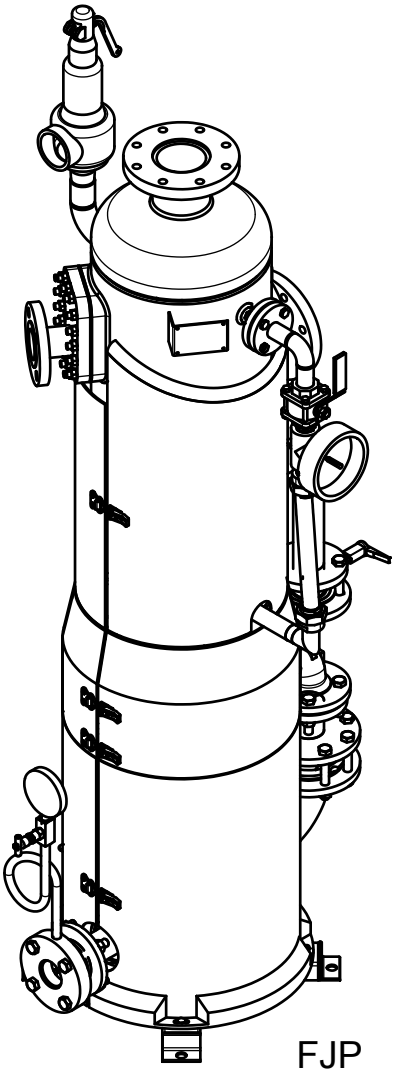
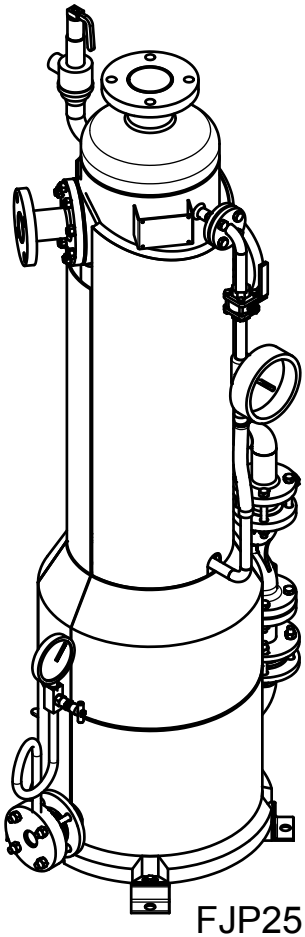
Installation and Maintenance Manual

FLASHJET™ Pump

FJP



FJP
40-50-80-80X



FJP25

Table of Contents

1 Preface :

This manual is intended for anyone using, commissioning, servicing, or disposing the below
mentioned products safely and efficiently.
Flash Jet Pump with CRM485R
Size: FJP25, FJP40, FJP 50, FJP 80, FJP80X

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 2.8) 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
1.FJP is suitable for use under the shed only.
2. 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.
3. Check for the suitability in conformance to the limiting conditions specified in technical information sheet of the product.
4. The correct installation and direction of fluid flow has to be determined.
5. 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 liquids or gases in the pipeline:
Contemplate what may have been in the pipe or is in the pipe and also for flammable materials, substances hazardous to health, extremes of temperature.
PPPPU

2.4 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.

2.5 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.

2.6 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.

2.7 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.

2.8 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.

2.9 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.

2.10 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.

2.11 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.

2.12 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 orenvironmental risk.

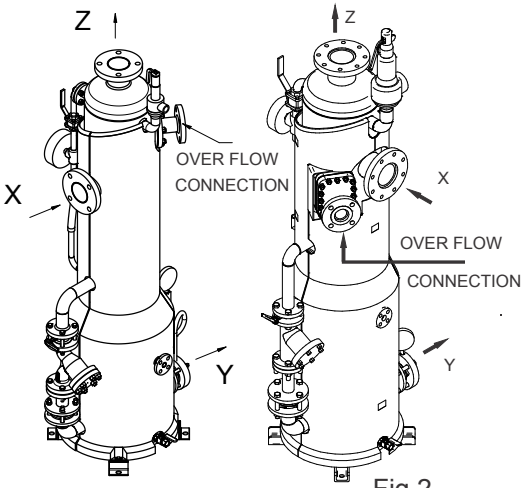
This information must be provided in writing including Health and Safety data sheets relating to any substances identified as hazardous or potentially hazardous.

3 Brief Product Information:

3.1 Description:
The Forbes Marshall Flash Jet Pump is an integrated solution of a pressure powered condensate pump operated by steam & a flash vessel. It is an innovative concept that enables the total recovery of flash steam & condensate simultaneously. Condensate recovery meter (CRM) gives the amount of condensate & energy recovered from the system.

3.2 Size & Pipe Connection

Flash outlet & condensate inlet flanged to ASME B16.5 CLASS 150 flange.
For Condensate outlet use flange provided with FJP.



FJP 25

Fig.2
FJP40-50-80-80X

Model	X Condensate inlet	Y Condensate outlet	Z Flash outlet	Overflow Connection
FJP25	80 NB	25 NB	80 NB	50 NB
FJP40	100 NB	50 NB	100 NB	
FJP50	100 NB	80NB	100 NB	
FJP80	100 NB	80 NB	100 NB	
FJP80X	150 NB	80 NB	150 NB	

3.3Limiting conditions

Sizes : FJP25 / FJP40 / FJP50 / FJP80 / FJP80X

Body design : 10 bar g at 184°C for FJP25
8.7 bar g at 220°C for FJP40 / FJP50 / FJP80
7.0 bar g at 180°C for FJP80X

Operating motive pressure : 3 to 10 bar g for FJP25
3 to 8.7 bar g for FJP40 / FJP50 / FJP80
3 to 7 bar g for FJP80X

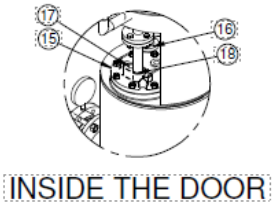
FJP discharge per cycle : 10 litres for FJP25
30 litres for FJP40 / FJP50 / FJP80
55 litres for FJP80X

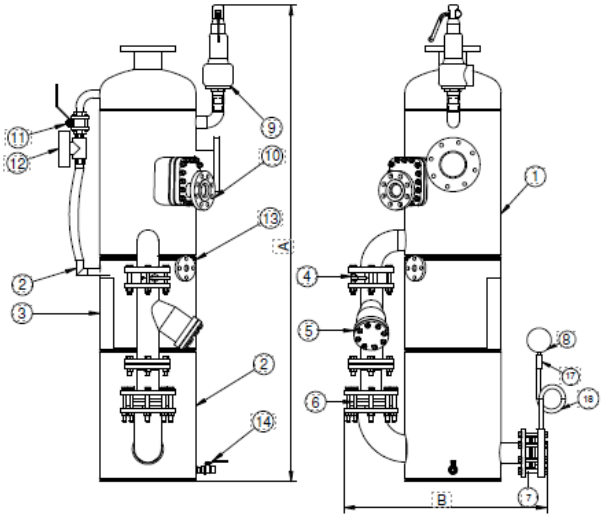
Maximum steam consumption : 4.5 kg of steam per 1000 kg of condensate pumped.

Note: For lower operating temperatures consult Forbes Marshall

3.4 Standard Accessories:

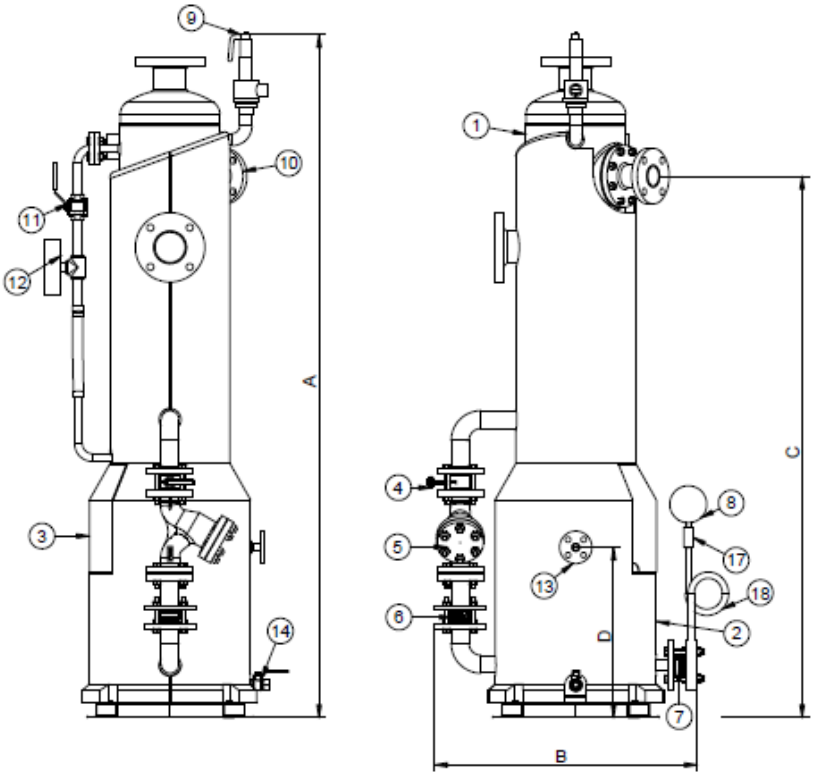
Condensate recovery meter - 485 (CRM485R)
and insulation jacket





Schematic FJP40/50/80/80X

Model	Approx. Dimensions				
	A	B	C	D	Approx. Empty Weight
FJP40	2m	0.77m	1.4m	0.71m	250 kg
FJP50	2m	0.87m	1.4m	0.71m	270kg
FJP80	2m	0.85m	1.4m	0.75m	300 kg
FJP80X	2.2m	0.95m	1.5m	0.77m	450 kg



Schematic FJP25

Model	Approx. Dimensions				
	A	B	C	D	Approx. Empty Weight
FJP25	1.8m	0.74m	1.28m	0.46m	175 kg

FJP25

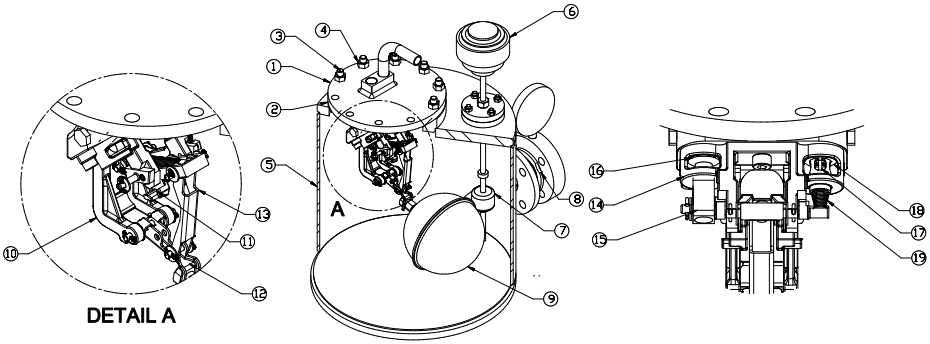


Fig 4 : Mechanism Detail of FJP25

SR.NO	DESCRIPTION	MATERIAL	STANDARD
1	FJP25 Mechanism Cover flange	Carbon Steel	IS2062 Gr. B
2	Cover gasket	Non-Asbestos	NA-254
3	M12 Stud	Carbon Steel	ASTM A193 Gr B
4	M12 Nut	Carbon Steel	ASTM A194 Gr 2H
5	Pump shell	Carbon Steel	IS2062 Gr. B
6	Reed Sensor	Stainless Steel	-
7	Sensor float	Stainless Steel	ASTM A240 Gr 304
8	FM Disc Check Valve	Stainless Steel	ASTM A351 Gr CF8
9	Float	Stainless Steel	ASTM A240 Gr 304
10	Mechanism manifold bracket	Stainless Steel	ASTM A351 Gr CF8
11	Actuator Mechanism	Stainless Steel	ASTM A351 Gr CF8
12	Float lever	Stainless Steel	ASTM A240 Gr 304
13	Crank lever	Stainless Steel	ASTM A240 Gr 304
14	Support bracket	Stainless Steel	ASTM A351 Gr CF8
15	Exhaust valve head	Stainless Steel	ASTM A276 Gr 431
16	Exhaust valve seat	Stainless Steel	ASTM A276 Gr 304
17	Inlet valve stem	Stainless Steel	ASTM A276 Gr 431
18	Inlet valve seat	Stainless Steel	ASTM A276 Gr 304
19	Inlet valve spring	Stainless Steel	ASTM A276 Gr 316

FJP40 / FJP50 & FJP80

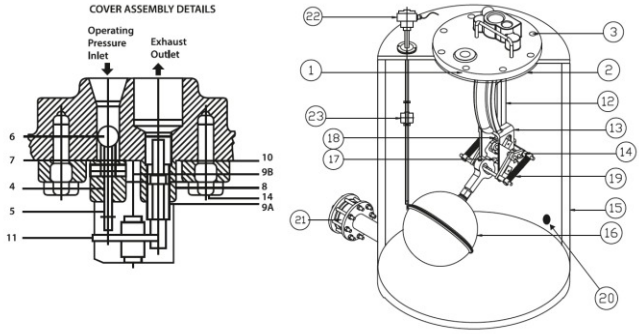
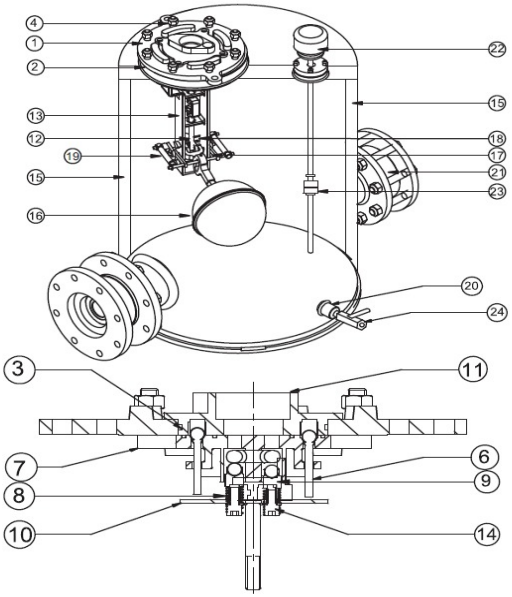


Fig 4 : Mechanism Detail of FJP40 / FJP50 & FJP80

Material:

Sr. No.	Description	Material	Standard
1	Cover	Cast Iron	IS 210 Gr FG 260
2	Cover Gasket	Synthetic Fibre	-
3	Stud and Nut M - 12	Cast Steel	-
4	Inlet Valve Seat	Stainless Steel Type 304	ASTM A276
5	Inlet Valve Stem	Stainless Steel Type 304	ASTM A276
6	Inlet Valve Head	Stainless Steel	-
7	Inlet Seat Gasket	Copper	-
8	Exhaust Valve	Stainless Steel Type 304	ASTM A276
9(a)	Exhaust Valve	Stainless Steel Type 304	ASTM A276
9(b)	Exhaust Valve Head	Stainless Steel Type 304	ASTM A276
10	Exhaust Seat Gasket	Copper	-
11	Valve Actuator Disc	Stainless Steel Type 304	ASTM A276
12	Push Rod	Stainless Steel Type 304	ASTM A240
13	Mechanism	Cast Iron	IS 210 FG 260
14	Mechanism Studs M12	Stainless Steel	IS 1364
15	Body	Carbon Steel	IS 3589
16	Float	Stainless Steel Type 304	ASTM A240
17	Linage Mechanism	Stainless Steel	ASTM A351 CF 8
18	Push Rod Actuator	Stainless Steel	ASTM A351 CF 8
19	Spring	Inconel	-
20	Plug 1/2"BSPT	Forged Carbon Steel	ASTM A105
21	Check Valve	Stainless Steel	-
22	Flow-temp Sensor	Stainless Steel	-
23	Sensor Float	Stainless Steel Type 304	ASTM A240

FJP80X



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	1/2"BSPT Ball Valve	Forged Carbon Steel	ASTM A 105

* Items Not Shown

Maximum flash pressure :- 1.5 bar g
Maximum back pressure :- 2 bar g
maximum condensate pressure :- 10 bar g
Total back pressure on FJP has to be more than the flash pressure for its working
Recommended motive pressure = Total back pressure + 2 bar g
Total Back pressure = {H * 0.1 bar g }+ FP bar g + LP bar g
H= Height to which condensate is to be lifted in mtrs.
FP= Frictional pressure drop of discharge
LP= Line pressure.

Capacity Chart

Motive steam pressure bar g	Back pressure bar g	FJP capacity, kg/hr				
		FJP25	FJP40	FJP50	FJP80	FJP80X
10	0.5	1208				
10	1	1256				
10	1.5	1209				
10	2	1072				
9	0.5	1330				
9	1	1313				
9	1.5	1214				
9	2	1019				
8.7	0.5	1325	3347	5206	7358	
8.7	1	1285	3022	4422	5870	
8.7	1.5	1201	2869	3894	5310	
8.7	2	1021	2731	3577	4848	
8	0.5	1320	3319	5145	7126	
8	1	1302	3022	4218	5550	
8	1.5	1196	2823	3727	4872	
8	2	999	2649	3477	4340	
7	0.5	1283	3254	4948	6826	11842
7	1	1193	2962	3985	5281	10548
7	1.5	1069	2768	3479	4696	9254
7	2	876	2594	3244	4228	7960
6	0.5	1273	3196	4613	6498	9102
6	1	1191	2858	3586	4963	8358
6	1.5	1135	2703	3185	4484	7614
6	2	935	2569	3107	4087	6870
5	0.5	1370	3124	4404	6305	8495
5	1	1141	2757	3520	4811	7997
5	1.5	1133	2575	3090	4335	7001
5	2	1049	2415	2902	3945	6006
4	0.5	1226	2837	3691	5179	8429
4	1	1120	2600	3240	4246	7437
4	1.5	1061	2372	3214	3557	6043
4	2	931	2184	2570	3060	4649
3	0.5	1176	2725	3363	4480	7379
3	1	1067	2359	2803	3500	6039

If the total back pressure is less than the flash pressure, contact factory

4 Product Working Principle:

FJP unit consists of a flash vessel assembly and a pump shell assembly containing a float mechanism which operates a set of motive steam and exhaust valves and inlet and outlet disc check valves. Steam is used as the motive media to operate FJP. Condensate flows into the flash vessel assembly where flash steam gets separated from condensate and this flash steam is allowed to vent out from flash vessel vent. Flash steam recovered from FJP can be used for suitable application. The remaining condensate then flows into the pump body having a float mechanism by opening the inlet butterfly valve

Note: For this section refer to Fig. 4

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 (9A) open. When condensate flows by gravity through inlet check valve in to pump body (15), the float (16) Will

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. When the pressure in the body shell (15) exceeds the back pressure in the condensate discharge line, it opens the outlet check valve (21) due to 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 through the exhaust valve and this completes one pumping stroke.

When the pressure in the pump body (15) has fallen to the same level as 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 the next cycle.

The motive steam used to pump the condensate from pump body is recovered in the flash vessel when exhaust stroke takes place. This exhaust steam can be used along with flash steam from the flash outlet.

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 no. 2,3 & installation chart

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.FJP has three connections , namely the condensate inlet, the condensate outlet and the flash steam outlet. An additional outlet for condensate overflow has also been provided.

3.The condensate discharge line of FJP should be routed to the boiler feed water tank and it should be connected to the condensate nozzle of the deaerator head.

4. It is an advisable to install forbes marshall 15NB 100 mesh strainer, piston valve and a float trap as a drain trap before the steam inlet connection.

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

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

2. 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 FJP.

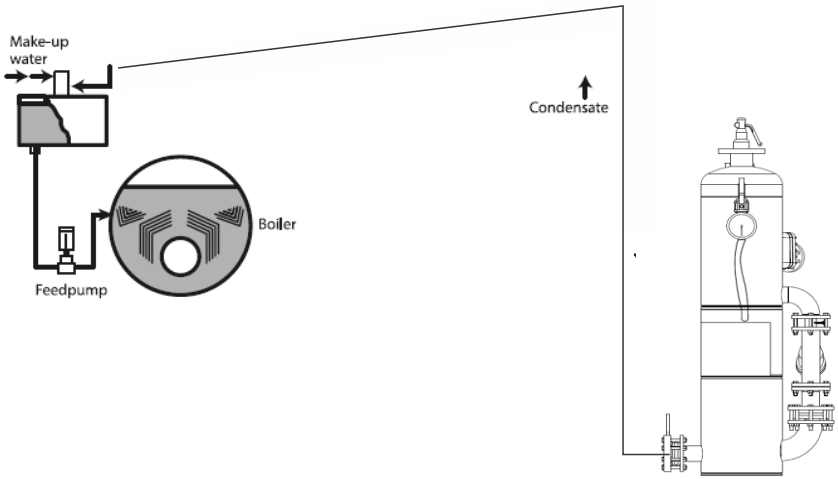


Fig 6 : Routing the Condensate Line to Feed Water Tank

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

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.

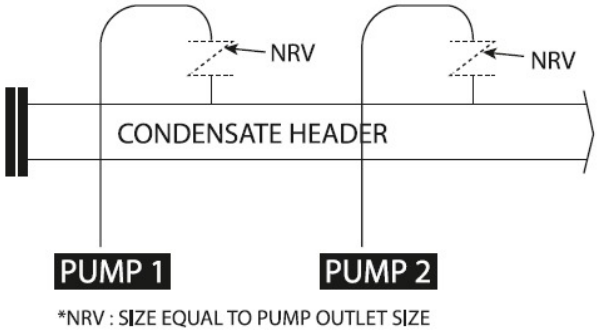


Figure 7: More than one pump connected to common condensate line

6 Startup and Commissioning:

For trouble free operation of FJP, it is important that the single orifice float trap internals, pump internals & check valves are not subjected to dirt or other hard particles.
Therefore, prior to bringing FJP in to operation, please ensure that the entire condensate piping circuit is thoroughly flushed.

Flushing Procedure

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

2. 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 the valve mentioned on the pump name plate/ TIS.

3. Make sure that the motive line drain trap is operational.

4. Open the FJP condensate isolation valve and allow the condensate to flow to the pump shell.

5. Now the pump should pump periodically.

6. Steam utilized for pumping is released with an audible exhaust at the end of each pumping cycle. Observe the condensate return line pressure gauge & ensure that the motive pressure is at least 1.5 to 2 bar g more than the back pressure.

7 Maintenance guidelines for FJP25/FJP40 / FJP50 / FJP80 and FJP80X

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. After suitable isolation repairs can be carried out with the product in
the line. FJP 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 FJP.

No. Parameters to be checked frequency for checking various Parameters

FJP UNIT Unit / 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 FJP motive pressure	Y					
12 Checking of flash steam pressure in flash vessel assembly	Y					
13 Cleaning of motive line trap internals				Y		
14 Cleaning of overflow trap internals				Y		
15 Visual inspection for leakages		Y				
16 Arresting leaks		Y				
17 Checking of float trap SLR setting				Y		
18 Visual inspection of safety relief valve		Y				
19 Overhauling and cleaning of safety relief valve						Y

Tools required :

8 A/F Allen Key, 6 A/F Allen Key, Torque wrench, 19 A/F spanner, 19 Hex socket, 6 A/F Allen Key,3 A/F Allen Key To remove the mechanism assembly

- After removing the cover flange bolts, remove the mechanism assembly carefully, so that there is no damage to the internal mechanism and its float.

- Visually inspect the mechanism for obvious damage. Check that it is free of dirt and scale and operates freely when the floats are moved up and down.

- Inspect the spring assembly for damage. Make sure the valves slide freely and the spring loaded exhaust valve moves on its guide.

- Inspect the float to ensure they are undamaged. Check all the pivot point to ensure they are moving freely.

To refit the mechanism assembly

- Ensure the mechanism cover gasket is clean and free from debris.

- Carefully slide the new cover assembly into the pump body, whilst ensuring the new gasket is carefully aligned with the gasket faces and no parts of it are trapped or pinched outside the sealing areas.
- Refit the Base bolts ensuring they are sequentially tightened in opposing pairs, gradually increasing torque to 90-100 N m
- Carefully reconnect the motive steam supply and the exhaust lines to the connections.
- Follow the start-up procedure as mentioned in commissioning to bring the FJP back into operation.

To change the inlet valve seat assembly

- Follow the procedure mentioned in 'To remove the mechanism assembly'
- Once the mechanism assembly is removed from the pump body; use 6mm allen key to remove support bracket (14), then use 22mm A/F spanner to remove the inlet valve seat assembly(18).
- Refit the new inlet valve seat assembly by ensuring the metal gasket in-between the seat and manifold bracket.

To change the exhaust valve seat assembly

- Follow the procedure mentioned in 'To remove the mechanism assembly'
- Once the mechanism assembly is removed from the pump body; use 6mm allen key to remove support bracket (14), then use 22mm A/F spanner to remove the exhaust valve seat assembly.
- Refit the new exhaust seat assembly by ensuring the metal gasket in-between the seat and manifold bracket.
- To remove the exhaust valve head (15); use nose plier to remove the split pin of actuator and then slide the exhaust valve head outside.
- Refit the new exhaust valve head by sliding it inside the guide. Ensure the exhaust spring and its guide present inside the exhaust valve head.
- Clamp the new split pin after replacing the exhaust valve head assembly (15).

FJP UNIT Unit / 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 FJP motive pressure	Y					
12 Checking of flash steam pressure in flash vessel assembly	Y					
13 Cleaning of motive line trap internals				Y		
14 Cleaning of overflow trap internals				Y		
15 Visual inspection for leakages		Y				
16 Arresting leaks		Y				
17 Checking of float trap SLR setting				Y		
18 Visual inspection of safety relief valve		Y				
19 Overhauling and cleaning of safety relief valve						Y

7.2 Tool Kit:

To carry out any maintenance of FJP25/40/50/80 use the tools mentioned in the table below

Size	Part	Component	Tool used and Size
FJP40 / FJP50 and FJP80	Internal Mechanism Assembly	Motive inlet and exhaust Valve	Open Spanner 26 mm (A/F)
		Float Mechanism	Open Spanner 19 mm (A/F)
		Push Rod and Lock Nut	Open Spanner 17 mm (A/F)
		Bush assembly and stop bolt	Box Spanner 13 mm (A/F)
		Stopper bracket bolt	Box spanner 8 mm (A/F)
		Float Arm Bolt	Open Spanner 10 mm (A/F)
		For Split Pin Assembly	Nose Plier
FJP40 / FJP50 and FJP80	External Assembly	Reads witch 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
FJP40 & FJP50	Condensate inlet connection	Butterfly valve (M16 X 110mm)	Box spanner 24 mm (A/F)
		Strainer assembly (M16 X 65mm)	Box spanner 24 mm(A/F)
	Condensate return connection	Disc check valve (M16 X 120mm)	Box spanner 24 mm (A/F)
		Disc check valve (M16 X 120mm)	Box spanner 24 mm (A/F)
FJP80	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)
	Condensate return connection	Disc check valve (M16 X 130mm)	Box spanner 24 mm (A/F)
		Disc check valve (M16 X 130mm)	Box spanner 24 mm (A/F)

Size	Part	Component	Tool used and Size
FJP25	Internal Mechanism Assembly	Motive inlet and exhaust Valve	Open Spanner 22 mm (A/F)
		Float	Open Spanner 19 mm (A/F)
		Float Arm Bolt	Open Spanner 10 mm (A/F)
		For Split Pin Assembly	Nose Plier
	External Assembly	Reed switch assembly 4 No M8 studs; M8 X 4mm nuts	Ring spanner 13 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
	Condensate inlet connection Condensate return connection	Butterfly valve (M12 X 110mm)	Box spanner 19 mm (A/F)
		Strainer assembly (M12 X 60mm)	Box spanner 19 mm (A/F)
		Disc check valve (M12 X 70mm)	Box spanner 19 mm (A/F)
		Disc check valve (M12 X 90mm)	Box spanner 19 mm (A/F)

7.3 Maintenance/Replacement Procedure : For FJP40 /FJP50 / FJP80

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

7.3.1 Procedure to Maintain/Replace the whole FJP internal assembly:

1. Open the FJP do .Before carrying out any maintenance, remove all the connections to the pump cover (1). Isolate the pump body by closing the inlet isolation butterfly valve and the the ball provided on the exhaust line. Open the pump body drain to normalize any pressure within pump body to atmospheric pressure.
2. Uns ew all eight nuts (3) present on the cover (1) and lift the cover and internal mechanism assembly from the pump body (15).
3. Arrange the whole assembly onto the vice such that the int nals are placed on top and clamp the cover.
4. Remove the assembly nuts to ee the whole assembly from the cover.
5. Remove the old gasket (2), and clean the gasket ea. If required replace with a new one.
6. Fit the FJP int nal assembly onto the cover. Carefully engage the exhaust valve (9A) onto the actuator disc (11) and screw the nuts.
7. Unclamp the cover and insert the whole assembly back inside the pu body (15).
8. ighten the cover nuts (3).

7.3.5 Procedure to Maintain/Replace the springs:

1. Unscrew all eight nuts (3) 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. Clean the springs (19) and replace if required.
6. Put the washer and split pins back
7. Reassemble the whole mechanism following steps 7 and 8 of section 7.3.1

7.3. 2 Procedure to Maintain/Replace float assembly:

1. Follow steps 1 to 3 of section 7.3.1
2. Unscrew the float (16) from the float arm using appropriate spanner.
3. Screw the new float using Loctite 272 adhesive onto the threads.
4. Insert the whole assembly inside the pump body as described in steps 7 and 8 of section 7.3.1

7.3.3 Procedure to Maintain/Replace Exhaust valve seat & head assembly:

1. Unscrew all eight nuts (3) 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 assembly nuts to free the whole assembly from the cover.
4. If required, remove the old gasket (2), and clean the gasket area before replacing with a new one.
5. Unscrew the Exhaust valve head (9B).
6. Clean the metal gasket and replace if required.
7. Fit the exhaust valve head and seat.
8. Now fit the FJP internal assembly onto the cover. Carefully engage the exhaust valve onto the actuator disc (11) and screw the nuts.
9. Unclamp the cover and insert the whole assembly back inside the pump body.

While reinstalling the cover.

10. Tighten the cover nuts (3).

7.3.4 Procedure to Maintain/Replace Inlet valve seat and head assembly:

1. Follow steps 1 through to 4 of section 7.3.3
2. Unscrew the Inlet valve head (6).
3. Clean the metal gasket and replace if required.
4. Fit the inlet valve head and seat.
5. Now fit the FJP internal assembly onto the cover (1). Carefully engage the exhaust valve (9A) onto the actuator disc (11) and screw the nuts.
6. Unclamp the cover and insert the whole assembly back inside the pump body (15). While reinstalling the cover.
7. Tighten the cover nuts (3).

7.4 ool kit for FJP80X

Size	Part	Component	Tool used and Size
FJP80X	Internal Mechanism Assembly	Mechanism support Motive inlet Valve Float Mechanism Push Rod and Lock Nut Float Arm For Split Pin Assembly	Allen key 8 mm Allen key 8 mm Open Spanner 19 mm (A/F) Open Spanner 17 mm (A/F) Open Spanner 19 mm (A/F) Nose Plier
FJP80X	External Assembly	Read switch assembly 4 No M6 studs;M6 X 4mm nuts Internal assembly cover (M12 X 50) Motive inlet and exhaust hose pipe connection	Ring spanner 10 mm (A/F) Open spanner 18 / 19 mm (A/F) Pipe wrench
FJP80X	Condensate inlet connection Condensate return connection	Butterfly valve (M16 X 120mm) Strainer assembly (M16 X 70mm) Disc check valve (M16 X 130mm) Disc check valve (M16 X 130mm)	Box spanner 24 mm (A/F) Box spanner 24 mm(A/F) Box spanner 24 mm (A/F) Box spanner 24 mm (A/F)

7.5 Maintenance/Replacement Procedure : For FJP80X

For a detailed maintenance/replacement procedure of the FJP80X Unit body internals, please refer to the instructions given in the subsequent sections;

7.5.1Procedure to Maintain/Replace the whole FJP internal assembly:

1.Open the FJP door.Before carrying out any maintenance, remove all the connections to the pump cover (1). Isolate the pump body by closing the inlet isolation butterfly valve and the the ball provided on the exhaust line. Open the pump body drain to normalize any pressure within pump body to atmospheric pressure.

1. Unscrew all eight nuts (3) present on the cover (1) and lift the cover and internal 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 assembly nuts to free the whole assembly from the cover.
4. Remove the old gasket (2), and clean the gasket area. If required replace with a new one.
5. Fit the FJP internal assembly onto the cover. Carefully engage the exhaust valve (9A) onto the actuator disc (11) and screw the nuts.
6. Unclamp the cover and insert the whole assembly back inside the pump body (15).

7.5.2 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 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

7.5.3 Procedure to Maintain/Replace Exhaust valve seat and head assembly:
1. Unscrew all eight nuts present on the cover and lift the cover and mechanism assembly from the pump body .
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 and the O-rings, and clean them before replacing the new one.
5. Remove the Exhaust valve.
6. Clean the metal gasket and replace if required.
7. Fit the new exhaust valve.
8. Now fit the FJP internal assembly onto the cover. Carefully engage the exhaust valve onto the actuator disc 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.

7.5.4 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 and the O-rings, and clean them before replacing the new one.
4. Push out the inlet valve stem 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.
7. Tighten the cover nuts.

7.5.5 Procedure to Maintain/Replace the springs:
1. Unscrew all eight nuts present on the cover and lift the cover and mechanism assembly from the pump body.
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 from the linkage mechanism
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

7.5.6 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 .
4. Remove the old O rings 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
7. Tighten the cover nuts .

7.5.7 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 .
4. Remove the old valve seat and replace with the new one. If required, the Orings, 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. While reinstalling the cover.
7. Tighten the cover nuts

8 Troubleshooting

8.1 Troubleshooting: For FJP25 / FJP40 /FJP50 / FJP80

If the expected performance is unachievable after the installation of the FJP80X Unit, check the following points for appropriate corrective measures.

Failure Mode	Possible Cause	Remedy
FJP25 / FJP40 / FJP50 / FJP80 stops working	a) Motive supply closed b) Motive line strainer chocked c) Condensate inlet line closed d) Condensate line strainer chocked e) Condensate discharge line closed f) Motive pressure insufficient to overcome back pressure g) Float punctured h) Check the direction of the Check Valve i) Steam coming out continuously from exhaust line j) Exhaust valve leaking	a) Open valves to supply motive pressure to pump b) Clean the strainer c) Open condensate inlet valve and allow condensate to flow in pumping chamber. d) Clean the strainer. e) Open all discharge line valves to allow free discharge from pump to destination. f) Check motive and back pressure. Adjust motive pressure to 2barg more than total back pressure. g) Replace the float. h) Correct it if found wrong. i) It means motive steam inlet valve is leaking- open the internals and clean the inlet valve. Replace it if found damaged. j) Open the pump internals and clean it. Also check the setting of valve actuator disc and correct it if found disturbed

Failure Mode	Possible Cause	Remedy
FJP25 / FJP40 / FJP50 / FJP80 working,overflows only during discharge.	a) Check inlet Check Valve	a) Lap the seat and if the problem persists replace Check Valve
FJP working, continuously overflows	a) FJP under sized. b) Inlet strainer partially choked c) Motive line strainer partially choked. e) Flash vent line is closed. f) Insufficient motive pressure to achieve rated capacity. g) Outlet Check Valve stuck open or leaking. h) Motive isolation valve partially closed. I) Condensate return line size lesser than pump discharge.	a) Verify the rated capacity as per the capacity table. Install additional FJP as required. b) Clean the strainer. Ensure all valves are fully open. c) Clean the strainer and ensure inlet valve is fully open. e) Make sure that receiver is vented to suitable application as recommended. f) Check motive pressure setting and maximum back pressure during operation. Compare with capacity table and increase motive pressure as required. g) Open the Check Valve and clean it or replace it if found damaged. h) Check and ensure that motive isolation valve is fully open. i) Condensate return line size should be equal to or greater than pump discharge line.

8.2 Troubleshooting: For FJP80X

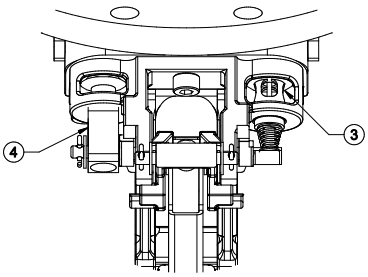
If the expected performance is unachievable after the installation of the FJP80X Unit, check the following points for appropriate corrective measures

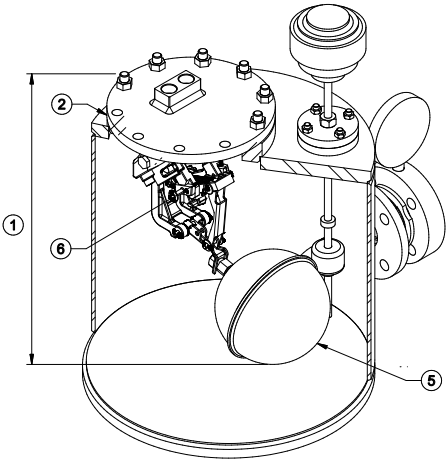
Failure Mode	Possible Cause	Remedy
FJP80X stops working	a) Motive supply closed a) Motive supply closed c) Condensate inlet line closed d) Condensate line strainer chocked e) Condensate discharge line closed f) Motive pressure insufficient to overcome back pressure g) Float punctured h) Check the direction of the Check Valve i) Steam coming out continuously from exhaust line j) Exhaust valve leaking	a) Open valves to supply motive pressure to pump b) Clean the strainer c) Open condensate inlet valve and allow condensate to flow in pumping chamber. d) Clean the strainer. e) Open all discharge line valves to allow free discharge from pump to destination. f) Check motive and back pressure. Adjust motive pressure to 2barg more than total back pressure. g) Replace the float. h) Correct it if found wrong. i) It means motive steam inlet valve is leaking- open the internals and clean the inlet valve. Replace it if found damaged. j) Open the pump internals and clean it. Also check the setting of valve actuator disc and correct it if found disturbed.

Failure Mode	Possible Cause	Remedy
FJP80X working, overflows only during discharge.	a) Check inlet Check Valve	a) Lap the seat and if the problem persists replace Check Valve
FJP80X working, continuously overflows	a) FJP under sized. b) Inlet strainer partially choked c) Motive line strainer partially choked. e) Flash vent line is closed. f) Insufficient motive pressure to achieve rated capacity. g) Outlet Check Valve stuck open or leaking. h) Motive isolation valve partially closed. I) Condensate return line size lesser than pump discharge.	a) Verify the rated capacity as per the capacity table. Install additional FJP as required. b) Clean the strainer. Ensure all valves are fully open. c) Clean the strainer and ensure inlet valve is fully open. e) Make sure that receiver is vented to suitable application as recommended. f) Check motive pressure setting and maximum back pressure during operation. Compare with capacity table and increase motive pressure as required. g) Open the Check Valve and clean it or replace it if found damaged. h) Check and ensure that motive isolation valve is fully open. i) Condensate return line size should be equal to or greater than pump discharge line.

9 Available spares:

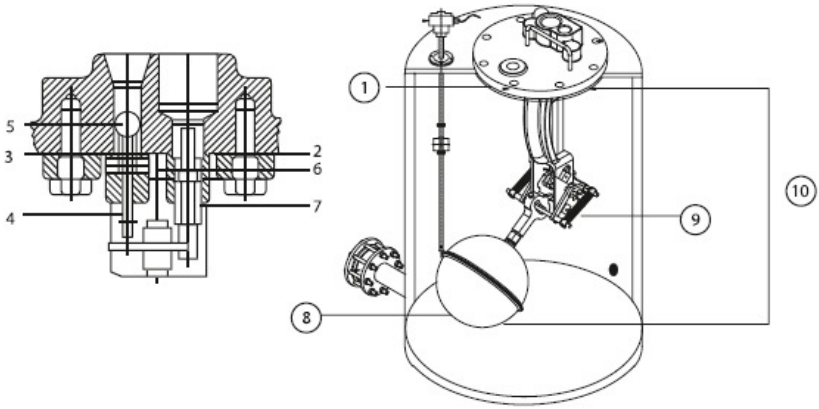
9.1 For FJP25





FJP25	
FJP25 Mechanism kit	SPARE-FJP25-MKIT
Gasket kit (set of 3)	SPARE-FJP25-GKIT
Inlet valve kit	SPARE-FJP25-IVKIT
Exhaust valve kit	SPARE-FJP25-EVKIT
Float assembly kit	SPARE-FJP25-FKIT
Overflow trap assembly kit	SPARE-FJP25-TAKIT
Inlet/Exhaust hose kit	SPARE-FJP25-IEHKIT
Spring Kit	SPARE-FJP25-SKIT

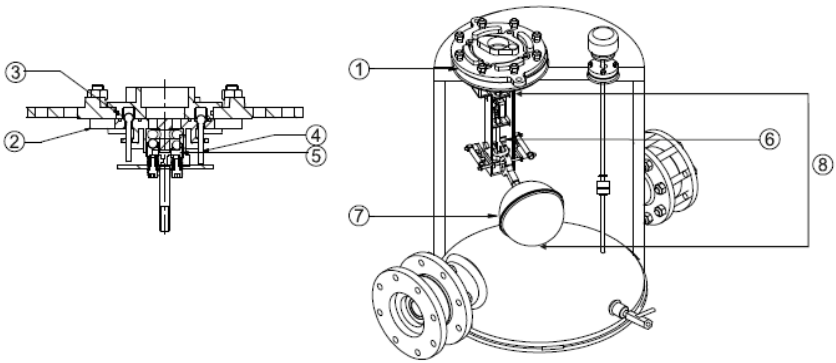
9.2 For FJP40 / FJP50 and FJP80



FJP40 / FJP50	
Internals	SPARE-405080PPPPU-MKIT
Gasket kit	SPARE-405080PPPPU-GKIT
Inlet valve kit	SPARE-405080PPPPU-IVKIT
Exhaust valve kit	SPARE-405080PPPPU-EVKIT
Float assembly	SPARE-405080PPPPU-FKIT
Spring assembly	SPARE-405080PPPPU-SKIT
Overflow trap gasket	SPARE-FJP40-GKIT
SOFT53 mechanism gasket	
25NB gasket for exhaust assembly	
SOFT53 main valve assembly with float	SPARE-50SOFT53-4.5MVKIT

FJP80	
Internals	SPARE-405080PPPPU-MKIT
Gasket kit	SPARE-405080PPPPU-GKIT
Inlet valve kit	SPARE-405080PPPPU-IVKIT
Exhaust valve kit	SPARE-405080PPPPU-EVKIT
Float assembly	SPARE-405080PPPPU-FKIT
Spring assembly	SPARE-405080PPPPU-SKIT
Overflow trap gasket	SPARE-FJP80-GKIT
SOFT53 mechanism gasket	
25NB gasket for exhaust assembly	
SOFT53 main valve assembly with float	SPARE-50SOFT53-4.5MVKIT

9.3 For FJP80X



FJP80X	
Internals	SPARE-MV55-MKIT
Gasket kit	SPARE-MV55-GKIT
Valve seat	SPARE-MV55-SKIT
Inlet valve seat & head assembly	SPARE-MV55-IVHKIT
Exhaust valve seat & head assembly	SPARE-MV55-EVHKIT
Float assembly	SPARE-MV55-FKIT
O ring set	SPARE-MV55-OKIT
Spring assembly	SPARE-405080PPPPU-SKIT
Overflow trap gasket	SPARE-FJP80X-GKIT
SOFT53 mechanism gasket	
25NB gasket for exhaust assembly	
SOFT53 main valve assembly with float	SPARE-50SOFT53-4.5MVKIT

How to specify

Example: Flash Jet Pump Model FJP40 with CRM.

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 ordering information and agreements in the contract

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Krohne Marshall
Forbes Vyncke
Forbes Marshall Steam Systems

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