

Installation and Maintenance Manual

Forbes Marshall Direct Acting Pressure Reducing Valve

FMDR31



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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.

Forbes Marshall Direct Acting Pressure Reducing Valve [FMDR31]

Sizes: DN15 (1/2"), DN 20 (3/4") & DN 25 (1")

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:

Description :

The Forbes Marshall Cast Iron Direct Acting Pressure Reducing Valves are used for reducing pressure in steam, air and water applications.

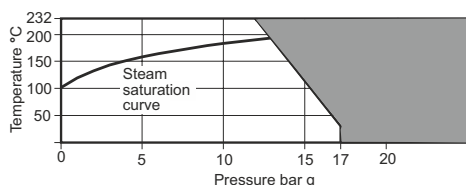
Sizes and End Connections :

DN15, DN20, DN25 Screwed: BSPT/NPT

Limiting Conditions :

Maximum Operating Pressure	17 barg
Maximum Operating Temperature	232 Deg C
Minimum Inlet Pressure	1.5 barg
Maximum Differential Pressure	8.5 barg
Minimum Differential Pressure	1.5 barg

Operating Range:



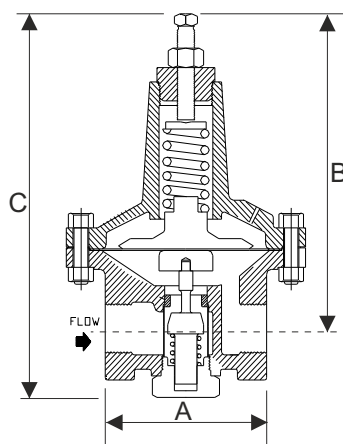
The product **must not** be used in this region.

Dimensions and Weight (approx.) in mm and kg

Size	A	B	C	Weight (Kg)
DN15	92	165	203	3.5
DN20	92	165	203	3.5
DN25	114	215	266	8

Pressure Adjustment Spring Ranges – Spring Number and Colour Code

Spring Type	Outlet Pressure (barg)	DN15	DN20	DN25
Single Spring	0 - 0.7	13 (Blue/yellow)	13 (Blue/yellow)	7 (red/green)
	0.7 - 2.0			8 (red/blue)
	0.7 - 3.4	14 (black/yellow)	14 (black/yellow)	
	2.0 - 3.4			9 (red/yellow)
	2.7 - 5.8			10 (green/blue)
	2.7 - 6.8	9 (red/yellow)	9 (red/yellow)	
	6.8 - 13.7	10 (green/blue)	10 (green/blue)	

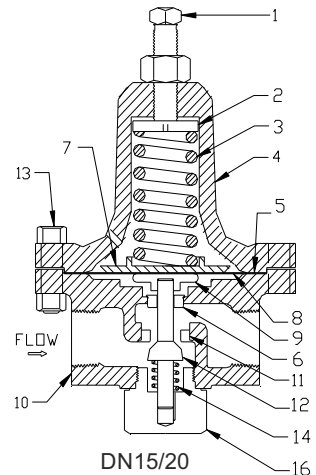


3.6 Product Dimension and Drawing:

Materials:

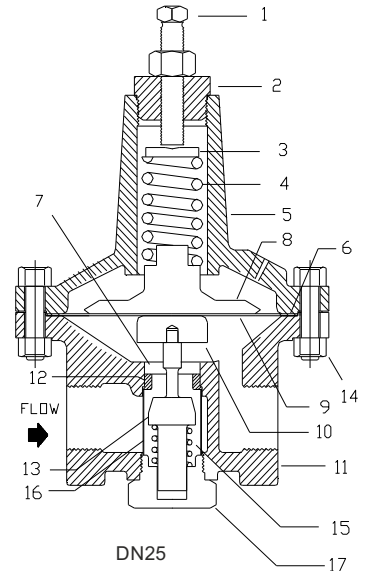
DN15/20

X3st	Part details	Material
1	Adjusting screw with lock Nut	Steel GR5 zinc plated
2	Spring Washer	Stainless Steel
3	Adjusting Spring	Stainless Steel 302
4	Cover	Cast Iron ASTM A126 CL B
5	Cover Gasket	Garlock 3400
6	Stem Guide	Stainless Steel ,ASTM A 276 SS416
7	Upper Diaphragm plate	BRASS
8	Diaphragm	BRONZE ,ASTM B103 Gr A
9	Lower Diaphragm plate	SS 303
10	Body Assly	Cast Iron ASTM A126 CL 30
11	Valve Seat	STAINLES S STEEL ASTM A582 420F
12	Valve Plug	STAINLES S STEEL ASTM A528 416
13	Cover bolts & nuts	Steel GR5 zinc plated
14	Main valve Spring	Stainless Steel 302
15	Strainer Screen	Stainless Steel 304
16	Bottom Plug	BRASS



DN25

IBÖÖ	Part details	Material
1	Adjusting screw with lock Nut	Steel GR5 zinc plated
2	Adjusting Spring Cap	Carbon Steel , ASTM A 108 Gr 12L14
3	Spring Washer	Stainless Steel
4	Adjusting Spring	Stainless Steel 302
5	Cover	Cast Iron ASTM A126 CL B
6	Cover Gasket	Garlock 3400
7	Stem Guide	Stainless Steel ,ASTM A 276 SS416
8	Upper Diaphragm plate	CAST IRON ,ASTM A 126 CL B
9	Diaphragm	BRONZE ,ASTM B103 Gr A
10	Lower Diaphragm plate	ASTM A 108-90
11	Body Assly	Cast Iron ASTM A126 CL B
12	Valve Seat	STAINLESS STEEL ASTM A582 420F
13	Valve Plug	STAINLESS STEEL ASTM A528 416
14	Cover bolts & nuts	Steel GR5 zinc plated
15	Main valve Spring	Stainless Steel 302
16	Strainer Screen	Stainless Steel 304
17	Bottom Plug	BRASS



Tightening Torques:

Item number	Part Detail	Torque (Nm)
14	Cover	18-24
13	Bottom Plug	45-50

3.6 Steam Capacity Chart:

Capacity Chart – Steam (kg/hr), Air (SCFM), Water (m3/hr)

Inlet Pressure	Outlet Pressure	DN 15			DN 20			DN 25		
		Steam	Air	Water	Steam	Air	Water	Steam	Air	Water
1.5	0.13	21	26	1	21	26	1	59	73	4
	0.34	17	21	1	17	21	1	48	59	3
1.5	0.34	29	36	2	29	36	2	83	102	5
	0.68	27	34	1	27	34	1	78	97	4
	1.03	20	25	1	20	25	1	58	72	3
2.06	0.34	37	46	2	37	46	2	106	131	6
	0.68	37	46	2	37	46	2	106	131	6
	1.38	32	40	1	32	40	1	90	112	4
3.44	0.34	54	67	3	54	67	3	154	190	9
	1.72	54	67	2	54	67	2	154	190	6
	2.75	39	49	1	39	49	1	111	138	4
6.89	2.06	96	119	4	96	119	4	273	337	11
	3.44	96	119	3	96	119	3	273	337	9
	4.82	88	109	3	88	109	3	176	218	6
8.61	2.06	117	145	4	117	145	4	333	410	13
	3.44	117	145	4	117	145	4	333	410	11
	4.82	117	145	3	117	145	3	333	410	10
	6.89	90	112	2	90	112	2	256	318	6
10.34	2.06	138	171	5	138	171	5	392	484	14
	3.44	138	171	5	138	171	5	392	484	13
	4.82	138	171	4	138	171	4	392	484	12
	6.89	134	166	3	134	166	3	380	471	9
	8.27	108	133	3	108	133	3	305	378	7
13.78	2.06	180	222	6	180	222	6	511	630	17
	3.44	180	222	6	180	222	6	511	630	16
	4.82	180	222	5	180	222	5	511	630	15
	6.89	180	222	5	180	222	5	511	630	13
17.23	3.44	222	274	6	222	274	6	630	777	18
	4.82	222	274	6	222	274	6	630	777	17
	8.62	222	274	5	222	274	5	630	777	14

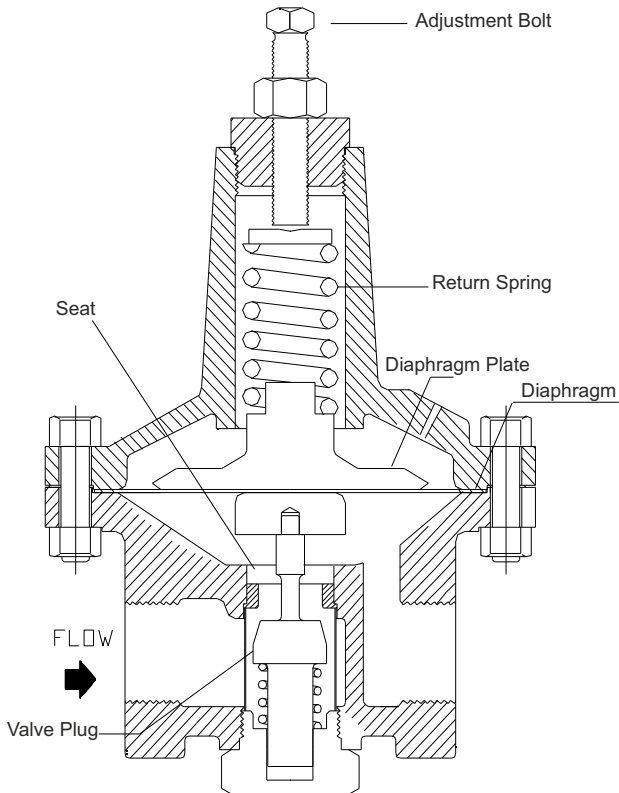
Note: For capacities of other gases multiply the air capacities by the following factors

E _q	Factor
Argon	0.85
Co2	0.81

2

4. Working Principle:

On start-up, upstream pressure, aided by a return spring, holds the valve plug against the seat in the closed position. Downstream pressure is set by rotating the Adjustment bolt in a clockwise direction which compresses the adjusting spring and lowers the diaphragm. This downward movement is transmitted via a lower diaphragm plate, which causes the main valve plug to open against the seat. Steam then passes through the open valve into the downstream pipework and also surrounds the diaphragm. As downstream pressure increases, it acts through the diaphragm to counteract the spring force and closes the main valve plug when the set pressure is reached. The main valve modulates to give constant pressure at the downstream side.



5. Installation Guidelines:

1. Blow down line thoroughly.
2. Install strainer ahead of valve.
3. Install steam trap ahead of valve

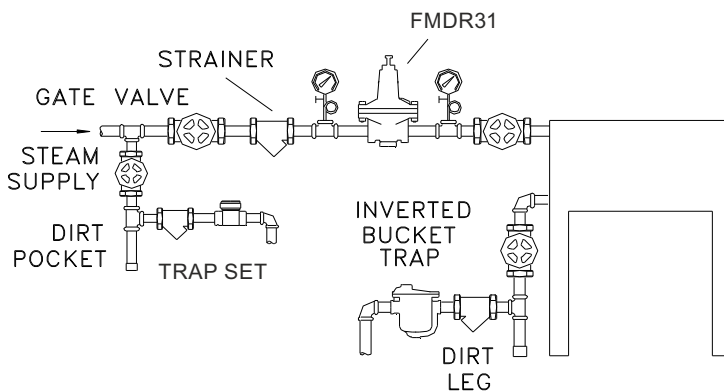
4. Install regulator in horizontal pipe only.

WARNING: Vertically installed unit can be erratic and prematurely wear.

5. Loosen lock nut, then loosen adjusting screw enough to release all tension on the Regulator Valve adjusting spring.

6. Turn on pressure slowly. Then turn down adjusting screw enough to open valve slightly. Operate in this manner for several minutes.

7. Turn down adjusting screw slowly at intervals until desired pressure is obtained. Tighten lock nut.



TYPICAL INSTALLATION

5. Maintenance Procedure

Unsatisfactory regulation is usually due to dirt, pipe compound, etc., blocking the internal strainer or gumming the internal mechanism. To clean strainer, first make sure pressure has been relieved from system. Unscrew bottom plug and remove strainer screen. Clean the lower part of the valve. This can be accomplished without removing the valve from the line or unbolting the cover. If cleaning the strainer does not correct operation, remove valve from line and disassemble parts. After cleaning parts the disc and seat should be lapped together using fine lapping compound. Avoid excessive lapping as this cuts tight ridges and makes tight seating impossible.

CLEANING STRAINER

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Remove lower plug.



Remove and clean strainer screen.



Blow debris from body & reassemble.

REMOVE VALVE FROM LINE AND DISASSEMBLE



Remove valve from line.



Remove cover bolts.



Remove cover.



Remove, inspect & clean parts.



Remove gasket.



Inspect and clean diaphragms.



Clean gasket surfaces.



Remove lower plug.



Remove spring & disc. Clean and lap disc to seat.



Remove, inspect and clean strainer.

Reassemble valve using new gaskets.

6. 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.

6.1 Routine and Preventive Maintenance:

Please refer to the maintenance schedule mentioned in the table below to undertake routine maintenance of the FMDR31.

SR.	PARAMETERS TO BE CHECKED	FREQUENCY FOR CHECKING VARIOUS PARAMETERS					
A	Forbes Marshall Direct Acting Pressure Reducing Valve	Daily	Weekly	Monthly	Quarterly	Half Yearly	Annually.
1	Clean Main valve strainer					Y	
2	Check & clean Main / diaphragm						Y

7 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 Direct Acting 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
Downstream pressure zero or too low	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 valve strainer to be clean. If found clogged clean it properly.
	Main Diaphragms	If main diaphragms are permanently deformed or punctured - replace the same.
	Jamming of Valve Plug	Please check if Valve Plug is jammed because of dirt ,clean it properly .

2) Downstream pressure is equal to upstream pressure:

If downstream pressure of Forbes Marshall Direct Acting 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
Downstream pressure is equal to upstream pressure	Pressure adjustment bolt	<ol style="list-style-type: none"> 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. 2. If downstream pressure does not respond to the adjustment bolt rotation, check the plug seat leakage by following the next step. <ol style="list-style-type: none"> A) Close the upstream isolation valve B) Loosen the pressure adjustment bolt and Make the downstream pressure zero C) Open the upstream isolation valve slowly & check for steam leakage E) If steam coming from the outlet it means the valve is leaking. F) Clean the Plug and check
	Check the screen	Clean it if found clogged.
	Check diaphragm	Replace if found deformed or damaged.

8 Available Spares:

SIZE	SPARE TYPE	DESCRIPTION	CODE
DN15/20	DIAPHRAGM KIT	DIPAHRAGMS 1 SET	SPARE-1520FMDR31-DKIT
DN15/20	GASKET KIT	COVER GASKET	SPARE-1520FMDR31-GKIT
DN25	DIAPHRAGM KIT	DIPAHRAGMS 1 SET	SPARE-25FMDR31-DKIT
DN25	GASKET KIT	COVER GASKET	SPARE-25FMDR31-GKIT

How to Order:

1 no. Forbes Marshall Direct Acting Pressure Reducing Valve, DN 15/20 FMDR31 diaphragm kit , item code SPARE-1520FMDR31-DKIT

9 Warranty Period:

As per the ordering information and agreement in the contract.



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