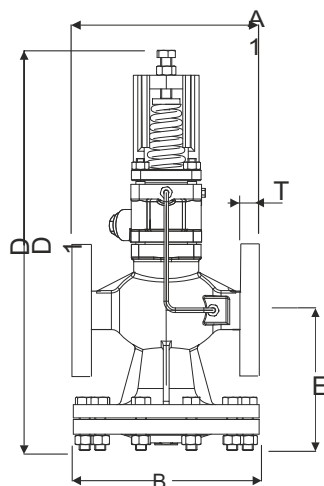
**Materials:**

No	Part	Material	Standard
1	Adjustments screw	Carbon Steel	IS1367Gr14
2	Adjustment lock nut	SS Type 304	
3	Spring housing	SG iron	EN-JS1025 DIN EN 1563
4	Top spring pad	C-20	IS2062
5	Pressure adjustment Spring	SS Type 302	Is4454 Part IV Gr.1
6	Bottom spring pad	SS Type 304	ASTM A276
7	Spring housing Securing nut Securing studs	Carbon Steel Carbon Steel DN 15-32 DN 40, 50	HT IS 1367 HT IS 1367 M10x95mm M12x95mm
8	Pilot diaphragms	SS Type 304	ASTM A240
9	Pilot valve chamber	SG iron	EN-JS1025 DIN EN1563
10	Pilot valve plunger	SS Type 304	
11	Pilot valve seat with integral seal	SS +PTFE	BS 970 431 S29
12	Pilot valve ball	SS	AISI 420
13	Pilot valve Spring	SS	BS 2057 302 S26
14	Pilot Valve clip	SS	ASTM A240 Type 301
15	Pilot filter cap gasket	SS	BS 1449-304-S16
16	Pilot filter cap	SS	ASTM A743 Gr. CA 40
17	Pilot filter element	Bronze	
18	Internal strainer	SS	ASTM A240 Type 304
19	Body gasket	SS forced exfoliated graphite	
20	Main valve return spring	Stainless Steel	BS 2056 302 S26
21	Main valve	Stainless Steel	ASTM A276 Type 420
22	Main valve seat	Stainless Steel	ASTM A276 Type 420
23	Balance pipe assembly	Stainless Steel	ASTM A213 Type 304
24	Main Valve body	SG iron	EN JS1025 DIN EN 1563
25	Lower diaphragm chamber	SG iron	EN-JS1025 DIN EN 163
26	Lower diaphragm chamber Securing nuts Securing Bolts	Carbon steel Carbon steel DN 15 - 25 DN 40, 50	S1367 S 1367 M12x50mm M12x50mm
27	Main diaphragm pad	SS Type 304	ASTM A240
28	Lower diaphragm pad	SS Type 304	ASTM A276
29	Pushrod	SS Type 431	
30	Lock nut	SS Type 316	
31	Control pipe assembly	SS Type 304	ASTM A213
32	Name plate	SS	

### 3.6 Product Dimension and Drawing:



**FMPRV41 SCREWED**



**FMPRV41 FLANGED**

**Dimensions (approx.) in mm**

Size (DN)	A	A1 (DIN)	A1 (ASME)	B	D	D1 (Air)	E	T (DIN)	T (ASME)	Wt.
15	160	130	120.2	180	409	358	129	16	11.6	13kg
15 LC	160	130	120.2	180	409	358	129	16	11.6	13kg
20	160	150	139.4	180	409	358	129	18	13.2	13kg
25	180	160	160	203	432	381	178	18	18	14kg
40	212	212	212	251	450	414	149	22	22	30kg
50	232	232	232	251	480	414	173	25	25	32kg

### 3.7 Pressure Sensing Pipe:

The FMPRV41 controls the pressure by sensing the downstream pressure through a pressure sensing pipe taken to the union (item L ) or through the internal sensing pipe (item M). Fitting of the external pressure sensing pipe is described in the user manual supplied with the valve. Note: Capacity is reduced and there is a possibility of hunting if an external pressure sensing pipe is not fitted.



### 3.8 Steam Capacity Chart:

#### Note

The capacities quoted below are based on valves fitted with an external pressure sensing pipe. Reliance on the internal pressure sensing pipe will mean that capacities may be reduced. In the case of low downstream pressure this reduction could be up to 30% of the valve capacity.

#### 3.8.1 How to Use the Chart (for steam application):

##### Saturated Steam

A valve is required to pass 600kg/h reducing from 6 bar g to 4 bar g. Find the point at which the curved 6 bar g upstream pressure line crosses the horizontal 4 bar g downstream pressure line. A perpendicular dropped from this point gives the capacities of all FMPRV41 sizes under these conditions.

##### Superheated steam

Because of the higher specific volume of superheated steam a correction factor must be applied to the figure obtained from the chart above. For 55°C of superheat the factor is 0.95 and for 100°C of superheat the factor is 0.9. Using the example given for saturated steam, the DN40 valve would pass  $1150 \times 0.95 = 1092 \text{ kg/hr}$ . if the steam had 55°C superheat. It is still big enough to pass the required load of 600kg/hr.

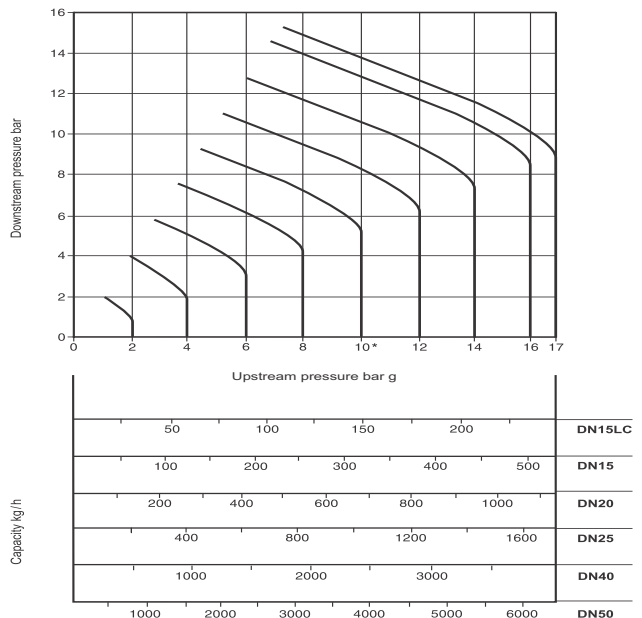
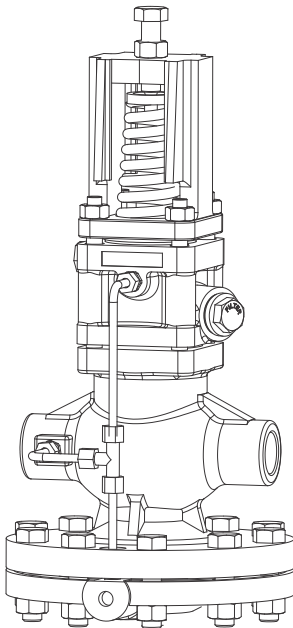


Figure 4: FMPRV 41 Sizing (Steam application)

### 3.8.2. How to Use the Chart: (for air application)

Capacities are given in cubic decimeters of free air per second<sup>3</sup>(dm/s). The use of the capacity chart can be best explained by an example.

Required, a valve to pass 100dm/s of free air reducing from 12 bar g to 8 bar g. Find the point at which the curved 12 bar g upstream pressure line crosses the horizontal 8 bar g downstream pressure line. A perpendicular dropped from this point shows that, a DN15 valve will pass approximately 120 dm/s under these conditions and is the correct valve size to choose.

#### Kv Values

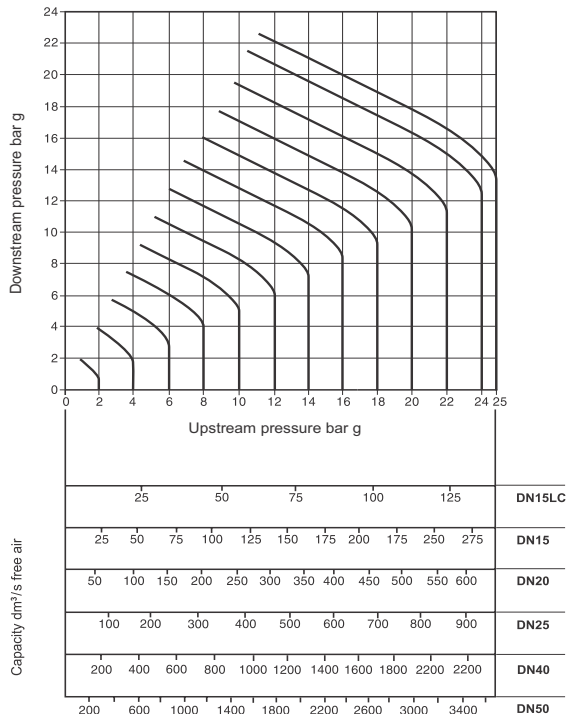
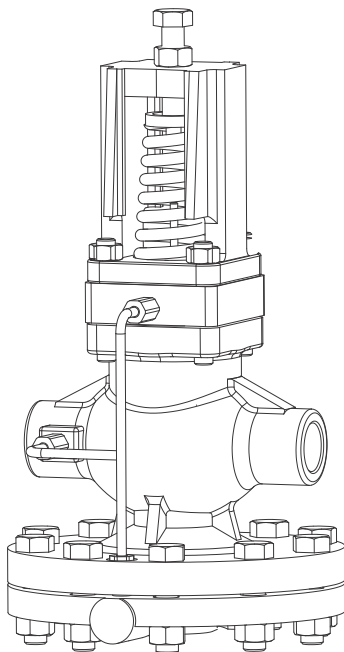
**The Kv values are full capacities and should be used for safety valve sizing purpose only.**

SIZE	DN15	DN20	DN25	DN40	DN50
KV	2.8	5.5	8.1	17	28

For conversion Cv (UK)=Kv x 0.963

Cv (US)=Kv x 1.156

Compressed Air Capacity Chart



**Figure 5: FMPRV 41 Sizing (air application)**

#### **4. Product Working Principle: [Refer to Figure 1]**

A Forbes Marshall Pilot Operated Pressure Reducing Valve balances the downstream pressure through the pressure sensing pipe **(23)** against the pressure adjustment control spring **(5)**. This in turn moves the pilot valve plunger **(10)** in the pilot valve assembly **(10, 11, 12, 13 and 14)**, to control modulate a control pressure which is directly proportional to the pilot valve opening. This pressure is transmitted to the underside of the main diaphragm **(27)** through the control pipe **(31)**. This movement in the diaphragm **(27)** pushes the pushrod **(29)** up and the main valve **(21)** opens in proportion to the pilot valve opening.

Under stable load conditions, the pressure underneath the pilot diaphragm **(8)** balances the force which is set on the adjustment spring **(5)**. This settles the pilot valve, allowing a constant pressure working under the main diaphragm **(27)**. This makes sure that the main valve **(21)** is also settled, hence giving a stable downstream pressure.

When downstream pressure rises, the pressure under the pilot diaphragm **(8)** becomes greater than the force created by the pressure adjustment spring **(5)** and this makes pilot diaphragm**(8)** to move upwards. This closes the pilot valve seat**(11)** and will interrupt the transmission of steam pressure underneath the main diaphragm**(27)**. The top of the main diaphragm **(27)** is always subjected to downstream pressure at all the times and, as there is more pressure above the main diaphragm **(27)** than below, the main diaphragm**(27)** moves down pushing the steam underneath it into the downstream outlet through the control pipe **(31)** and surplus pressure orifice. The pressure on either side of the main diaphragm **(27)** is balanced, and a small excess force created by the main valve return spring **(20)** closes the main valve seat **(22)**.

Any variation in load or pressure will immediately be sensed on the pilot diaphragm **(8)**, which will act to adjust the position of the main valve accordingly, ensuring a constant downstream pressure.

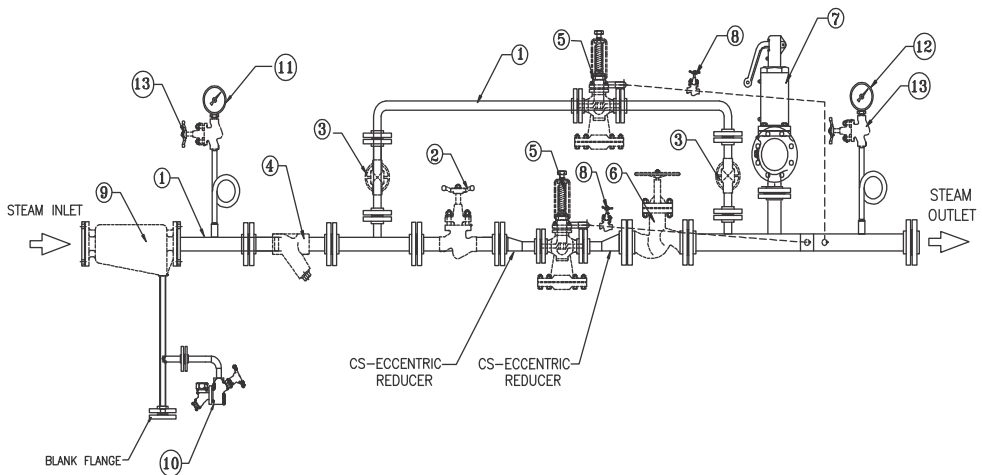
## 5. Installation Guidelines:



**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 that the product is suitable for the intended installation.

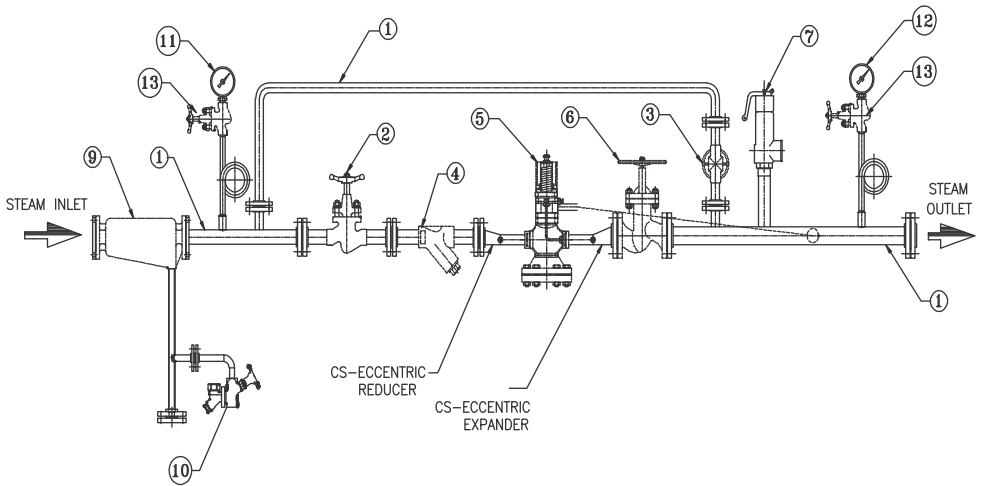
### 5.1 Fitting:

The valve should always be fitted in a horizontal pipeline with the main diaphragm chamber below the line (figure 7). To meet the high capacities or widely varying loads or where stand-by facility is required, two or more valves may be used in parallel (figure 6). For pressure turn down in excess of 10 to 1 consideration should be given to using the two valves in series. To avoid turbulence between the two pressure reducing valves, the distance must be equivalent to at least 50 pipe diameters. To ensure adequate drainage of the space between the two pressure reducing valves a trap set should be fitted as shown in figure 8.



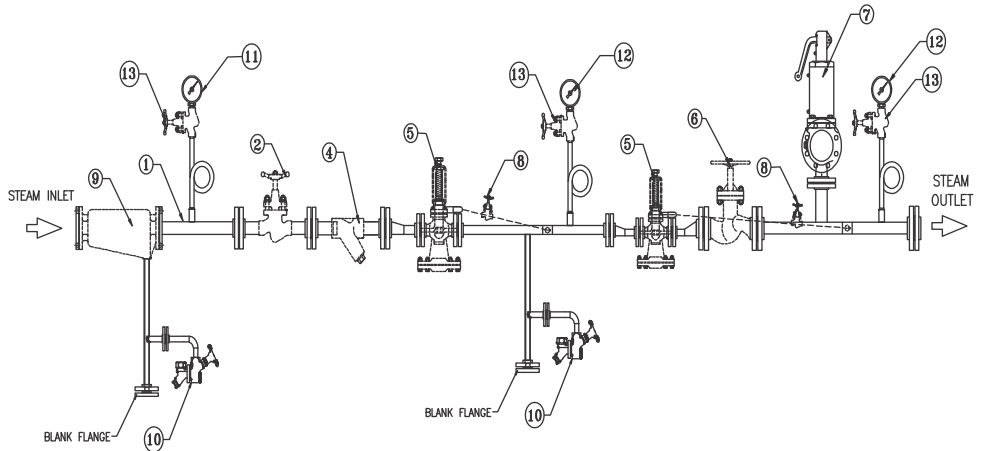
**Figure 6: Recommended installation of FMPRV41**

**\*This is a typical representation of Forbes Marshall Pilot Operated Pressure Reducing Valve**



**Fig. 7: Installation of Two FMPRV41 in parallel**

**\*This is a typical representation of Forbes Marshall Pilot Operated Pressure Reducing Valve**



**Figure 8: Installation of Two FMPRV41 in series**

**\*This is a typical representation of Forbes Marshall Pilot Operated Pressure Reducing Valve**

Sr. No.	DESCRIPTION
1	Interconnecting Pipework for Pressure Reducing Station
2	Stop Valve (Inlet)
3	Stop Valve (Bypass)
4	Strainer
5	Forbes Marshall Pilot Operated Pressure Reducing Valve, FMPRV41
6	Stop Valve (Outlet)
7	Safety Valve
8	Stop Valve ( Pressure Balancing Line)
9	Moisture Separator
10	Drain Trap Assembly
11	Dial Pressure Gauge (Inlet)
12	Dial Pressure Gauge (Outlet)
13	Stop Valve (Dial Pressure Gauge)

## 5.2 Pipeline sizing:

The piping on both sides of the valve must be sized so that velocities do not exceed 30 m/s. normally, a correctly sized FMPRV41 will be smaller than the connecting pipe work.

## 5.3 Pipeline stresses:

Line stresses caused by expansion or inadequate support should not be imposed on the valve body.

## 5.4 Isolating Valves:

These should preferably be of the full bore type.

## 5.5 Removal of condensate:

Ensure that the pipework is supplied with dry steam. The ideal arrangement is to fit a separator in the steam supply. If the steam is known to be dry then a drain pocket may be adequate. If there is a rise in the low pressure line after the valve then a further drain point should be provided to keep the valve drained after shutdown.

## 5.6 Preventing Dirt:

The valve should be protected from dirt / foreign particles using pipeline strainer. The strainer should be fitted on its side to prevent the accumulation of water.

## 5.7 Pressure Control Pipe:

For applications that require closer control, improved stability or maximum capacity condition the internal balance pipe should be replaced by an external pressure sensing pipe (supplied by others) as follows:

Remove the internal balance pipe assembly. The resulting 1/8" BSP tapping in the side of the body should be blanked using a plug provided in the bag attached to the valve. The other 1/4" BSP tapping in the side of the pilot valve chamber should be used to fit the external pressure sensing pipe. This is suitable for the fitting of 13.7mm O/D pipe. If suitable pipe is not available the compression fitting can be removed and 1/4" nominal bore steel pipe screwed directly to the pilot valve chamber. The pressure control pipe should be connected in to the top of the reduced pressure main at a point where in either direction there is a length of straight pipe uninterrupted by fittings for at least 1m or 15 pipe diameters whichever is the greater. It should be arranged with a positive fall so that any condensate can drain away from the FMPRV41. Where the size of the reduced pressure main makes it difficult to maintain a fall when entering the top of the main, the pressure control pipe may be connected in the side of the main.

### **5.8 Pressure gauges:**

It is essential to fit a pressure gauge on the downstream side so that the valve can be properly set. A pressure gauge on the upstream side can also be useful.

### **5.9 Continuous Duty:**

For continuous duty applications where a constant steam supply is essential then a parallel stand-by pressure reducing valve station is recommended to allow for planned maintenance see fig 6. Alternatively a by-pass line can be used (see fig 7). It is important that the by-pass should have a similar capacity to the Forbes Marshall Pilot Operated Pressure Reducing Valve which is achieved by choosing an appropriately sized valve or by using a reduced orifice in the line.

The hand wheel should be pad locked to prevent unauthorised use, and when in use should be under constant manual supervision.

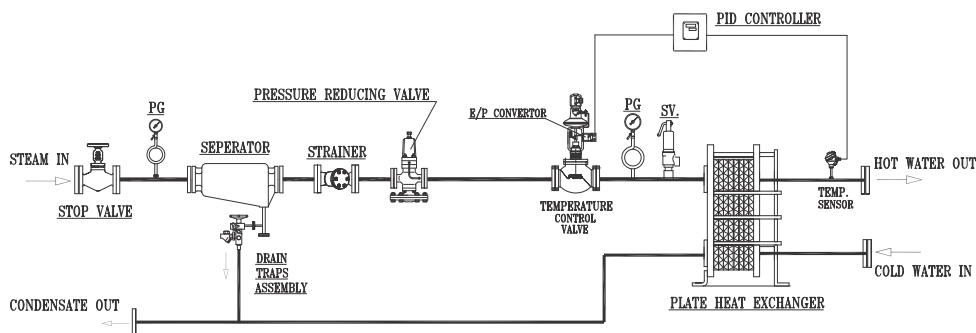
The by-pass may be arranged above or to the side of the main assembly but never below it.

### **5.10 Safety valve:**

A safety valve should be fitted to protect the down steam equipment from excessive pressure. It should be set to lift below the safe working pressure of the downstream equipment and will normally be sized to pass the full capacity of the pressure reducing valve. The safety valve set pressure should take account of its re seat characteristics and the 'No-load' pressure setting of the pressure reducing valve. For example, the typical blowdown value (re seat differential) for a DIN type safety valve is 10% of the set pressure. The minimum possible safety valve set pressure must therefore be equal to the no-load set pressure of the reducing valve plus the blowdown value of the safety valve plus a small margin of at least 0.1bar. If the safety valve lifts and the working pressure is too close then it will not be able to close properly and will simmer, create a leak which is often wrongly diagnosed as a result of a leaking reducing valve.

Discharge pipe work should be taken to a safe place.

## 5.11 Position in relation to other control valves



**Figure 9: FMPRV41 position in relation to other control equipment**

**\*This is a typical representation of FMPRV41 position in relation to other control equipment.**

Line or system stop valves, either remotely actuated or manually, should be installed on the upstream side of the Forbes Marshall Pilot Operated Pressure Reducing Valve FMPRV41.

Where there is downstream control equipment, particularly temperature control valve, ensure the control equipment is atleast 50 pipe diameters away from the FMPRV41 to prevent pressure pulses being transmitted back causing unstable operation and premature wear or if this is impractical an intermediate vessel can provide a similar benefit.

Where a safety valve is required to protect the process system downstream of a FMPRV41 and where a temperature control valve is also being used downstream of the FMPRV41, it is recommended that the safety valve is fitted downstream of the temperature control valve rather than in between the FMPRV41 and the temperature control valve. If any slight leakage occurs this will avoid any pressure build-up causing nuisance operation of the safety valve but provide complete protection for the downstream system.

Where valves are installed downstream of the FMPRV41 the intermediate downstream pipework must be properly trapped to ensure no condensate can build up on the downstream side of the FMPRV41.



## **6. Startup and Commissioning : (Refer figure 7)**

1. Ensure that all connections are properly made and that all stop valves **(2, 3 and 6)** are closed.
2. Close all stop valve **(2, 3 and 6)** at reducing valve station, including valves on bypass line if fitted.
3. Check that adjustment screw of the Forbes Marshall Pilot Operated Pressure Reducing Valve, FMPRV41 **(5)** is turned fully anti-clockwise until spring is slack.
4. Check that the pressure gauge isolating valve **(13)** are open.
5. For correct operation of the FMPRV41 **(5)** it is important that the pilot and main valves are not subjected to dirt or other hard particles. Therefore, prior to bringing the FMPRV41 **(5)** into operation ensure that the upstream pipework has been cleared of all the loose dirt and hard particles and that the main strainer screen **(4)** is examined and cleaned if necessary.
6. Slowly open the upstream stop valve **(2)** until it is fully open.
7. Using a suitable sized spanner slowly turn adjustment screw of FMPRV41 **(5)** in a clockwise direction until desired downstream pressure reading is obtained.
8. Holding the adjustment screw of FMPRV41 **(5)** in position with the spanner tighten down the lock-nut to secure the setting of the adjustment spring.
9. Slowly open the downstream stop valve **(6)** until it is fully open.

**Note:** After installation or maintenance ensure that the system is fully functional. Carry out tests on any alarms or protective devices. It is recommended that after commissioning the pilot filter is changed and the spare one (supplied with the valve) is fitted.

## 7. Maintenance Guidelines:



Before undertaking any maintenance on the product it must be isolated from both supply line and return line and any pressure should be allowed to safely normalize to atmosphere. The body gasket (all FMPRV41 derivatives) and actuating chamber gasket contains a thin stainless steel support ring which may cause physical injury if not handled and disposed of correctly.

### 7.1 Routine and Preventive Maintenance:

Please refer to the maintenance schedule mentioned in the table below to undertake routine maintenance of the FMPRV41.

SR.	PARAMETERS TO BE CHECKED	FREQUENCY FOR CHECKING VARIOUS PARAMETERS					
		Daily	Weekly	Monthly	Quarterly	Half Yearly	Annually
A	Forbes Marshall Pilot Operated Pressure Reducing Valve						
1	Clean Main valve strainer					Y	
2	Clean Pilot valve chamber assembly kit					Y	
3	Check & clean Main / Pilot diaphragm						Y
4	Clean SS tube & stud coupling with split pin					Y	
5	Main valve cleaning					Y	
6	FMPRV41 overhauling and push rod checking						Y
7	Pilot Valve chamber Strainer					Y	

## 7.2 Tool Kit:

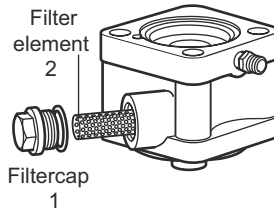
To carry out maintenance of the Forbes Marshall Pilot Operated Pressure Reducing Valve FMPRV41 refer the tools mentioned in the table below.

Size	Component	Tool used and Size
DN 15 /	Main valve seat assembly	Ring spanner 36 mm (A/F)
DN 15	Veriner to measure depth & lift of the push rod (main valve head & seat assembly)	1.8 mm lift
DN 20	Veriner to measure depth and lift of the push rod (main valve head and seat assembly)	2.3 mm lift
DN 25	Main valve seat assembly	Ring spanner 41 mm (A/F)
	Veriner to measure depth and lift of the push rod (main valve head and seat assembly)	2.8 mm lift
DN 15 / 20 /25	Push rod lock nut	Open spanner 13 mm (A/F)
	Lower stud coupling	Box spanner 13 mm (A/F)
	Pilot valve assembly	Ring spanner 19 mm (A/F)
	M12 bolt and nut for bottom plate assembly	Box spanner 19 mm (A/F)
	<b>Pilot Valve Chamber Assembly</b>	
	M10 studs	Stud Runner M10 X 1.5
	Nut	Ring spanner 17mm (A/F)
	Split Pin	Nose Plier
	M10 bolt for housing and spring assembly	Box Spanner 17 mm (A/F)
	4 No control pipe (Elbow fitting )	Open Spanner 13mm (A/F)
DN 40	Lower drain	Open Spanner 10mm (A/F)
	Strainer cap	Box Spanner 19 mm (A/F)
DN 40	Main valve assembly (31mm slot and OD 37mm)	Customer made tool has to be designed.
	Veriner to measure depth and lift of the push rod (main valve head and seat assembly)	4.5 mm lift
DN 50	Main valve assembly (42mm slot and OD 49 mm)	Customer made tool has to be designed.
	Veriner to measure depth and lift of the push rod (main valve head and seat assembly)	4.8 mm lift
DN 40 / 50	Push rod lock nut	Open spanner 17mm (A/F)
	Stud coupling and long nut on lower plate	Box spanner 13 mm (A/F)
	M12 bolt and nut for bottom plate assembly	Box spanner 19 mm (A/F)
	Split Nut	Nose Plier
	<b>Pilot Valve Chamber Assembly</b>	
	M12 stud	Stud Runner M12 X 1.75
	Nut	Ring spanner 24mm (A/F)
	Strainer cap	Box spanner 19 mm (A/F)
	Pilot valve seat	Open spanner 19mm (A/F)
	M12 bolt for housing and spring	Box spanner 19 mm (A/F)
	4 No. control pipe (elbow fitting )	Open spanner 13 mm (A/F)
	Low drain	Open spanner 11mm (A/F)

### 7.3 Procedure to renew the pilot filter element: (Refer to Figure 10)

1. Isolate the reducing valve and depressurize the system completely.
2. Unscrew the filter cap (1) and carefully withdraw the filter element (2).
3. Replace the element and tighten the filter cap.

Note: The gasket is re-usable.

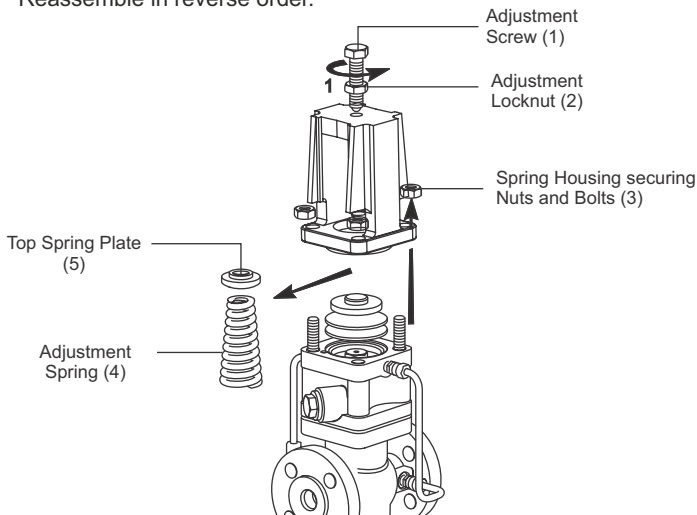


**Figure 10: Filter element**

### 7.4 Procedure to renew or change the pressure adjustment spring: (Refer to Figure 11)

Isolate the reducing valve and completely depressurize the system in order to change the pressure adjustment spring.

1. Release the adjustment lock-nut (2) by turning in the anticlockwise direction.
2. Turn the adjustment screw (1) anticlockwise. Ensure there is no compression on the pressure adjustment spring (4).
3. Undo the 4 off spring housing securing nuts and bolts (3) and remove the spring housing.
4. Remove and replace the pressure adjustment spring (4) and the top spring plate (5). Reassemble in reverse order.



**Figure 11: Pressure adjustment spring**

## 7.5 Procedure to renew the pilot valve assembly FMPRV41steam: (Refer to Figure12)

1. Unscrew the unions of balancing pipe and controlling pipe (1) and release the pipe work.
2. Unscrew spring housing securing nuts and bolts (2), thereby releasing the spring housing, spring (3), top spring plate (4), bottom spring plate (5) and pilot diaphragm (6)
3. Unscrew and remove the pilot valve assembly (7) (19 mm A/F). The pilot assembly has an integral PTFE seal.

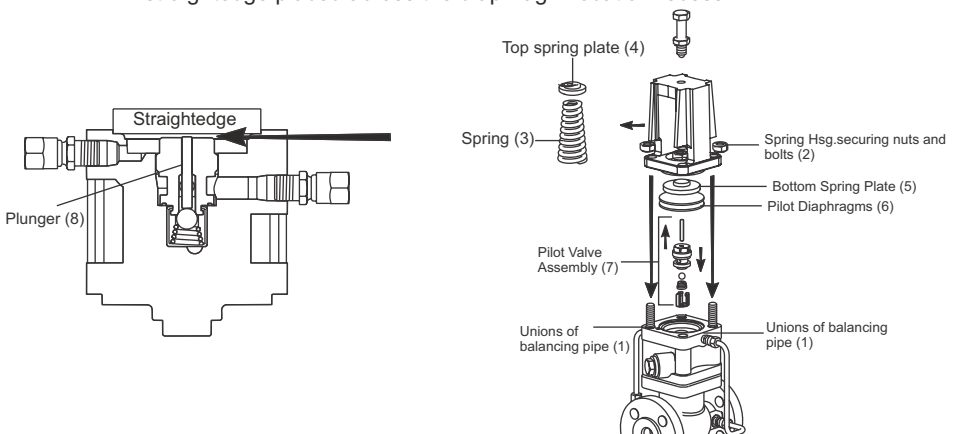
The following handling precautions should be observed.

### Handling precautions for PTFE

Within its working temperature range PTFE is a completely inert material, but when heated to its sintering temperature it gives rise to gaseous decomposition products or fumes which can produce unpleasant effects if inhaled. Fumes can be produced during processing: for example, when the material is heated to sinter it, or when brazed connections are being made to cable insulated PTFE. The inhalation of these fumes is easily prevented by applying local exhaust ventilation to atmosphere as near to their source as possible.

Smoking should be prohibited in workshops where PTFE is handled because tobacco contaminated with PTFE will during burning give rise to polymer fumes. It is therefore important to avoid contamination of clothing, especially the pockets, with PTFE and to maintain a reasonable standard of personal cleanliness by washing hands and removing any PTFE particles lodged under the fingernails.

4. Screw the new pilot valve into the housing and tighten the nuts to the recommended torque (Refer Table1).
5. Check that there is a very slight clearance between the top of the plunger and a straightedge placed across the diaphragm location recess.



**Figure 12: Pilot valve assembly FMPRV41 steam**

6. Refit the two pilot diaphragms (6) and ensure that all contact faces are clean. Diaphragms showing signs of wear or damage should be replaced.
7. Replace the bottom spring plate (5).
8. Assemble the spring housing and tighten the nuts to the recommended torques.

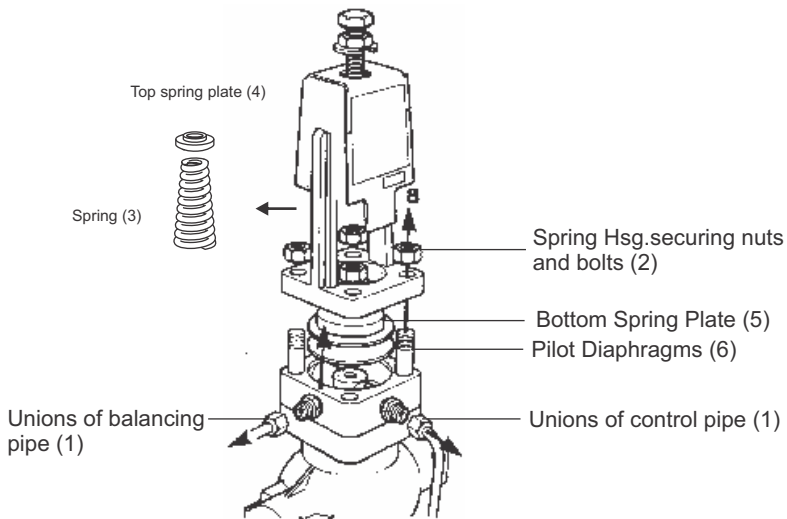
SIZE OF VALVE	NUT SIZE	TIGHTENING TORQUES
Dn15, DN20, DN25	M10	40-50 Nm
DN40 AND DN50	M12	45-55 Nm

**Table 1 : Recommended tightening torques for spring housing nuts**

### 7.6 Procedure to renew the pilot valve assembly for FMPRV41 air: ( Refer to fig.13 & 14)

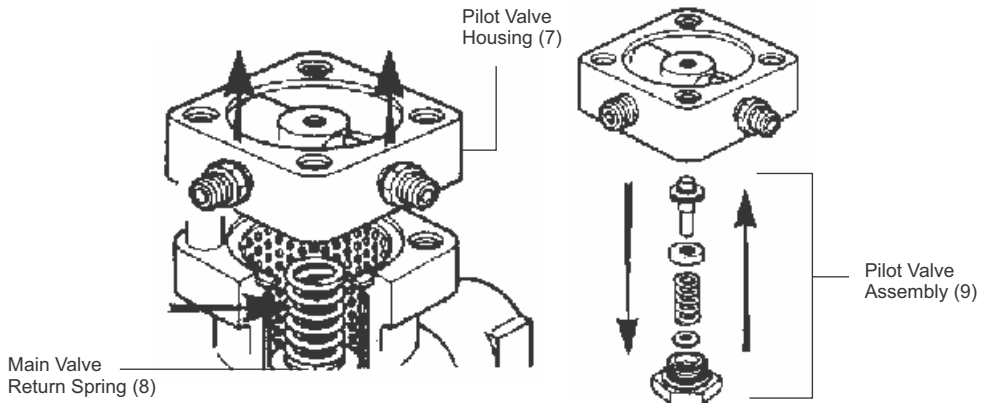
Isolate the reducing valve and zero the pressure.

1. Unscrew the unions of balancing pipe and controlling pipe(1) and release the pipe work.
2. Unscrew spring housing securing nuts and bolts (2), thereby releasing the spring housing, spring(3), top spring plate(4), bottom spring plate(5) and pilot diaphragm (6).



**Figure 13: FMPRV41 air**

3. Remove pilot valve housing(7).
4. Ensure main return spring (8) is still in position.
5. Unscrew and remove pilot valve assembly(9) (22 mm A/F)
6. Screw new pilot valve into housing and tighten the nuts to the recommended torques (Refer Table1)



**Figure 14: Dismantling Pilot Valve housing**

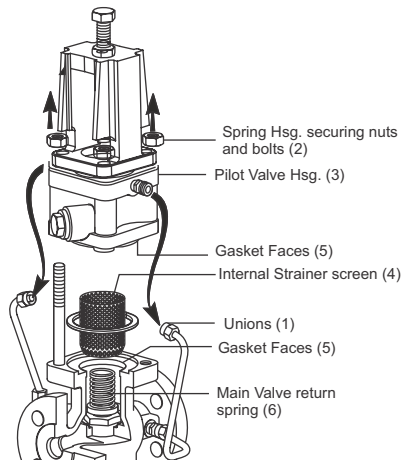
7. Check that there is a very slight clearance between the top of the plunger and a straight edge placed across the diaphragm location recess.

**Note:** The plunger is usually longer than what is required owing to production tolerances. In order to achieve the correct length, it is generally necessary to grind or machine material of the top end. Ensure the sharp edges formed as a result of machining are removed, as these can damage the diaphragm.

#### **7.7 Procedure to clean or replace the internal strainer screen: (FMPRV41 Steam / Air) (Refer to Figure 15)**

Isolate the reducing valve and zero the pressure.

1. Unscrew the unions (1) and release the pipework.
2. Unscrew the spring housing securing nuts and bolts(2).
3. Remove the pilot valve housing (3)
4. Remove the internal strainer screen (4) and clean or replace.
5. Ensure the gasket(5) faces are clean.
6. Check that the main valve return spring (6) is in position.
7. Fit a new gasket.
8. Replace the internal strainer screen.
9. Assembled the pilot valve housing (3) complete with spring housing assembly and tighten the nuts to the recommended torques as shown in table 1.
10. Refit the pipe work and retighten unions to ensure a tight seal. Bring the valve in to commission, following as many steps as necessary in section 6.

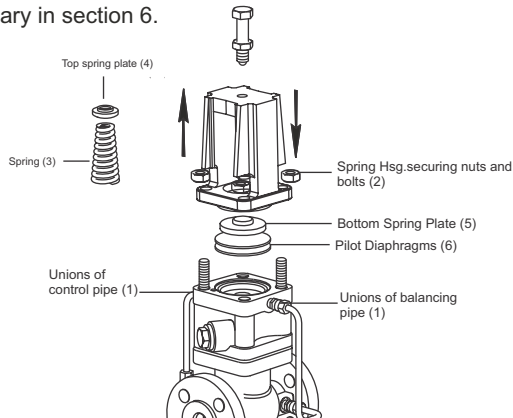


**Figure 15: Procedure to clean or replace the internal strainer screen**

### **7.8 Procedure to renew the pilot valve diaphragms: (FMPRV41 Steam/Air) (Refer to Figure 16)**

Isolate the reducing valve and zero the pressure.

1. Unscrew the unions of balancing pipe and controlling pipe(1) and release the pipe work
2. Unscrew spring housing securing nuts and bolts(2), thereby releasing the spring housing, spring(3), top spring plate(4), bottom spring plate(5) and pilot diaphragm(6)
3. Ensure the bottom spring plate(5) and pilot valve assembly is clean.
4. Replace the pilot valve diaphragms(6).
5. Assemble the spring housing and tighten the nuts to the recommended torque as shown in Table 1. Bring the valve back into commission, following as many steps as necessary in section 6.



**Figure 16: Replacing/ Maintaining Pilot valve diaphragm**



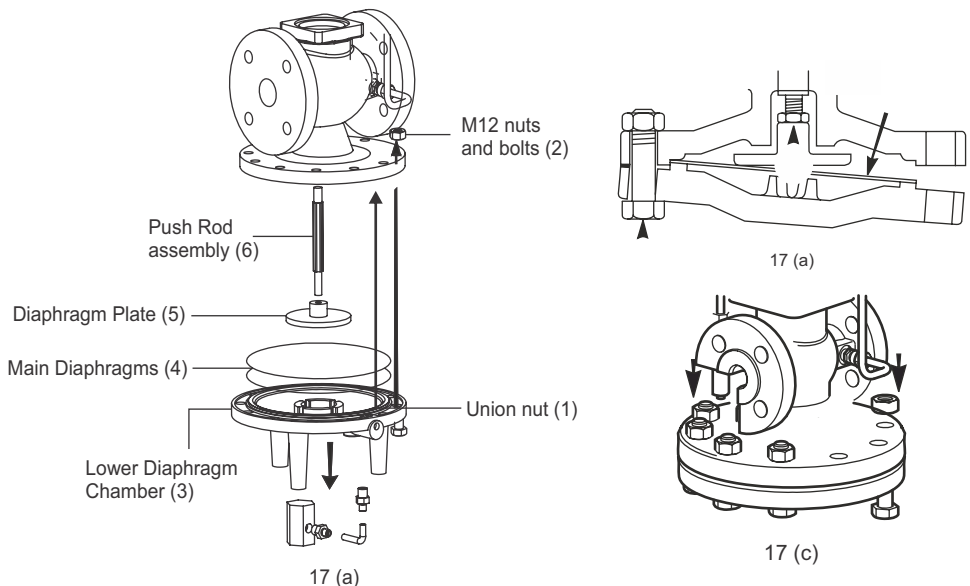
## 7.9 Procedure to renew or clean main diaphragms: (Refer to Figure 17)

Isolate the reducing valve and zero the pressure.

1. Undo the long union nut (1) and pull away.
2. Undo the M12 nuts and bolts (2)
3. Drop away the lower diaphragm chamber (3), the two main diaphragms (4), diaphragm plate (5) and the pushrod assembly (6).
4. Thoroughly clean the lower diaphragm chamber (3) making sure contact faces are clean.
5. Replace the diaphragm plate (5) and pushrod assembly (6) and loosely fit the lower diaphragm chamber (3) on two bolts either side of the union connection
6. Bring the two new diaphragms together and slide into position

If the diaphragms are not renewed, but cleaned only, care must be taken to replace the diaphragms in their original order.

7. Push the lower chamber (3) and tighten the M12 nuts and bolts (2). Progressively and evenly tighten to a torque of 80 - 100 N m .
8. Retighten the long union nut to ensure a steam tight seal.
9. Bring the valve back into commission, following as many steps as necessary in section 6



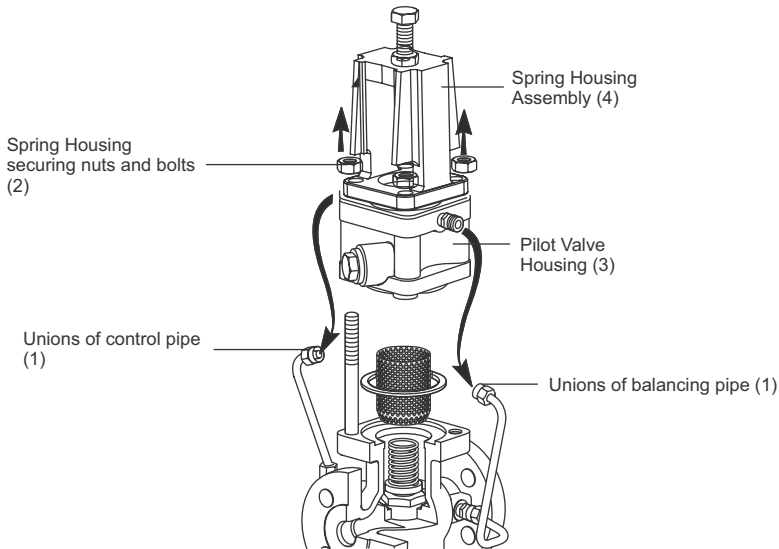
**Figure 17: Main Diaphragms**

### 7.10 Procedure to service or renew the main valve and seat (FMPRV41 Steam/Air): (Refer to Figure 18, 19 and 20)

Isolate the reducing valve and zero the pressure.

**For this section refer to figure 18**

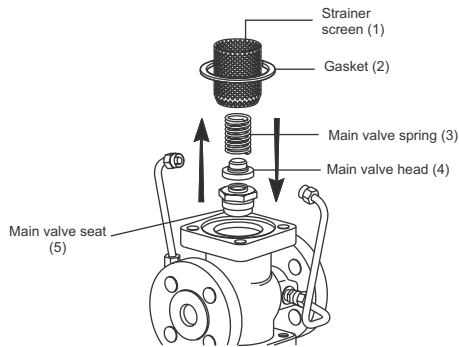
1. Unscrew the unions of balancing pipe and controlling pipe **(1)** and release the pipe work
2. Unscrew spring housing securing nuts and bolts **(2)**, thereby releasing the pilot valve housing **(3)**, complete with spring housing assembly **(4)**.



**Figure 18: (FMPRV41 Steam/Air)**

**For this section refer to figure 19**

3. Remove the strainer screen **(1)** and gasket **(2)** and clean.
4. Remove the main valve spring **(3)** and the main valve head **(4)**. Clean to remove dirt or scale as necessary.
5. Remove the main valve seat **(5)**. Clean and remove dirt and scale as necessary.
6. Examine the faces of the main valve head **(4)** and seat **(5)**. If they are only slightly worn they may be lapped on a flat plate using a fine grinding paste. If either is badly worn or unfit for further use they must be replaced.
7. Refit the valve seat **(5)** applying jointing compound to the seating faces and tighten to the recommended torque as shown in Table 2.

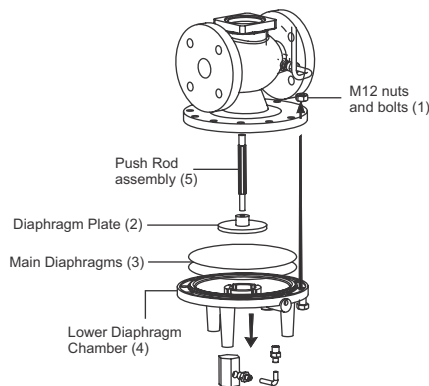


**Figure 19: Cleaning the main valve head and seat**

Where a new part has been fitted it will be necessary to reset the main valve pushrod to give the correct valve lift: (Refer to Figure 20)

To do this it is necessary to expose the main diaphragm plate (2) and pushrod assembly (5).

1. Undo the long nuts and pull away.
2. Undo the M12 nuts and bolts (1).
3. Drop away the lower diaphragm chamber (4), the two diaphragms (3), and diaphragm plate (2) and pushrod assembly(5)



**Figure 20: Resetting the main valve pushrod**

Size of valve	Width across flats	Tightening torques
DN15	30 mm A/F (External)	110 - 120 N m
DN20	36 mm A/F (External)	140 - 150 N m
DN25	19 mm A/F (Inside)	230 - 250 N m
DN40	30 mm A/F (Inside)	450 - 490 N m
DN50	41 mm A/F (Inside)	620 - 680 N m

**Table 2: TORQUE FOR MAIN VALVE SEAT FMPRV41 STEAM/AIR**

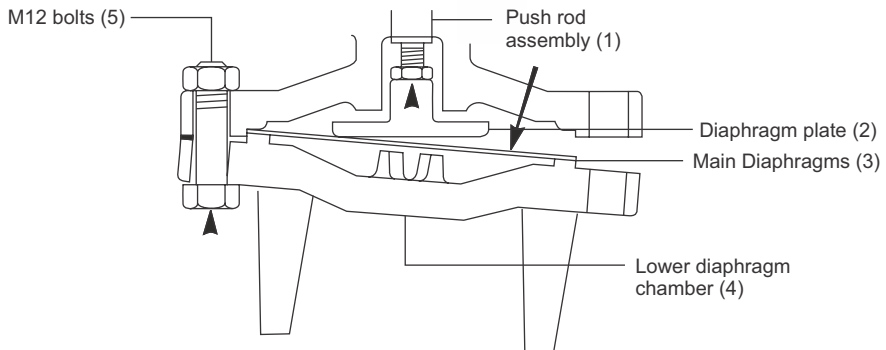
4. Refit the pushrod assembly.
5. Refit the main valve head, make sure valve locates on seat.
6. Check the valve lift shown in Table 3 using a depth gauge and adjust if necessary byscrewing the pushrod in or out of the diaphragm plate.

**Table 3 : VALVE LIFT FMPRV41 STEAM/AIR**

Size of Valve	Valve Lift
DN15	1.8
DN20	2.3
DN25	2.8
DN40	4.3
DN50	4.8

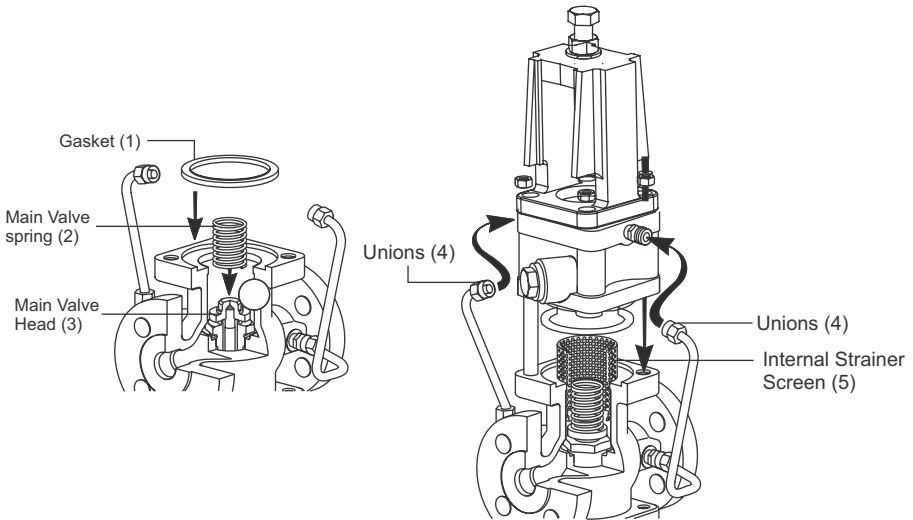
**For this section refer to figure 21**

7. Thoroughly clean the lower diaphragm chamber (4) making sure contact faces are clean.
8. Replace the diaphragm plate (2) and pushrod assembly (1) and loosely fit the lower diaphragm chamber on two bolts (5) either side of the union connection to locate the spigot in the recess.
9. Refit the diaphragms (3) in exactly the same way as when they were dismantled.
10. Push the lower diaphragm chamber (4) home to locate in the recess and refit the M12 nuts and bolts. Progressively and evenly tighten to a torque of 80 - 100 N m.
11. Retighten the long union nut to ensure a steam tight seal.



**Figure 21: Resetting the main valve pushrod**

### 7.11. Procedure to reassemble the valve: (Refer to Figure 22)



**Figure 22: Reassembling**

1. Refit the main valve head(3).
2. Replace the main valve return spring(2).
3. Fit a new gasket(1).
4. Replace the internal strainer screen(5).
5. **FMPRV41 - Steam**

Assemble the pilot valve housing complete with spring housing assembly and tighten the nuts to the recommended torques.

#### **FMPRV41 - AIR**

Assemble the pilot valve housing and tighten the nuts to the recommended torques

6. Refit the pipework and retighten the unions (4) to ensure a tight seal. Bring the valve back into commission, following as many Steps as necessary in Section 6.

## 8. Troubleshooting:

Before undertaking the following fault finding procedure, ensure the valve has been isolated and that upstream & downstream pressures are zero. Possible fault checks are given in a logical order below. A pressure reducing valve typically has the following failure modes:

### 1) Downstream pressure zero or too low:

If downstream pressure of Forbes Marshall Pilot Operated Pressure Reducing Valve is zero, please check following before dismantling the Forbes Marshall Pilot Operated Pressure Reducing Valve.

1. Downstream pressure gauge: - Please ensure that it should be in working condition.
2. Upstream pressure: - It Should be as per the pressure reducing valve upstream design pressure.
3. Isolation valve not fully Open - Ensure Upstream & Downstream Isolation valves are in full open condition
4. Upstream Strainer Clogged – Ensure upstream Strainer is in clean condition: Clean it if it is found as clogged.

Failure Mode	Possible Cause	Remedy
<b>Downstream pressure zero or too low</b>	Pressure adjustment bolt	Please ensure that pressure adjustment bolt is not in loose condition. If so, rotate it clockwise slowly to set the desired downstream pressure.
	Clogging in pressure reducing valve	Ensure Pilot valve strainer, Control pipe assembly & SS hex coupling fixed to bottom diaphragm chamber are clean. If found clogged clean it properly. Check the internal balancing line for blockage.
	Main Diaphragms	If main diaphragms are permanently deformed or punctured - replace the same.
	Jamming of push rod	Please check if Push rod is jammed in liner bush at lower position. Open & clean it.
	Main valve lift disturbed:	Check that pushrod lock nut is intact & it is in full tightens condition. If it is loose there is a chance that the main valve lift may be reduced. To re adjust the main valve lift, Please refer the main valve lift setting video clip.

## 2) Downstream pressure is equal to upstream pressure:

If downstream pressure of Forbes Marshall Pilot Operated Pressure Reducing Valve is equal to upstream pressure, please check following before dismantling the Forbes Marshall Pilot Operated Pressure Reducing Valve.

1. By Pass isolation valve: - Please ensure that it should not be leaking & should be in full closed condition.
2. Feedback line: - Isolation valve installed in the feedback line should be fully open and the line should not be clogged, clean it if necessary.

Failure Mode	Possible Cause	Remedy
<b>Downstream pressure is equal to upstream pressure</b>	Pressure adjustment bolt	<ol style="list-style-type: none"> <li>1. Please ensure that pressure adjustment bolt is not in full tight condition. Release it fully, ensure that the downstream pressure is zero and re adjust the required downstream pressure by slowly rotating it clockwise.</li> <li>2. If downstream pressure does not respond to the adjustment bolt rotation, check the pilot valve or main valve leakage by following the next step. <ol style="list-style-type: none"> <li>A) Close the upstream isolation valve</li> <li>B) Loosen the pressure adjustment bolt and Make the downstream pressure zero</li> <li>C) Remove the SS tubing from Pilot valve chamber &amp; center T Joints</li> <li>D) Open the upstream isolation valve slowly &amp; check for steam leakage</li> <li>E) If steam coming from Pilot valve chamber – it means Pilot valve is leaking.</li> <li>F) Clean the Pilot valve or replace it, if required.</li> <li>G) If steam coming from “T” joint – It means either Main valve is leaking or Main valve return Spring is broken - Clean &amp; lap the main valve head or replace the MV return spring if found broken. If the problem still persists then follow the next step.</li> </ol> </li> </ol>
	Check the control orifice	Clean it if found clogged.
	Check pilot diaphragm	Replace if found deformed or damaged.
	Pushrod locknut	Check that pushrod lock nut is intact & it is in full tighten condition. If it is loose there is a chance that the main valve lift may be disturbed. To re adjust the main valve lift.

### 3) Hunting:

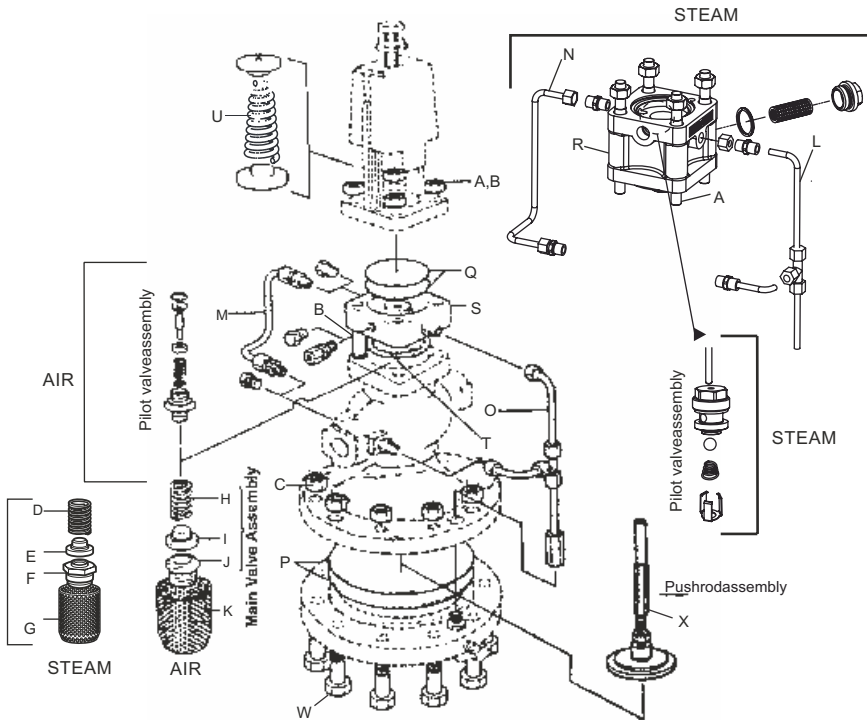
Hunting or Pressure Fluctuations may coincide with variations in steam load. In such case, check following before dismantling the Forbes Marshall Pilot Operated Pressure Reducing Valve.

1. WET Steam- Ensure steam is not wet and Moisture separator is installed before the pressure reducing valve & the steam trap below it, is operational.
2. Up Stream Pressure – It is recommended to have stable upstream pressure however the Forbes Marshall Pilot Operated Pressure Reducing Valve will give constant downstream pressure with + or - 20% variation in designed Upstream pressure.
3. Partial Blockage in Upstream - If the pressure drops during full-load conditions, it is possible that there is a partial blockage in the upstream line or that the upstream pipe work is undersized. Steam Line should be sized properly to carry the required steam flow rate at given pressure considering steam velocity of 25 M/S. Please refer steam line sizing chart for correct steam line size.
4. Isolation valves - Ensure Upstream & Downstream Isolation valves are in full open condition. By pass valve should be in full closed condition and it should not be leaking.
5. Upstream Strainer Clogged – Ensure upstream Strainer is in clean condition: Clean it if it is found as clogged.
6. Bypass valve – Check whether the bypass valve is leaking. Replace if found so.

Failure Mode	Possible Cause	Remedy
<b>Hunting</b>	Sticking of push rod in the Main Valve Chamber	Check that the Main valve pushrod is not sticking. Open & clean it. Also check whether the push rod outer surface is not deformed. Replace the push rod if it is found deformed.
	Diaphragms Over Stretched / permanently deformed	If Pilot diaphragms or main diaphragms overstretched or deformed -replace the same.
	pressure reducing valve sizing.	Set the pressure reducing valve in no flow condition i.e. all process valves are closed. Now Apply full- load to the pressure reducing valve by opening all the process valves. If the downstream pressure drops excessively during full-load condition but it is maintaining by opening of by-pass valve, it is likely that the valve is undersized; in which case it should be replaced. Please refer the pressure reducing valve sizing chart given in Technical information sheet to know the correct pressure reducing valve size. Consult Forbes Marshall for correct sizing of the valve.
	Check Split pin port	Check the port is clean and the split pin is free to move



**9. Available Spares:**



**Figure 23: Parts Available as spares (Heavy outline ) for FMPRV41**

Sr.No.	SPARE PART	SPARE CONSIST OF	PART No. Ref.Fig.23	SPARE CODE
1	MAIN VALVE KIT (STEAM) 15NB	SEAT , VALVE HEAD, RETURN SPRING , BODY GASKET, BODY SCREEN (PACK OF 1 NO. EACH )	D,E,F,G	SPARE-015FMPRV41- MVSKIT
	MAIN VALVE KIT (STEAM) 15NB (LOW CAPACITY)			SPARE-015FMPRV41LC- MVSKIT
	MAIN VALVE KIT (STEAM) 20NB			SPARE-020FMPRV41- MVSKIT
	MAIN VALVE KIT (STEAM) 25NB			SPARE-025FMPRV41- MVSKIT
	MAIN VALVE KIT (STEAM) 40NB			SPARE-040FMPRV41- MVSKIT
	MAIN VALVE KIT (STEAM) 50NB			SPARE-050FMPRV41- MVSKIT
2	MAIN VALVE KIT (GAS) 15NB	SEAT , VALVE HEAD WITH SOFT SEATING, RETURN SPRING ,BODY GASKET,BODY SCREEN (PACK OF 1 NO. EACH )	H,I,J,K	SPARE-015FMPRV41- MVGKIT
	MAIN VALVE KIT (GAS) 15NB (LOW CAPACITY)			SPARE-015FMPRV41LC- MVGKIT
	MAIN VALVE KIT (GAS) 20NB			SPARE-020FMPRV41- MVGKIT
	MAIN VALVE KIT (GAS) 25NB			SPARE-025FMPRV41- MVGKIT
	MAIN VALVE KIT (GAS) 40NB			SPARE-040FMPRV41- MVGKIT
	MAIN VALVE KIT (GAS) 50NB			SPARE-050FMPRV41- MVGKIT

Sr.No.	SPARE PART	SPARE CONSIST OF	PART No. Ref.Fig.23	SPARE CODE
3	MAIN VALVE RETURN SPRING 15/20/25NB	MAIN VALVE RETURN SPRING & BODY GASKET, (PACK OF 1 NO. EACH )	D,T	SPARE-152025FMPRV41-MVRSKIT
	MAIN VALVE RETURN SPRING 40/50 NB			SPARE-4050FMPRV41-MVRSKIT
4	PILOT DIAPHRAGM KIT (STEAM/ GAS) 15/20/25/40/50NB	DIAPHRAGMS (PACK OF 10 NOS.)	Q	SPARE-1550FMPRV41-PDKIT
5	MAIN DIAPHRAGM KIT (STEAM/ GAS) 15/20NB	DIAPHRAGMS (PACK OF 2 NOS.)	Q	SPARE-1520FMPRV41-MDKIT
	MAIN DIAPHRAGM KIT (STEAM/ GAS) 25NB		P	SPARE-25FMPRV41-MDKIT
	MAIN DIAPHRAGM KIT (STEAM/ GAS) 40/50NB		P	SPARE-4050FMPRV41-MDKIT
6	BALANCING PIPE ASSEMBLY KIT (STEAM) 15/20NB	'L' SHAPE PIPE ASSEMBLY WITH STUD COUPLINGS (PACK OF 01 NO. PIPE & 02 NOS. OF STUD COUPLINGS)	N	SPARE-1520FMPRV41-BPSKIT
	BALANCING PIPE ASSEMBLY KIT (STEAM) 25NB			SPARE-25FMPRV41-BPSKIT
	BALANCING PIPE ASSEMBLY KIT (STEAM) 40NB			SPARE-40FMPRV41-BPSKIT
	BALANCING PIPE ASSEMBLY KIT (STEAM) 50NB			SPARE-50FMPRV41-BPSKIT
7	BALANCING PIPE ASSEMBLY KIT(GAS) 15/20NB	'L' SHAPE PIPE ASSEMBLY WITH STUD COUPLINGS (PACK OF 01 NO. PIPE & 02 NOS. OF STUD COUPLINGS)	M	SPARE-1520FMPRV41-BPGKIT
	BALANCING PIPE ASSEMBLY KIT(GAS) 25NB			SPARE-25FMPRV41-BPGKIT
	BALANCING PIPE ASSEMBLY KIT(GAS) 40NB			SPARE-40FMPRV41-BPGKIT
	BALANCING PIPE ASSEMBLY KIT(GAS) 50NB			SPARE-50FMPRV41-BPGKIT

Sr.No.	SPARE PART	SPARE CONSIST OF	PART No. Ref.Fig.23	SPARE CODE
8	CONTROL PIPE ASSEMBLY KIT (STEAM) 15/20NB	CONTROL PIPE AND STUD COUPLING ASSEMBLY WITH 'T' JOINT (PACK OF 03 NOS. OF PIPES & 03 NOS. OF STUD COUPLINGS)	L	SPARE-1520FMPRV41-CPSKIT
	CONTROL PIPE ASSEMBLY KIT (STEAM) 25NB			SPARE-25FMPRV41-CPSKIT
	CONTROL PIPE ASSEMBLY KIT (STEAM) 40NB			SPARE-40FMPRV41-CPSKIT
	CONTROL PIPE ASSEMBLY KIT (STEAM) 50NB			SPARE-50FMPRV41-CPSKIT
9	CONTROL PIPE ASSEMBLY KIT (GAS) 15/20NB	CONTROL PIPE AND STUD COUPLING ASSEMBLY WITH 'T' JOINT (PACK OF 03 NOS. OF PIPES & 03 NOS. OF STUD COUPLINGS)	O	SPARE-1520FMPRV41-CPGKIT
	CONTROL PIPE ASSEMBLY KIT (GAS) 25NB			SPARE-25FMPRV41-CPGKIT
	CONTROL PIPE ASSEMBLY KIT (GAS) 40NB			SPARE-40FMPRV41-CPGKIT
	CONTROL PIPE ASSEMBLY KIT (GAS) 50NB			SPARE-50FMPRV41-CPGKIT
10	PILOT VALVE ASSEMBLY KIT (STEAM) 15/20/25/40/50NB	PILOT VALVE ASSEMBLY, PLUNGER, METALLIC GASKET (PACK OF 01 NO.EACH)	-	SPARE-1550FMPRV41-PVSKIT
11	PILOT VALVE ASSEMBLY KIT(GAS) 15/20/25/40/50NB	PILOT VALVE ASSEMBLY, PLUNGER, O-RING (PACK OF 01 NO.EACH)	-	SPARE-1550FMPRV41-PVGKIT
12	FILTER KIT 15/20/25/40/50NB	PILOT VALVE CHAMBER FILTER PACK OF 3 NO'S	-	SPARE-1550FMPRV41-PVFKIT
13	PILOT VALVE CHAMBER ASSEMBLY KIT (STEAM) 15/20/25NB	PILOT VALVE CHAMBER CASTING, PILOT VALVE ASSEMBLY & PLUNGER (PACK OF 01 NO. EACH)	N,R,A,L,Q	SPARE-1525FMPRV41-PCSKIT
	PILOT VALVE CHAMBER ASSEMBLY KIT (STEAM) 40/50NB			SPARE-4050FMPRV41-PCSKIT

Sr.No.	SPARE PART	SPARE CONSIST OF	PART No. Ref.Fig.23	SPARE CODE
14	PILOT VALVE CHAMBER ASSEMBLY KIT (GAS) 15/20/25NB	PILOT VALVE CHAMBER CASTING, PILOT VALVE ASSEMBLY & PLUNGE (PACK OF 01 NO.EACH)	Q,S,M,O,T R	SPARE-1525FMPRV41- PCGKIT
	PILOT VALVE CHAMBER ASSEMBLY KIT (GAS) 40/50NB			SPARE-4050FMPRV41- PCGKIT
15	BODY GASKET KIT (STEAM/GAS) 15/20/25NB	GASKET BETWEEN PRV BODY AND PILOT VALVE CHAMBER (PACK OF 10 NOS.)	T	SPARE-1525FMPRV41- BGKIT
	BODY GASKET KIT (STEAM/GAS) 40/50NB			SPARE-4050FMPRV41- BGKIT
16	PRESSURE ADJUSTMENT CONICAL SPRING 15/20/25/40/50NB	CONICAL SPRING RANGE 0.2 - 17 BAR (QTY - 01 NO.)	U	SPARE-1550FMPRV41- 17PASKIT
17	PUSH ROD ASSEMBLY KIT (STEAM/GAS) 15/20NB	PUSH ROD, LOCK NUT & LOWER DIAPHRAGM PAD (PACK OF 01 NO. EACH)	-	SPARE-1520FMPRV41- PRKIT
	PUSH ROD ASSEMBLY KIT (STEAM/GAS) 25NB		-	SPARE-25FMPRV41- PRKIT
	PUSH ROD ASSEMBLY KIT (STEAM/GAS) 40NB		-	SPARE-40FMPRV41- PRKIT
	PUSH ROD ASSEMBLY KIT (STEAM/GAS) 50NB		-	SPARE-50FMPRV41- PRKIT
18	SPRING HOUSING KIT (STEAM ) 15/20/25NB	SPRING HOUSING CASTING, STUDS & NUTS (SPRING HOUSING - PACK OF 01 NO. , STUDS & NUTS - PACK OF 04 NOS. EACH)	A,B	SPARE-1525FMPRV41- SHKIT
	SPRING HOUSING KIT (STEAM ) 40/50NB			SPARE-4050FMPRV41- SHKIT
19	BODY LOWER BOLT & NUT KIT (STEAM/GAS) 15/20/25NB	BOLTS & NUTS (PACK OF 10 NOS. EACH)	W	SPARE-1525FMPRV41- BBNKIT
	BODY LOWER BOLT & NUT KIT (STEAM/GAS) 40/50NB	BOLTS & NUTS (PACK OF 12 NOS. EACH)		SPARE-4050FMPRV41- BBNKIT

Sr.No.	SPARE PART	SPARE CONSIST OF	PART No. Ref.Fig.23	SPARE CODE
20	REPAIR KIT (STEAM) 15NB	PILOT VALVE CHAMBER ASSEMBLY, VALVE HEAD, PUSH ROD ASSEMBLY, BODY GASKET, MAIN VALVE SPRING, CONTROL & BALANCING PIPE ASSEMBLY (EACH 01 NO), PILOT & MAIN DIAPHRAGM-2 NO'S EACH,	N,R,A,L,E, X,T,D,L,O, Q,P	SPARE-15FMPRV41-RKIT
	REPAIR KIT (STEAM) 20NB			SPARE-20FMPRV41-RKIT
	REPAIR KIT (STEAM) 25NB			SPARE-25FMPRV41-RKIT
	REPAIR KIT (STEAM) 40NB			SPARE-40FMPRV41-RKIT
	REPAIR KIT (STEAM) 50NB			SPARE-50FMPRV41-RKIT

**How to Order:**

1 no. Forbes Marshall Pilot Operated Forbes Marshall Pilot Operated Pressure Reducing Valve, DN 40 FMPRV41 having a 0.2-17 bar g spring and flanged BS10 table "F/H" connections.

**10. Warranty Period:**

As per the ordering information and agreement in the contract.



[www.forbesmarshall.com](http://www.forbesmarshall.com)

Forbes Marshall Arca

Codel International

Krohne Marshall

Forbes Vyncke

Forbes Marshall Steam Systems

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