Installation and Maintenance Manual

MV110

Multi Valve Pressure Powered Pump Package Unit with Insulation Jacket & Condensate Recovery Meter

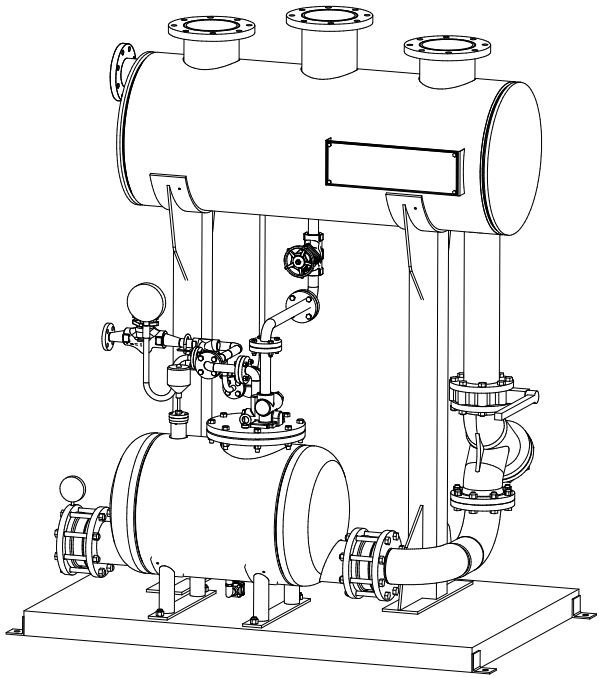


Table of Contents

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

1. Preface:

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

1. Multi Valve Pressure Powered Pump Package Unit with CRM485R - (Mv110)

   Size: DN150 (6”).

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 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 environments where they may be exposed to temperatures below freezing point) to be made.

2.10 Product Disposal:

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

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:

MV110 Pump is a steam operated pump which transfers high temperature condensate from a low point, low pressure or vacuum space to an area of higher pressure or elevation.

The unit consists of a pumping unit, inlet & outlet disc check valves. The pumping unit consists of an internal mechanism and steam is used as the motive media to operate the pump.

MV110 pump has multiple inlet and exhaust valves assembled in a compact shell and it gives high discharge capacities.

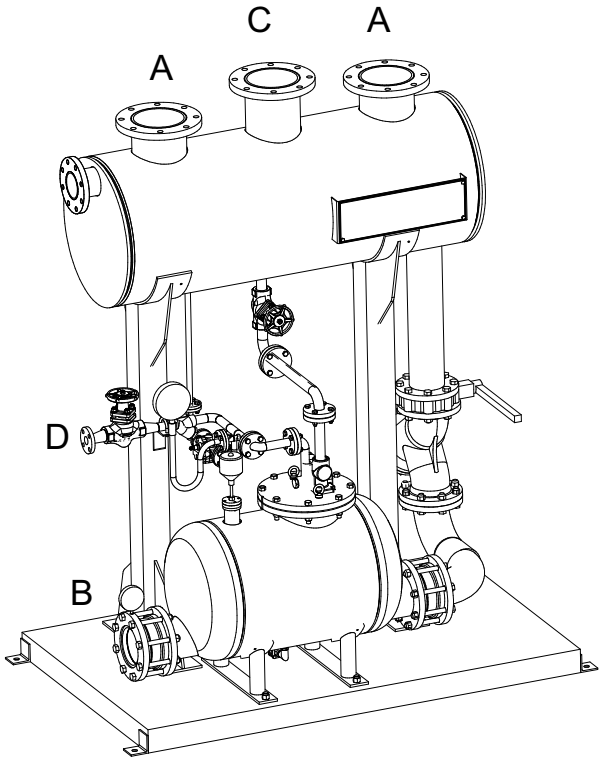


Figure 1: MV110 PUMP

3.2 Sizes and Pipe Connections:

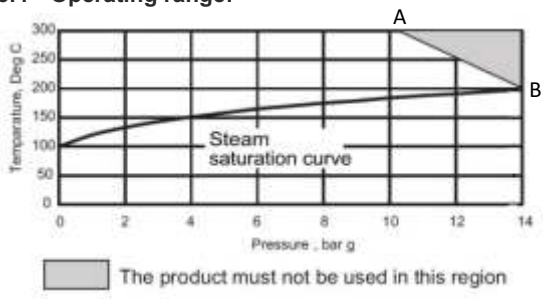
Size	:	DN150
Condensate inlet (A)	:	DN200 Flange class 150
PUMP Condensate outlet (B):		DN150 Flange class 150
Vent Outlet (C)	:	DN200 Flange class 150
Steam inlet connection (D)	:	DN25 Flange class 150
Empty Weight	:	1150 kg

3.3 Limiting Conditions:

PMA Maximum design pressure	14 bar g
TMA Maximum design temperature	198°C
Operating Inlet Motive Pressure	Steam 3-14 bar g (Max)
Pump discharge per cycle	110 liters
Steam Consumption	6.5 Kg of steam per 1000 Kg Condensate pumped
Minimum operating temperature	0°C
Maximum Hydro Pressure - (Only for pump shell)	21 bar g
Maximum Back Pressure	8.5 bar g

Note: For lower operating temperatures consult Forbes Marshall
The product should not be used outside the recommended operating pressure, temperature and other specification ranges.Damage to the product or malfunctioning may lead to serious accidents.

3.4 Operating range:



A - B - Class 150 Flange Rating.

3.5 Standard Accessories:

- Condensate Recovery Meter - (CRM485R)
- Insulation Jacket

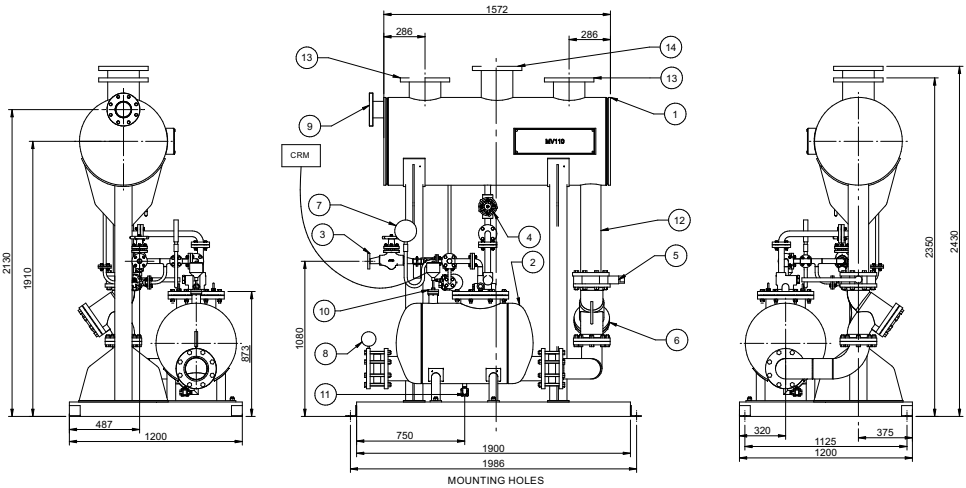


Fig.2 –MV110 Pump Package Unit overall dimensions

Sr. No.	Part	Material
1	Inlet Receiver	ASTM A516 Gr. 70
2	Pump shell assembly	ASTM A516 Gr. 70
3	Motive steam line connection	Carbon Steel
4	Exhaust isolation valve	ASTM A105
5	Condensate inlet isolation valve	ASTM A216 WCB
6	Condensate strainer	ASTM A216 WCB
7	Motive steam pressure gauge	Stainless Steel
8	Back pressure gauge	Stainless Steel
9	Overflow line connection	ASTM A106 Gr. B
10	Condensate recovery meter	Stainless Steel
11	Pump drain valve	ASTM A105
12	Inlet Condensate line	ASTM A106 Gr. B
13	Condensate inlet connection	ASTM A106 Gr. B
14	Vent connection	ASTM A106 Gr. B

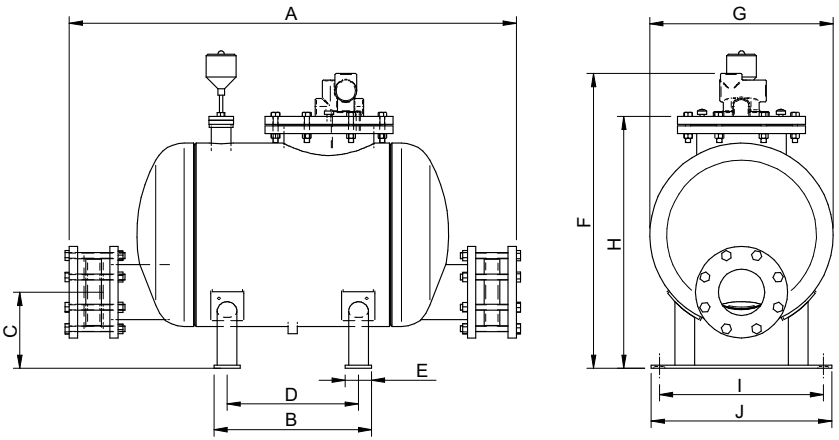


Fig.2.1- Pump Overall dimensions

Dimensions	A	B	C	D	E	F	G	H	I	J
mm	1385	480	224	400	80	900	558	770	500	550

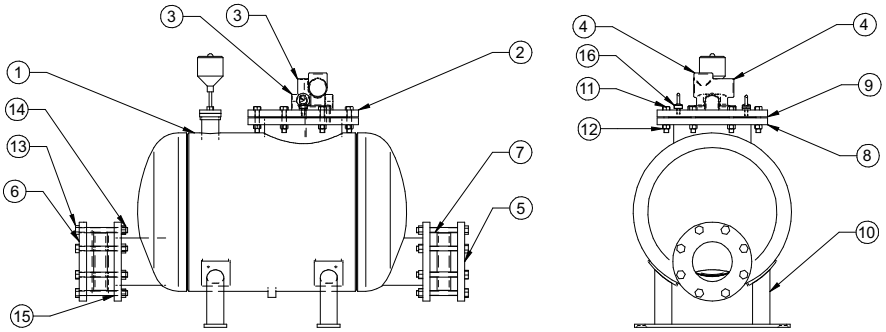


Fig.2.2- Pump shell assembly

Sr. No.	Part	Material
1	Pump shell assembly	ASTM A 516 Gr.70
2	Mechanism flange	ASTM A 516 Gr.70
3	Steam Inlet	ASTM A 351 Gr. CF8
4	Steam Exhaust	ASTM A 351 Gr. CF8
5	Condensate inlet flange DN150 BTS Dn125	ASTM A 105N
6	Condensate outlet flange Dn150	ASTM A 105N
7	DN150 Check valve	ASTM A 351 Gr. CF8
8	Mechanism mating flange	ASTM A 516 Gr.70
9	Mechanism Gasket	Inorganic Fiber gasket
10	Pump Supports	Carbon Steel
11	M16 Bolts	ASTM A 193 Gr. B7
12	M16 Nuts	ASTM A 194 Gr. 2H
13	M18 Bolts	ASTM A 193 Gr. B7
14	M18 Nuts	ASTM A 194 Gr. 2H
15	DN150 Gasket	SS reinforced graphite
16	M12 Eye Bolts	Carbon Steel

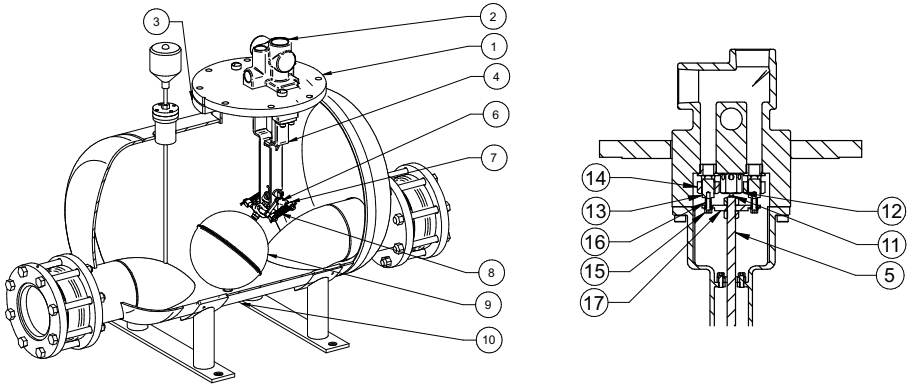


Fig. 2.3 - Internal Mechanism Detail Drawing

Sr. No.	Part	Material	Standard
1	Actuator mechanism mounting flange	Carbon Steel	ASTM A 516 Gr.70
2	Manifold	Stainless Steel	ASTM A 351 CF8
3	Actuator mechanism mating flange	Carbon Steel	ASTM A 516 Gr.70
4	Mechanism support bracket	Stainless Steel	ASTM A 351 CF8
5	Push-rod	Stainless Steel	ASTM A 276 Type 304
6	Linkage Mechanism	Stainless Steel	ASTM A 351 CF8
7	Push-rod actuator	Stainless Steel	ASTM A 351 CF8
8	Spring	Special Alloy	Ni-Cr-Co Alloy
9	Float	Stainless Steel	ASTM A 240 Type 304
10	Drain	Carbon Steel	ASTM A 105
11	Inlet stem	Stainless Steel	-
12	Inlet seat	Stainless Steel	ASTM A 276 Type 304
13	Exhaust stem	Stainless Steel	ASTM A 276 Type 431
14	Exhaust seat	Stainless Steel	ASTM A 276 Type 431
15	Exhaust stem screw	Stainless Steel	IS 1364
16	Exhaust valve spring	Stainless Steel	ASTM A 276 Type 304
17	Actuating disc	Stainless Steel	ASTM A 240 Type 304

3.7 Capacity Chart:

When installed with recommended filling head above top of pump = 740mm.For liquid specific gravity 0.9 to 1.

Motive Medium : Steam

Motive Pressure, bar g	Back Pressure, bar g	Capacity, Kg/h	Motive Pressure, bar g	Back Pressure, bar g	Capacity, Kg/h
14	8.5	11320	10	7	11040
14	8	12010	10	6	12170
14	7	12775	10	5	14290
14	6	14025	10	4	16425
14	5	16230	10	3	19195
14	4	17885	10	2	22650
14	3	20020	10	1	25310
14	2	23285	10	0.5	29380
14	1	26125	9	7	10375
14	0.5	34955	9	6	12240
13	8.5	11120	9	5	14600
13	8	11550	9	4	16925
13	7	12295	9	3	18305
13	6	13195	9	2	22690
13	5	15320	9	1	27660
13	4	17615	9	0.5	30365
13	3	19015	8	6	11090
13	2	22595	8	5	13590
13	1	26055	8	4	15475
13	0.5	28880	8	3	18655
12	8.5	10630	8	2	22565
12	8	10755	8	1	22605
12	7	12050	8	0.5	30145
12	6	12665	7	4	14380
12	5	14645	7	3	16780
12	4	16890	7	2	20605
12	3	19475	7	1	26235
12	2	24350	7	0.5	28680
12	1	27000	6	4	13790
12	0.5	30490	6	3	16550
11	8.5	10620	6	2	20075
11	8	11610	6	1	26220
11	7	12604	6	0.5	28680
11	6	13570	5	3	15010
11	5	14230	5	2	19935
11	4	17740	5	1	24955
11	3	19690	5	0.5	27255
11	2	23255	4	3	12170
11	1	27375	4	2	17913
11	0.5	29360	4	1	24132
			4	0.5	27256

*Capacities are for filling height (Base of the pump to bottom of the inlet reservoir) of 1.5 m.

Note: Back pressure (h) = [H X 0.1 bar g] + FP bar g + LP bar g

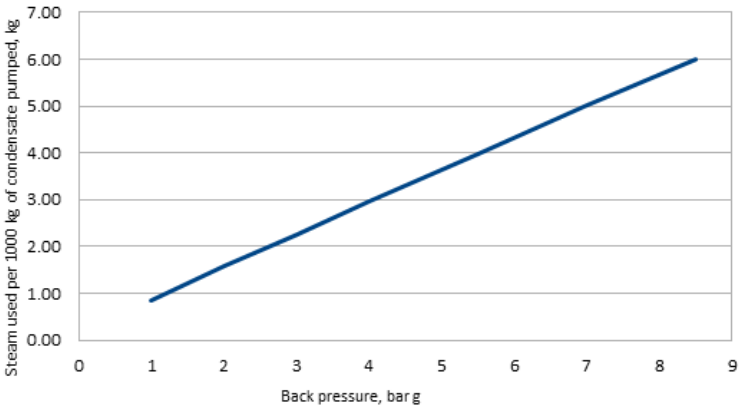
Where H=height to which condensate is to be lifted in metres.
FP= Frictional pressure drop of discharge line
LP=Line Pressure

Recommended motive pressure = Total back pressure + 2 bar g

Example: Steam pressure available for operating pump 11 bar g.
Vertical lift from pump to return piping 29 m Pressure in return piping (piping friction negligible) 3.72 bar g

Solution: 1 Calculate "h", the total lift or back pressure against which the condensate must be pumped.
= (29m x 0.1) + 3.72 = 6.62 bar g
2 From capacity table with 11 bar g operating inlet pressure and 7.0 bar g back MV110 pump capacity is 12604 kg/h

Steam consumption chart:



4. Product Working Principle (Refer to figure 2 :

Note: For this section refer to Figure 2

A MV110 unit consists of a receiver (1), Inlet Isolation valve (5), Strainer (6), a pump shell (2) containing a float mechanism which operates a set of motive steam inlet and exhaust valves and inlet & outlet disc check valves. The steam is used as motive media to operate the pump. Condensate comes into the receiver (1) from flash vessel or plant condensate header and is allowed to flow in to the pump body (2) having float mechanism by opening the inlet isolation valve (5).

Note: For this section refer to Figure 2.2

A MV110 pump consists of a pump shell assembly (1), Internal mechanism assembly (2) containing a float mechanism which operates a set of motive steam inlet valves and exhaust valves, Steam inlet (3), steam exhaust (4) and condensate inlet (5) & condensate outlet (6) connections, check valves (7). Steam is used as a motive media to operate the pump. Condensate flows from reservoir or plant condensate header into the pump body (1) having float mechanism.

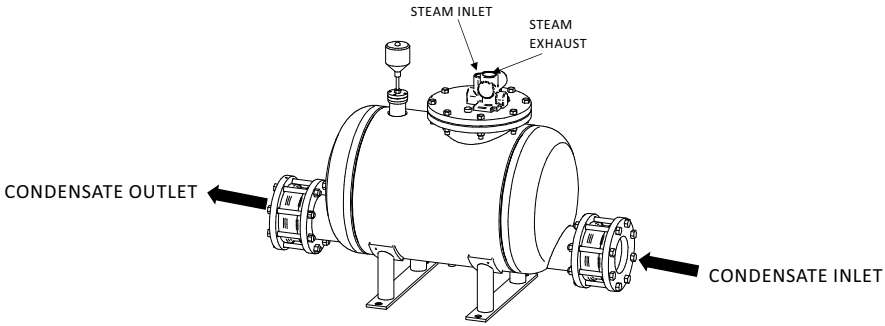


Figure 3 : Pump Shell

Note: For this section refer to Figure 2.3

In the normal position before startup the float (9) is at the lowest position with the motive steam valve (11 & 12) closed and, the exhaust valve open (14). When condensate flows by gravity through inlet check valve in to pump body, the float (9) will rise along with the level of condensate.

As the float (9) continues to rise, the mechanism link increases tension in the springs (8). When the float (9) has risen to its upper tripping position, the linkage mechanism (6 and 7) snaps. The push rod (5) is thereby moved upwards, to simultaneously open the motive steam inlet valve (11 & 12) and close the exhaust valve (14). Steam flow through the inlet valve (11 & 12) increases the pressure within the body and closes the inlet check valve. The increased pressure in the body shell exceeds the backpressure in the condensate discharge line, and opens the discharge check valve to pump out the condensate in the discharge line.

As the condensate level in the pump body falls, the float (9) is lowered and mechanism link is engaged, which again increases the tension in the springs (8). When the float (9) reaches the lower tripping position, the linkage mechanism (6 and 7) snaps. The push rod (5) is moves

downwards, to open the exhaust valve (14) and close the steam inlet valve (11 & 12) simultaneously. Steam utilized for pumping the condensate gets released to through exhaust valve and this completes one pumping stroke.

When the pressure in the pump body 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 1. 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 4

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. 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 MV110 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 to the motive supply inlet (D).
7. 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.

5.1 Care to be taken while routing the condensate pump discharge line: (Refer to Fig. 5)

a. The outlet line size should be equal to or more than pump outlet flange size provided with pump.

b. 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 back pressure on the pump

c. If there are multiple horizontal & vertical rise in outlet discharge line of Pump, mount the vacuum breaker & air eliminator as shown in Fig.- 5 . This will reducer likelihood of vacuum creation in discharge line due to acceleration & deceleration of stroke volume. Air eliminator will help to remove air in case of pressurized return line.

Fig.4: MV110 with Forbes Marshall Flash Vessel

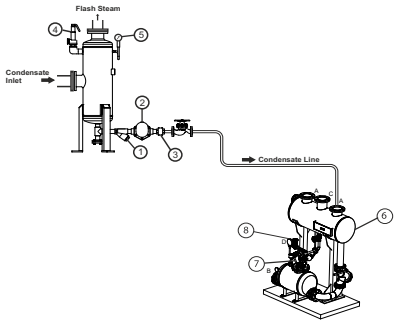


Figure 5: Routing the condensate line to the Feed Water Tank

5.2 In case more than one condensate pump is connected to a common Condensate line: (Refer to Figure 6)

1. 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
2. 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.

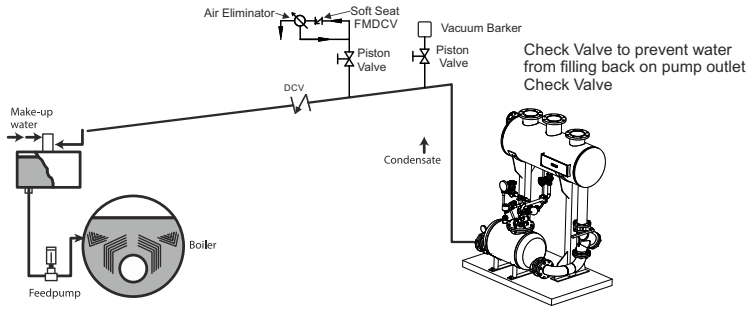


Figure 6: More than one pump connected to common condensate line

Startup and Commissioning :

For trouble free operation of MV110 pump, it is important that the float trap internals, pump internals & disc check valves are free from dirt or other particles.

Therefore, prior to bringing the MV110 pump in to operation, please ensure that the entire condensate piping circuit is thoroughly flushed.

6.1 Starting procedure of MV110

Wherever process condensate is directly connected to pump receiver, open the pump condensate strainer cap & screen to flush foreign particles and contaminated condensate. Similarly, motive steam should also be flushed by removing strainer cap & screen until clean motive media is seen.

1. Once flushing of condensate and motive line is completed, open the motive line isolation valve and ensure that the motive media pressure does not exceed as mentioned in the Technical Information Sheet/User Manual.
2. Make sure that the motive line drain trap is operational
3. Open the pump condensate isolation valve and allow the condensate to flow into the pump shell.
4. To avoid fluttering of inlet check valve during cold startup of the pump, open the pump condensate isolation valve by 50%. Once the cold startup is over open the isolation valve fully.

*NRV : SIZE EQUAL TO PUMP OUTLET SIZE

5. Now the pump shall operate as described in the above sections.
6. Steam utilized for pumping is released with an audible exhaust (dB<85) 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. However the capacity of pump discharge will be as per the capacity chart. (Refer Technical Section)

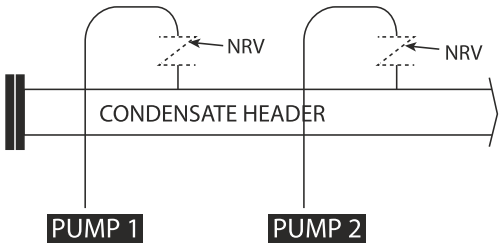
7. Maintenance Guidelines:

Before undertaking any maintenance on the pump it must be isolated from both supply line and return line and any pressure should be allowed to safely normalize to atmosphere. The pump should then be allowed to cool. With suitable isolation repairs can be carried out with the pump in the line.

MV110 pumps 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 pump.



7.2 Tool Kit: Multi Valve Pressure Powered Pump Package Unit /

To carry out any maintenance of the MV110 pump, please use the tools mentioned in the table below

NO.	PARAMETERS TO BE CHECKED	FREQUENCY FOR CHECKING VARIOUS PARAMETERS					
A	Flash Vessel	Daily	Weekly	Monthly	Quarterly	Half Yearly	Annually
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 MV110 motive pressure	Y					
12	Checking of flash steam pressure in flash vessel	Y					

NO.	PARAMETERS TO BE CHECKED	FREQUENCY FOR CHECKING VARIOUS PARAMETERS					
A	Multi Valve Pressure Powered Pump Package Unit /	Daily	Weekly	Monthly	Quarterly	Half Yearly	Annually
13	Cleaning of motive line 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	Visual inspection of safety relief valve		Y				
20	Overhauling and cleaning of safety relief valve						Y
21	Cleaning pump internal assembly						Y

Sr. No.	Tools	Quantity	Where used
1	A/F 27mm open spanner	1	Inlet and Exhaust seats
2	8mm Allen key/torque wrench	1	M10 Allen bolts
3	5mm Allen key	1	M6 Allen bolts
4	A/F 7mm open spanner	1	M4 hex bolts
5	A/F 19mm open spanner	1	Actuating disc M12 nut
6	A/F 19mm ring spanner	1	Actuating disc M12 nut
7	Plier	2	Split pins
8	A/F 18mm open torque wrench	1	Float spud
9	A/F 10mm open spanner	1	Float arm M6 nuts
10	A/F 24mm open spanner	1	Mechanism flange bolts
11	A/F 27mm open spanner	1	Inlet and Outlet flange bolts

7.3 Maintenance/Replacement Procedure:

For a detailed maintenance/replacement procedure of the pump body internals, please refer to the instructions given in the subsequent sections;

7.3.1 How to Maintain/Replace the whole internal assembly (Ref fig. 2.2)

1. Before carrying out any maintenance, remove all the connections to the pump cover. Isolate the pump body by closing the inlet isolation valve.
2. Unscrew all twelve nuts(12) present on the mounting flange (2) and lift the cover and internal mechanism assembly by tilting it from the pump shell
3. Remove the old gasket (9), and clean the gasket area before replacing the new one
4. Put the whole assembly back inside the pump body (1).
5. Tighten the cover nuts (12).

7.3.2 How to Maintain/Replace float assembly (Ref fig. 2.3)

1. Follow steps 1 to 2 of 7.3.1 section.
2. Arrange the whole assembly onto the vice such that the internals are placed on top and clamp the cover.

7.3.3 How to Maintain/Replace Exhaust valve seat and head assembly (Ref fig.

1. Follow steps 1 & 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. Remove the four allen bolts of support bracket (4) to free the whole assembly from the cover.
4. Do not disturb the actuating disc setting by unscrewing its nut.
5. Remove the Exhaust valve seat (14).
6. Clean the metal gasket and replace if required.
7. Assemble the new exhaust valve seat.
8. Refit the support bracket while carefully engaging the exhaust valve stem into the exhaust valve seat using M10 allen bolts.
9. Unclamp the cover and insert the whole assembly back inside the pump body.
10. Tighten the cover nuts (12).

7.3.4 How to Maintain/Replace Inlet valve assembly: (Ref fig. 2.3)

1. Follow steps 1 and 2 of section 7.3.1

2. Unscrew the allen bolts present support bracket (4) to free the whole assembly from the cover.
3. Do not disturb the actuating disc setting by loosening of its nut.
4. Remove inlet valve seat(12)
5. Push out the inlet valve stem (11) from above by removing its castle nut. And replace it by new ones.
6. Refit support bracket.
7. Unclamp the cover and insert the whole assembly back inside the pump body.
8. Tighten the cover nuts .

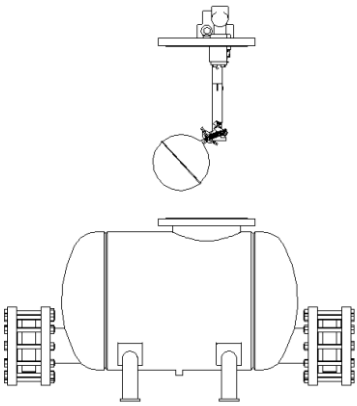
7.3.5 How to Maintain/Replace the springs: (Ref fig. 2.3)

1. Follow step 1,2 of section 7.3.1
2. Remove the split pins.
3. Remove the washers and the springs (8) from the linkage mechanism.
4. Insert the new springs
5. Put the washer and split pins back
6. Reassemble the whole mechanism following steps 4 and 5 of section 7.3.1

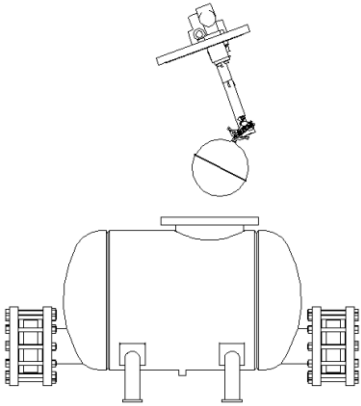
7.3.6 How to assemble actuator mechanism assembly with Pump body.:

Troubleshooting:

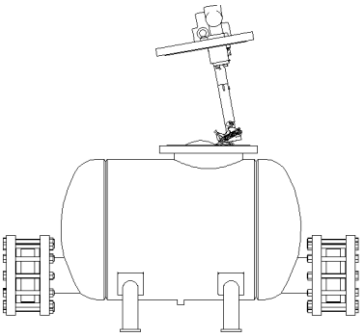
If the expected performance is unachievable after the installation of the pump, check the following points for appropriate corrective measures.



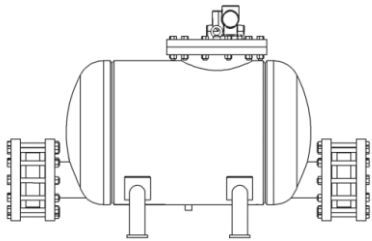
Step 1: Hold the mechanism assembly above the pump and align it with the mounting flange



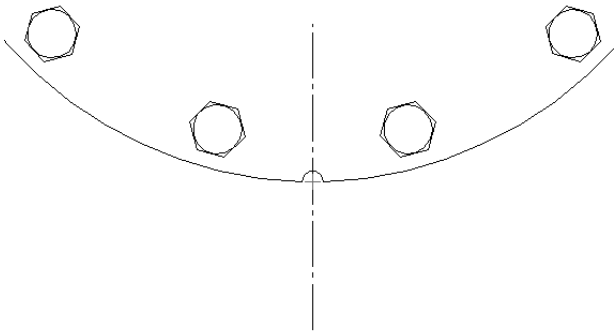
Step 2: Tilt the mechanism



Step 3: Lower the mechanism assembly into the pump shell.



Step 4: Tighten M16 bolts and nuts with a torque of 200 -220Nm in cross pattern

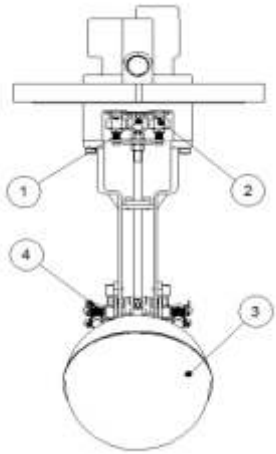


Ensure half radius marking on the mechanism assembly flange matches with mating flange on the pump shell.

9. Available Spares (Refer to Figure 4)

Description	Possible Cause	Troubleshooting Procedure
Pump stops working	a) Motive steam supply closed	a) Open valves to supply motive steam pressure to pump .
	b) Motive line strainer chocked	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 chocked	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 DCV	h) Correct it if found wrong.
	continuously from exhaust line	valve is leaking- open the internals and clean the inlet valve. Replace it if found
Warranty Period:	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.
Pump working, overflows only during discharge.	a) Check inlet Disc Check Valve	a) Lap the seat and if the problem persists replace Disc Check Valve

Description	Possible Cause	Troubleshooting Procedure
Pump working, continuously overflows	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 increase motive pressure as required.
	g) Outlet Disc check vavle stuck open or leaking	g) Open the Disc check valve and clean it or replace it if found damaged.
	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.



Sr.No	Description	Part Code No.
1	Mechanism assembly kit	SPARE-MV110-MKIT
2	Inlet valve kit	SPARE-MV110-IVKIT
3	Exhaust valve kit	SPARE-MV110-EVIKIT
4	Float assembly	SPARE-MV110-FKIT
5	Spring assembly	SPARE-MV110-BSKIT
6	Mechanism Gasket	SPARE-MV110-GKIT
7	CRM Kit	SPARE-MV110CRM485-SNSRKIT
8	Ex-proof CRM Kit	SPARE-MV110EXCRM485-SNSRKIT

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