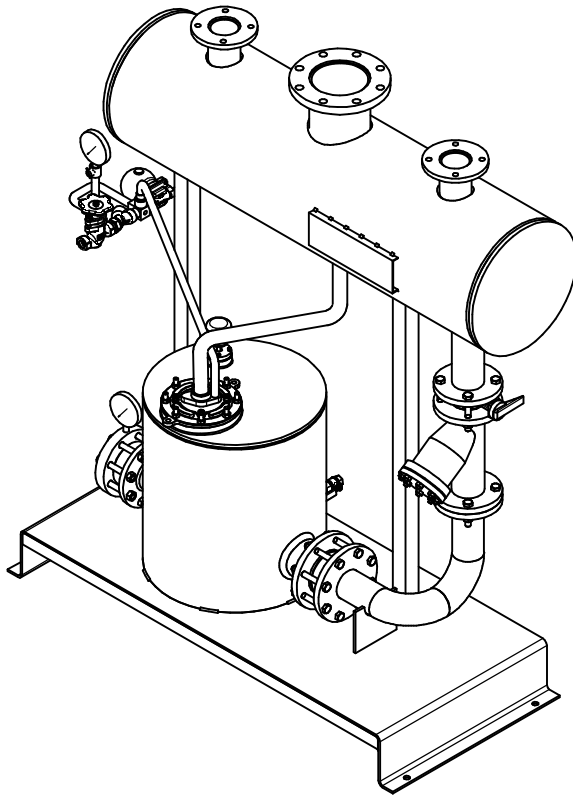


# **Installation and Maintenance Manual**

## **Multi Valve Pressure Powered Pump Package Unit with Insulation Jacket and Condensate Recovery Meter**

MV55PPPPU



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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.

### **1. Multi Valve Pressure Powered Pump Package Unit with IJ and CRM485R(MV55)**

**Size: DN80 (3").**

#### **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:**

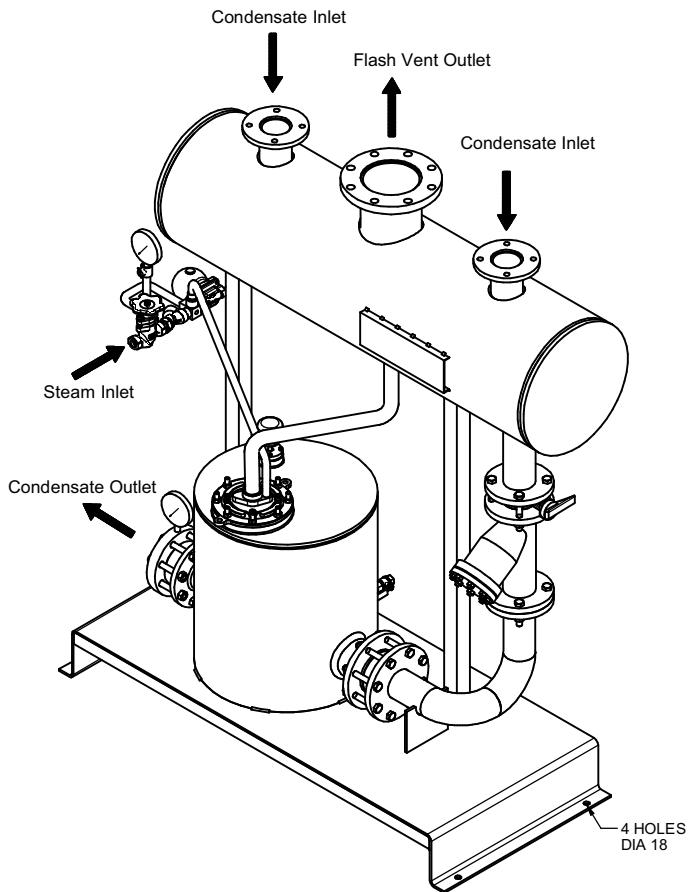
Customers and Stockist are reminded that, when returning products to Forbes Marshall they must provide information on any hazards and the precautions to be taken due to contamination residues or mechanical damage which may present a health, safety or environmental risk.

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 Multi Valve Pressure Powered Pump Package Unit with IJ and CRM485R , MV55, is a positive displacement pump unit operated by steam or compressed air or pressurised gas. The unit is specifically designed to pump hot condensate. The MV55 pump has multiple inlet and exhaust valves in a mechanism assembled in a single shell which is compact in size, giving high discharge capacities.



**Figure 1: Multi Valve Pressure Powered Pump Package Unit**

### 3.2 Sizes and Pipe Connections:

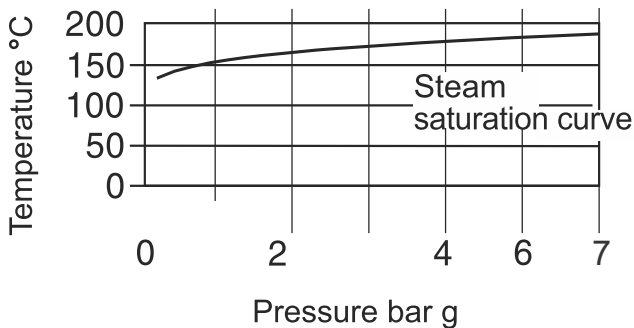
Size	:	DN80
Condensate inlet	:	DN80 Flange Class 150
Condensate outlet	:	Dn80 Flange Table "F"
Vent Outlet	:	DN150 Flange Class 150
Empty Weight	:	500 kg

### 3.3 Limiting Conditions:

PMA Maximum design pressure	7 bar g
TMA Maximum design temperature	180°C
Operating Inlet Motive Pressure	Steam / Compressed Air / Pressurised gas 3-7 bar g (Max)
Pump discharge per cycle	55 kg
Steam Consumption	3 Kg of steam per 1000 kg condensate pumped
Air consumption	22 SCF per 1000 Kg condensate pumped
Minimum operating temperature	0°C

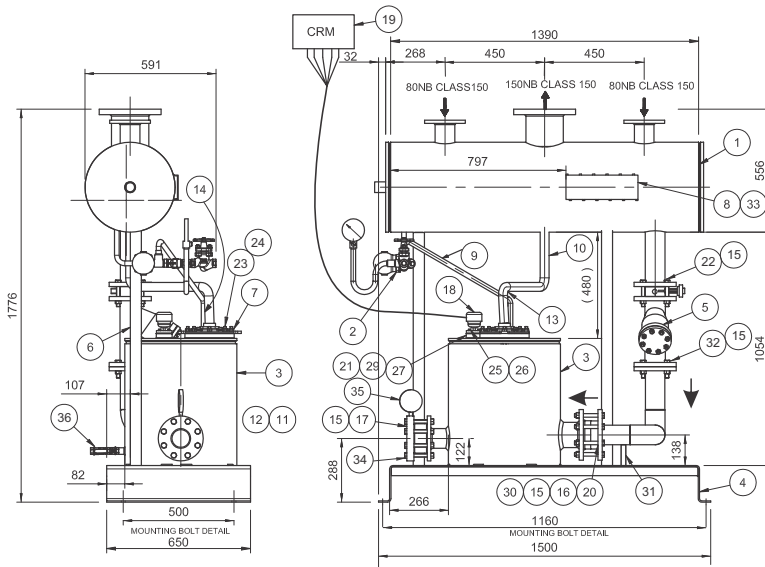
**Note: For lower operating temperatures consult Forbes Marshall**

### 3.4 Operating range:



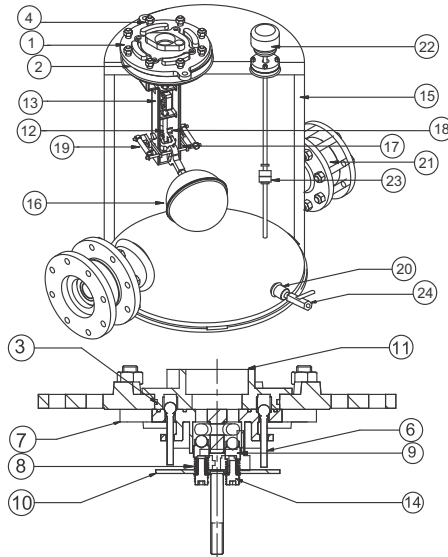
### 3.5 Standard Accessories:

- Condensate Recovery Meter - 485 (CRM485R)
- Insulation Jacket (IJ-MV55)



All dimensions are in 'mm'

Sr.No.	Part	Material	Sr.No.	Part	Material
1	Receiver Pipe	Carbon steel, IS3589	19	Condensate Recovery Meter (CRM)	.....
2	Stem inlet connection assembly (1/2" BSPT)	Carbon steel	20	DN100 Check valve	Stainless steel
3	Shell pipe	Carbon steel, IS3589	21	Reed sensor flange	Carbon steel, IS 2062
4	Frame assembly	Carbon steel, IS 2062	22	Valve Hex head bolts	Mild Steel
5	Condensate inlet strainer	Cast Iron, IS210 Gr FG260	23	Mechanism Studs	Carbon steel, EN9
6	Support assembly	Carbon steel	24	Mechanism Nuts	Mild Steel
7	Actuator mechanism assembly	Stainless steel	25	CRM flange Studs	ASTM A 193 GR B7
8	Name plate	Stainless steel	26	CRM flange Nuts	SS304
9	1/2" Steam inlet hose 500 mm long	Stainless steel SS304	27	Sensor mounting flange	Carbon steel, IS 2062
10	1-1/2" Exhaust hose 750 mm long	Stainless steel SS304	28	Mechanism gasket (Not shown in figure)	AF 154
11	DN80 Check valve	Stainless steel	29	Reed gasket	SS304 Exfoliated Graphite
12	DN80 Tab F / Class 150 Outlet flange	Carbon steel, SA 516 Gr 70	30	DN100 Check valve Hex head bolts	Mild Steel
13	1-1/2" BSPT Exhaust bend	Carbon steel	31	Condensate line support	Mild Steel
14	Threaded pipe nipple	Carbon steel	32	Strainer Hex head bolts	Mild Steel
15	M16 Nut	Mild Steel	33	Name plate screw	SS304
16	DN100 Check valve gasket	SS304 Exfoliated Graphite	34	DN80 TAB F / Class 150 special flange	Carbon steel, IS 2062
17	DN80 Check valve gasket	SS304 Exfoliated Graphite	35	Outlet Pressure gauge	Stainless steel
18	Reed sensor assembly	Stainless steel	36	Drain valve (1/2" BSPT)	Cast Steel



## Materials

Sr. No.	Part	Material	Standard
1	Mounting Flange	Stainless Steel	ASTM A 351 CF8
2	Cover Gasket	Synthetic Fibre	AF 154
3	O Ring	Viton	IS 9975
4	Stud & Nut M-12	Stainless Steel	
5	Inlet Valve Stem*	Stainless Steel Type 304	ASTM A 276
6	Inlet Valve Head	Stainless Steel/ASTM A 410	
7	Valve Seat	Stainless Steel	ASTM A 351 CF8
8	Exhaust Valve Spring	Stainless Steel Type 304	ASTM A 276
9	Exhaust Valve	Stainless Steel Type 304	ASTM A 276
10	Actuating Disc	Stainless Steel Type 304	ASTM A 240
11	Motive Inlet Manifold	Stainless Steel	ASTM A 351 CF8
12	Push Rod Bottom	Stainless Steel Type 304	ASTM A 276
13	Mechanism Support	Stainless Steel	IS 210 FG 260
14	Exhaust Valve Screw	Stainless Steel	IS 1364
15	Shell	Carbon Steel	IS 2062
16	Float	Stainless Steel	
17	Linkage Mechanism	Stainless Steel	ASTM A 351 CF8
18	Push Rod Actuator	Stainless Steel	ASTM A 351 CF8
19	Spring	Inconel	
20	½" BSPT Pipe Nipple	Forged Carbon Steel	ASTM A 105
21	Check Valve	Stainless Steel	
22	Flow-Temp Sensor	Stainless Steel	
23	Sensor Float	Stainless Steel Type 304	ASTM A 240
24	½"BSPT Ball Valve	Forged Carbon Steel	ASTM A 105

\* Items Not Shown



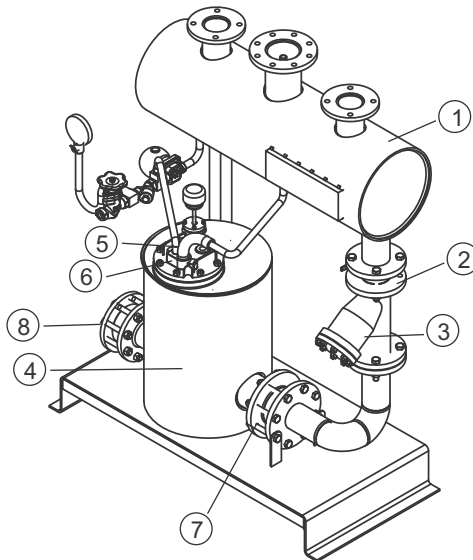
**Materials:**

Motive Pressure	Back Pressure	Capacity	Air Capacity
		Motive Fluid - Steam	Motive Fluid - Air
barg	barg	kg/hr	kg/hr
7.00	1.00	10548	
7.00	2.00	7960	
7.00	3.00	6119	
7.00	4.00	5048	
6.00	1.00	8358	10556
6.00	2.00	6870	7896
6.00	3.00	5480	5587
6.00	4.00	3583	4118
5.00	1.00	7997	10690
5.00	2.00	6006	7410
5.00	3.00	4983	5099
4.00	0.50	8429	11136
4.00	1.00	7437	9586
4.00	2.00	4649	6806
3.00	0.50	7379	10723
3.00	1.00	6039	9498

#### 4. Product Working Principle :

**Note: For this section refer to Figure 4**

A Multi Valve Pressure Powered Pump Package Unit consists of a receiver (1), Inlet Isolation valve (2), Strainer (3), a body shell (4) containing a float mechanism which operates a set of motive steam / air inlet (5) and exhaust valves (6) and inlet (7) & outlet (8) disc check valves. The steam or air is used as motive media to operate the pump. Condensate comes into the pump receiver (1) from Flash vessel or plant condensate header and is allowed to flow in to the pump body (4) having float mechanism by opening the inlet isolation valve (2).



**Figure 4: Multi Valve Pressure Powered Pump Package Unit**

**Note: For this section refer to Figure 3**

In the normal position before startup the float is at the lowest position with the motive steam/air valve **(5)** closed and, the exhaust valve open **(9A)**. When condensate flows by gravity through inlet check valve in to pump body **(15)**, the float **(16)** will rise along with the level of condensate.

As the float **(16)** continues to rise, the mechanism link **(17)** is engaged which increases tension in the springs **(19)**. When the float **(16)** has risen to its upper tripping position, the linkage mechanism **(17)** snaps upward over center. The energy in the springs **(19)** is released as the push rod **(18)** is moved upward, to simultaneously open the motive steam inlet valve **(5)** and close the exhaust valve **(9A)**. Steam flow through the inlet valve **(5)** increases the pressure within the body and closes the inlet check valve. The increased pressure in the body shell **(15)** exceeds the backpressure in the condensate discharge line, and opens the discharge check valve **(21)** to pump out the condensate in the discharge line.

As the condensate level in the pump body **(15)** falls, the float **(16)** is lowered and mechanism link **(17)** is engaged, which again increases the tension in the springs **(19)**. When the float **(16)** reaches the lower tripping position, the linkage mechanism **(17)** snaps downward over center. The energy in the springs **(19)** is released as the push rod **(18)** is moved downward, to simultaneously open the exhaust valve **(9A)** and close the steam inlet valve **(5)**. Steam / air utilized for pumping the condensate gets released to through exhaust valve and this completes one pumping stroke.

When the pressure in the pump body **(15)** has fallen below the pressure in the inlet pipe, the inlet check valve opens. Condensate will again flow through the check valve to fill the body and begin next cycle.

## 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.

### Note: For this section refer to Figure 5

1. Ensure that there is no damage in transit. Before installation is done ensure that all steam, air or gas lines are closed. Select correct pipeline sizes as per the pump and connections are available. Level the unit by level bottle.
2. The reservoir has 3 ports, two of them should be connected for condensate inlet (**A**) and third is used for vent line **C**. Most important is that reservoir must be vented to atmosphere. This is to ensure free flow of condensate under gravity to the pump.
3. It is recommended to install PPPPU along with a Forbes Marshall Flash vessel arrangement, if condensate flashing is expected when exposed to atmosphere.
4. Connect the condensate line coming from plant to the flash vessel inlet port. Install strainer (1), single orifice float trap (2) and view glass (3) after the flash vessel and connect condensate outlet line to the pump receiver (6). Install the safety relief valve (4) and pressure gauge (5) at respective locations provided on the flash vessel. Ensure that the pump receiver inlet is at a lower level than the condensate outlet line of flash vessel so the condensate travels by gravity to the pump receiver.
5. Vent line (**C**) should be piped, unrestricted to safe location in the atmosphere.
6. Connect the motive steam or compressed airline (7) to the motive supply inlet .
7. A pressure gauge (8) is supplied loose along with the pump. Install the same on motive line syphon. Condensate discharge line (**B**) of pump should be routed to the boiler feed water tank and connect the same to the condensate nozzle of de-aerator head.

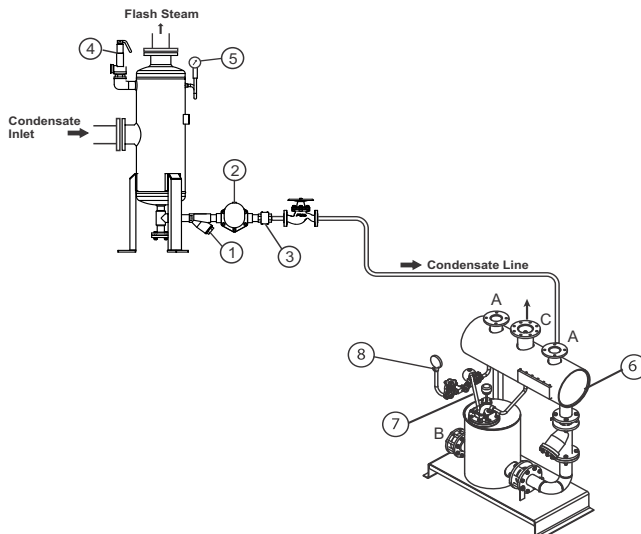
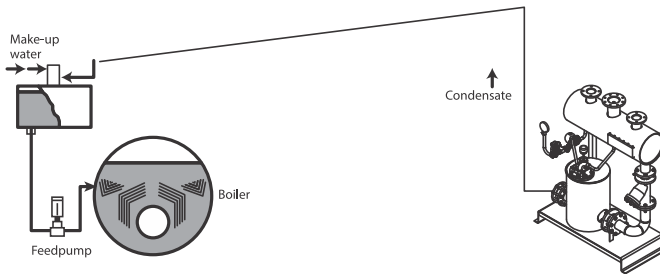


Fig.5: Installation of Multi Valve Pressure Powered Pump Package Unit with Forbes Marshall Flash Vessel

### 5.1 Care to be taken while routing the condensate pump discharge line: (Refer to Fig. 6)

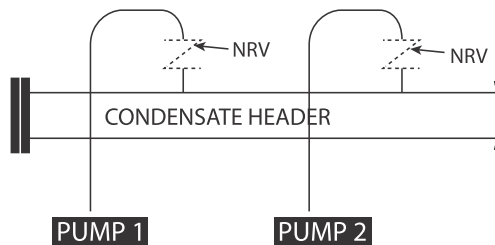
- The outlet line size should be equal to or more than pump outlet flange size provided with pump.
- As far as possible, the discharge line should have minimum bends. Ideally the condensate pump discharge line should be lifted immediately after the pump to the maximum elevation in the circuit and then to be connected to feed water tank with a downward slope. This ensures minimum backpressure on the pump



**Figure 6: Routing the condensate line to the Feed Water Tank**

### 5.2 In case more than one condensate pump is connected to a common Condensate line: (Refer to Figure 7)

- Make sure that NRV supplied with pump is installed with flow direction towards FWT. The NRV size should be equal to the pump outlet line size.
- If more than one-pump discharge lines are to be connected to a common condensate line, please ensure that the individual line is connected from the top with a non-return valve. The common condensate line should be sized to take care of connected condensate load of all the pumps.



\*NRV : SIZE EQUAL TO PUMP OUTLET SIZE

**Figure 7: More than one pump connected to common condensate line**

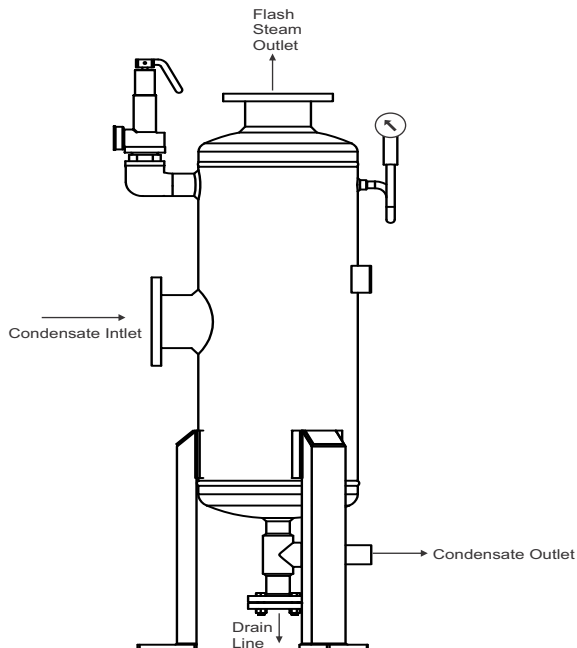
## 6. Startup and Commissioning

It is recommended to install Multi Valve Pressure Powered Pump Package Unit along with a FM Flash vessel arrangement, for all condensate pressure higher than atmosphere pressure. For trouble free operation of Multi Valve Pressure Powered Pump Package Unit, it is important that the single orifice float trap internals, pump internals & disc check valves are not subjected to dirt or other hard particles.

Therefore, prior to bringing the Multi Valve Pressure Powered Pump Package Unit in to operation, please ensure that the entire condensate piping circuit is thoroughly flushed.

### 6.1 Flushing Procedure in the presence of a Forbes Marshall Flash vessel : (Refer Figure 8)

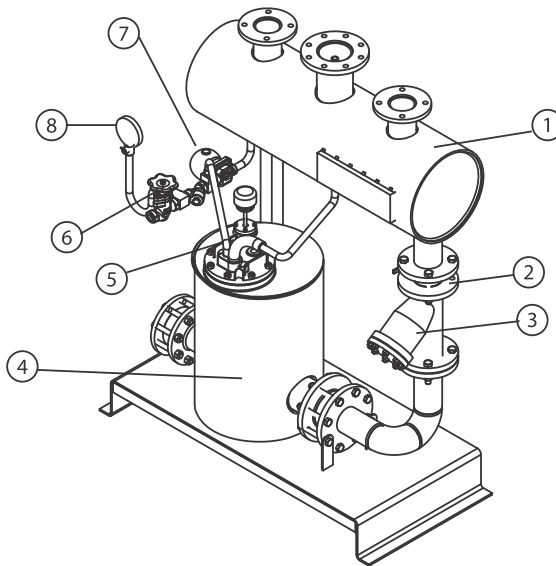
1. Open the Forbes Marshall Flash vessel drain line and allow the process condensate to flow through the drain till all the foreign particles & contaminated condensate is flushed out and clean condensate can be seen coming out.



**Figure 8: Flushing procedure of Forbes Marshall Flash vessel**

## 6.2 Flushing Procedure in the absence of a Forbes Marshall Flash vessel : (Ref. Fig. 9)

1. Wherever process condensate is directly connected to pump receiver & FM Flash vessel module is not part of Multi Valve Pressure Powered Pump Package Unit, open the pump condensate strainer cap (5) & screen to flush the foreign particles and contaminated condensate. Similarly, motive steam / airline (4) should also be flushed by removing strainer cap & screen until we see clean motive media coming out.
2. Once flushing of condensate and motive line is completed, open the motive line isolation valve (7) and ensure that the motive media pressure should not exceed as mentioned on the pump nameplate.
3. Make sure that the motive line drain trap (8) is operational.
4. Open the pump condensate isolation valve (11) and allow the condensate to flow to the pump receiver (2) and subsequently to pumping chamber (1).
5. Now the pump shall operate as described in section 4.
6. Steam or air utilized for pumping is released with an audible exhaust at the end of each pumping cycle. Observe the condensate return line pressure & ensure that the motive pressure is at least 1.5 to 2 bar g more than the back pressure.



**Figure 9: Flushing procedure of Multi Valve Pressure Powered Pump Package Unit**

## 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 product should then be allowed to cool. With suitable isolation repairs can be carried out with the product in the line.

MV55 pump units are designed for trouble free operation. In normal course of action maintenance is not required provided certain care of the system is taken.

### 7.1 Routine and Preventive Maintenance:

Please refer to the maintenance schedule mentioned in the table below to undertake routine maintenance of the Multi Valve Pressure Powered Pump Package Unit.

SR. NO.	PARAMETERS TO BE CHECKED	FREQUENCY FOR CHECKING VARIOUS PARAMETERS					
		Daily	Weekly	Monthly	Quarterly	Half Yearly	Annually.
A	Multi Valve Pressure Powered Pump Package Unit / Forbes Marshall Flash vessel						
1	Clean strainer of motive media line			Y			
2	Clean condensate inlet strainer			Y			
3	Visual inspection and cleaning of complete set of internals				Y		
4	Condensate pump chamber draining				Y		
5	Inlet / Exhaust valve leakage testing				Y		
6	Check Valve Cleaning					Y	
7	Operate motive line valve			Y			
8	Operate Condensate inlet valve			Y			
9	Lubrication of piston valves				Y		
10	Pr. Gauge calibration						Y
11	Checking of MV55 motive pressure	Y					
12	Checking of flash steam pressure in Flash vessel	Y					
13	Cleaning of motive line trap internals				Y		
14	Cleaning of Flash vessel steam trap internals				Y		
15	Visual inspection for leakages		Y				
16	Arresting leaks		Y				
17	Checking of float trap SLR setting				Y		
18	Cleaning of strainer between Flash vessel and pump			Y			
19	Check air quality(in case motive media is air)		Y				
20	Visual inspection of safety relief valve		Y				
21	Overhauling and cleaning of safety relief valve						Y



## 7.2 Tool Kit:

To carry out any maintenance of the Multi Valve Pressure Powered Pump Package Unit please use the tools mentioned in the table below.

Size	Part	Component	Tool used and Size
<b>DN 80</b>	Internal Mechanism Assembly	Mechanism support	Allen key 8 mm
		Motive inlet Valve	Allen key 8 mm
		Float Mechanism	Open Spanner 19 mm (A/F)
		Push Rod and Lock Nut	Open Spanner 17 mm (A/F)
		Float Arm	Open Spanner 19 mm (A/F)
		For Split Pin Assembly	Nose Plier
<b>DN80</b>	External Assembly	Read switch assembly 4 No M6 studs; M6 X 4mm nuts	Ring spanner 10 mm (A/F)
		Internal assembly cover (M12 X 50)	Open spanner 18 / 19 mm (A/F)
		Motive inlet and exhaust hose pipe connection	Pipe wrench
<b>DN 80</b>	Condensate inlet connection	Butterfly valve (M16 X 120mm)	Box spanner 24 mm (A/F)
		Strainer assembly (M16 X 70mm)	Box spanner 24 mm(A/F)
		Disc check valve (M16 X 130mm)	Box spanner 24 mm (A/F)
	Condensate return connection	Disc check valve (M16 X 130mm)	Box spanner 24 mm (A/F)

### **7.3 Maintenance/Replacement Procedure : (Refer to Figure 3)**

For a detailed maintenance/replacement procedure of the Multi Valve Pressure Powered Pump Package Unit body internals, please refer to the instructions given in the subsequent sections;

#### **7.3.1 How to Maintain/Replace the whole MV55 internal assembly:**

1. Before carrying out any maintenance, remove all the connections to the pump cover. Isolate the pump body by closing the inlet isolation butterfly valve.
2. Unscrew all eight nuts **(4)** present on the mounting flange **(1)** and lift the cover and internal mechanism assembly from the pump shell **(15)**.
3. Arrange the whole assembly onto the vice such that the internals are placed on top and clamp the cover.
4. Remove the assembly nut to free the whole assembly from the cover.
5. Remove the old gasket **(2)**, and clean the gasket area before replacing the new one.
6. Insert the whole assembly back inside the pump body **(15)**. While reinstalling the cover **(1)**.
7. Tighten the cover nuts **(4)**.

#### **7.3.2 Procedure to Maintain/Replace float assembly:**

1. Follow steps 1 to 2 of section 7.3.1
2. Arrange the whole assembly onto the vice such that the internals are placed on top and clamp the cover.
3. Unscrew the float **(16)** from the float arm using appropriate spanner.
4. Screw the new float using Loctite 272 adhesive onto the threads.
5. Insert the whole assembly inside the pump body as described in steps 4 and 5 of section 7.3.1

#### **7.3.3 Procedure to Maintain/Replace Exhaust valve seat and head assembly:**

1. Unscrew all eight nuts **(4)** present on the cover **(1)** and lift the cover and mechanism assembly from the pump body **(15)**.
2. Arrange the whole assembly onto the vice such that the internals are placed on top and clamp the cover.
3. Remove the four allen bolts to free the whole assembly from the cover.
4. If required, remove the old gasket **(2)** and the O-rings **(3)**, and clean them before replacing the new one.
5. Remove the Exhaust valve **(9)**.
6. Clean the metal gasket and replace if required.
7. Fit the new exhaust valve.
8. Now fit the MV55 internal assembly onto the cover. Carefully engage the exhaust valve onto the actuator disc **(10)** and screw the allen bolts.
9. Unclamp the cover and insert the whole assembly back inside the pump body. While reinstalling the cover.
10. Tighten the cover nuts **(4)**.

**7.3.4 Procedure to Maintain/Replace Inlet valve assembly:**

1. Follow steps 1 and 2 of section 7.3.3
2. Unscrew the allen bolts present on the top of the cover.
3. Remove the motive inlet valve manifold. If required, remove the old gasket **(2)** and the O-rings **(3)**, and clean them before replacing the new one.
4. Push out the inlet valve stem **(5)** from below and replace with new ones.
5. Refit the valve manifold.
6. Unclamp the cover and insert the whole assembly back inside the pump body **(15)**.
7. Tighten the cover nuts **(4)**.

**7.3.5 Procedure to Maintain/Replace the springs:**

1. Unscrew all eight nuts **(4)** present on the cover **(1)** and lift the cover and mechanism assembly from the pump body **(15)**.
2. Arrange the whole assembly onto the vice such that the internals are placed on top and clamp the cover.
3. Remove the split pins.
4. Remove the washer and the springs **(19)** from the linkage mechanism **(17)**
5. Insert the new springs
6. Put the washer and split pins back
7. Reassemble the whole mechanism following steps 4 and 5 of section 7.3.1

**7.3.6 Procedure to Maintain/Replace new set of O-rings:**

1. Follow steps 1 and 2 of section 7.3.1
2. Unscrew the allen bolts present on the top of the cover.
3. Remove the motive inlet valve manifold **(11)**.
4. Remove the old O rings **(3)** and replace with the new ones.
5. Refit the valve manifold.
6. Unclamp the cover and insert the whole assembly back inside the pump body **(15)**.
7. Tighten the cover nuts **(4)**.

**7.3.7 Procedure to Maintain/Replace the Valve seat:**

1. Follow steps 1 and 2 of section 7.3.1
2. Unscrew the allen bolts present on the top of the cover.
3. Remove the motive inlet valve manifold **(11)**.
4. Remove the old valve seat **(7)** and replace with the new one. If required, the O- rings **(3)**, and clean them before replacing the new one.
5. Refit the valve manifold.
6. Unclamp the cover and insert the whole assembly back inside the pump body **(15)** While reinstalling the cover.
7. Tighten the cover nuts **(4)**.

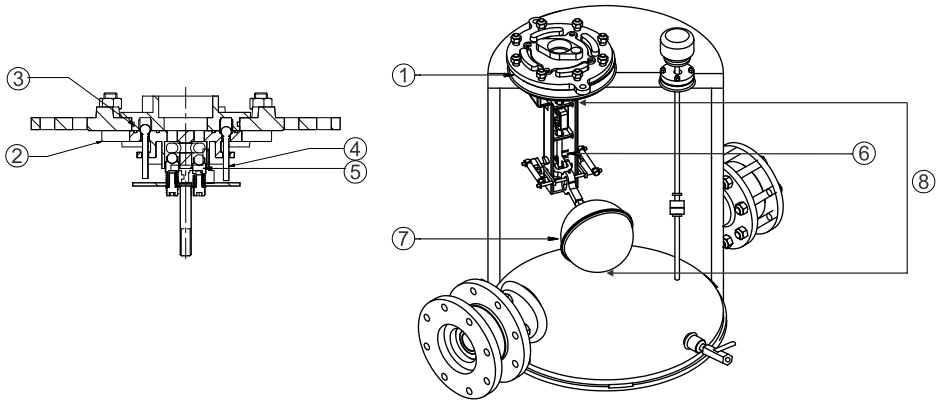
## 8. Troubleshooting:

If the expected performance is unachievable after the installation of the Multi Valve Pressure Powered Pump Package Unit, check the following points for appropriate corrective measures.

Failure Mode	Possible Cause	Remedy
<b>Pump stops working</b>	a) Motive steam supply closed	a) Open valves to supply motive steam pressure to condensate in the pump shell.
	b) Motive line strainer choked	b) Clean the strainer
	c) Condensate inlet line closed	c) Open condensate inlet valve and allow condensate to flow in pumping chamber.
	d) Condensate line strainer choked	d) Clean the strainer
	e) Condensate discharge line closed	e) Open all discharge line valves to allow free discharge from pump to destination.
	f) Motive pressure insufficient to overcome back pressure.	f) Check motive and back pressure. Adjust motive pressure to 2barg more than total back pressure.
	g) Float punctured	g) Replace the float.
	h) Check the direction of the Check valve	h) Correct it if found wrong.
	i) Steam coming out continuously from exhaust line	i) It means motive steam inlet valve is leaking- open the internals and clean the inlet valve. Replace it if found damaged. Check the O ring for any damage. Replace if found so.
	j) Exhaust valve leaking	j) Open the pump internals and clean it. Also check the setting of valve actuator disc and correct it if found disturbed.
<b>Pump working, overflows only during discharge.</b>	a) Check inlet Check Valve	a) Lap the seat and if the problem persists replace Check Valve

Failure Mode	Possible Cause	Remedy
<b>Pump working, continuously overflows</b>	a) Pump under sized.	a) Verify the rated capacity as per the capacity table. Install additional pump as required.
	b) Inlet strainer partially choked	b) Clean the strainer Ensure all valves are fully open.
	c) Motive line strainer partially choked.	c) Clean the strainer and ensure inlet valve is fully open.
	d) Live steam reaching in pump receiver and receiver is pressurized.	d) Check the steam trap installed after the Flash vessel or process traps (if there is no Flash vessel), for leakage and rectify it.
	e) Receiver vent line is closed.	e) Make sure that receiver is vented to atmosphere as recommended.
	f) Insufficient motive pressure to achieve rated capacity	f) Check motive pressure setting and maximum back pressure during operation. Compare with capacity table and clean it or replace it if found damaged.
	g) Outlet check vavle stuck open or leaking	g) Open the check valve and increase motive pressure as required.
	h) Motive isolation valve partially closed.	h) Check and ensure that motive isolation valve is fully open.
	i) Condensate return line size lesser than pump discharge.	i) Condensate return line size should be equal to or greater than pump discharge line.

**9. Available Spares : (Refer to Figure 10 )**



**Figure 10: Available Spares for Multi Valve Pressure Powered Pump Package Unit**

Sr NO.	SPARE TYPE	SPARE CONSIST OF	PART NO.	SPARE CODE
1	SEAT AND VALVE HEAD ASSEMBLY	VALVE SEAT FOR INLET AND EXHAUST VALVES, INLET VALVE HEADS -4 NO., EXHAUST VALVE HEADS -4 NOS. & O-RINGS-3 NO'S	3,4,5	SPARE-MV55-SVHKIT
2	INTERNAL ASSEMBLY	ENTIRE MECHANISM IN ASSEMBLED CONDITION, WITH MOUNTING FLANGE, MOTIVE INLET MANIFOLD, ACTUATOR MECHANISM, ACTUATING DISC, PUSH ROD, PUSH ROD ACTUATOR, O-RINGS, FLOAT ARM, FLOAT, ALLEN BOLT, GASKET, INLET VALVE HEADS & EXHAUST VALVE HEADS (PACK OF 1 ASSEMBLY)	8	SPARE-MV55-MKIT
3	O-RINGS	INLET O-RING, EXHAUST O-RING & MANIFOLD MOUNTING O-RING (PACK OF 2 NO'S EACH)		SPARE-MV55-OKIT
4	MOTIVE LINE STEAM HOSE	750mm LONG MOTIVE STEAM HOSE SIZE 1/2" BSPT		SPARE-MV55-IHKIT
5	EXHAUST LINE STEAM HOSE	500mm LONG STEAM EXHAUST HOSE SIZE 1-1/2" BSPT		SPARE-MV55-EHKIT
6	FLOAT ASSEMBLY	PPPPU FLOAT (PACK OF 1)	7	SPARE-405080PPPPU-FKIT
7	SPRING ASSEMBLY	BARREL SPRINGS (PACK OF 2)	6	SPARE-405080PPPPU-SKIT
8	GASKET KIT FOR MECHANISM	COVER PLATE GASKETS (PACK OF 2).		SPARE-405080PPPPU-GKIT

**How to Order:**

Example : Multi Valve Pressure Powered Pump Package Unit model MV55 with insulation jacket and Condensate Recovery Meter - 485

**How to Order Spares:**

Always order spares by using the description given in the column headed "Available Spares" for this product.

**10. Warranty Period:**

As per the ordering information and agreement in the contract



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