

Installation and Maintenance Manual

Pressure Powered Pump Package Unit - High Pressure with Insulation Jacket and Condensate Recovery Meter

PPPPU-HP

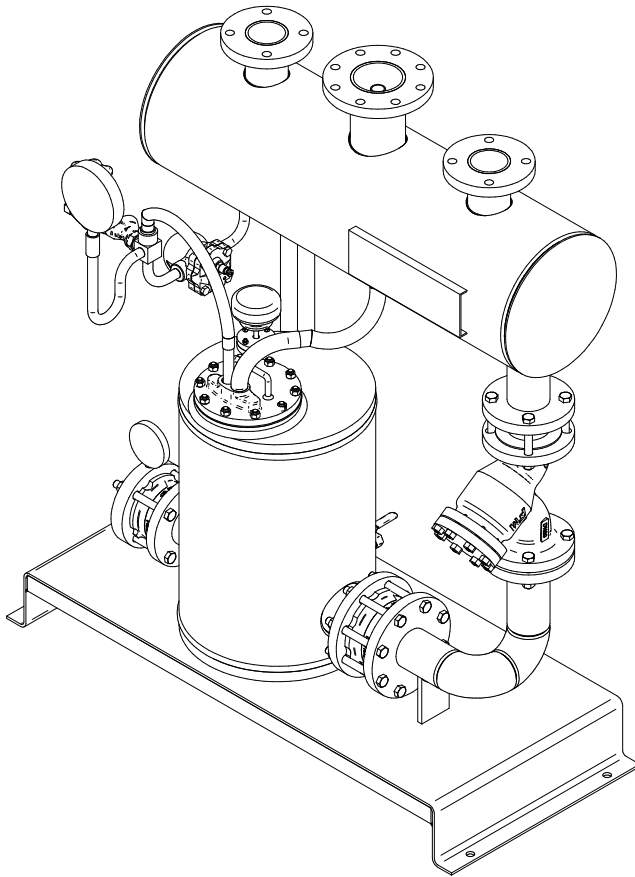


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PLEASE NOTE - Throughout this manual this cautionary symbol is used to describe a potential damage or injury that might occur if the safety considerations are overlooked. This symbol denotes **CAUTION**, **WARNING** or **DANGER**.



1. Preface:

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

Pressure Powered Pump Package Unit - High Pressure with IJ and CRM485R, [PPPPU - HP]

Size: DN40 (1 ½"), DN50 (2"), DN80 (3")

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. 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.
2. Check for the suitability in conformance to the limiting conditions specified in technical information sheet of the product.
3. The correct installation and direction of fluid flow has to be determined.
4. 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.

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 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 Pressure Powered Pump Package Unit (PPPPU-HP) is a positive displacement pump unit operated by steam, compressed air or pressurized gas designed to pump hot condensate.

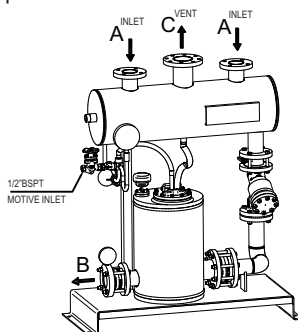


Figure 1 : Pressure Powered Pump Package Unit - High Pressure

3.2 Sizes and Pipe Connections:

Size (DN)	Condensate inlet conn. (A) (DN)	Pump outlet conn. (B) (DN)	Vent conn. (C)(DN)	Empty weight (kg)
40	50	50	100	245
50	50	80	100	350
80	80	80	100	395

SIZE : DN40, 50 and 80 pressure powered pump package unit.

Condensate inlet and vent flanged to ASME B16.5 Class 150

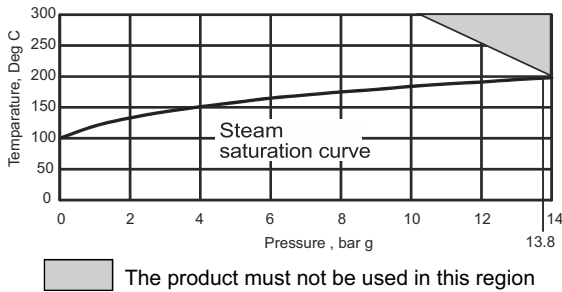
Condensate outlet : use flange special provided with pump

3.3 Limiting Conditions:

Design Standard	ASME Section VIII Div.1
PMA Maximum design pressure	13.8 bar g
TMA Maximum design temperature	200°C
Operating inlet motive pressure	Steam / Compressed Air / Pressurised gas 3-13.8 bar g (max)
Pump discharge per cycle	30 kg
Steam consumption	3.5 kg of steam per 1000 kg liquid pumped
Air consumption	200 SCF per 1000kg liquid pumped
Minimum operating temperature	0°C
Max. Allowable back Pressure	8.5 bar g
Pump Shell Hydrotest Pressure	21 bar g

Note: For lower operating temperatures consult Forbes Marshall

3.4 Operating Range:



3.5 Standard Accessories:

Condensate recovery meter - 485 (CRM485R)
and insulation jacket

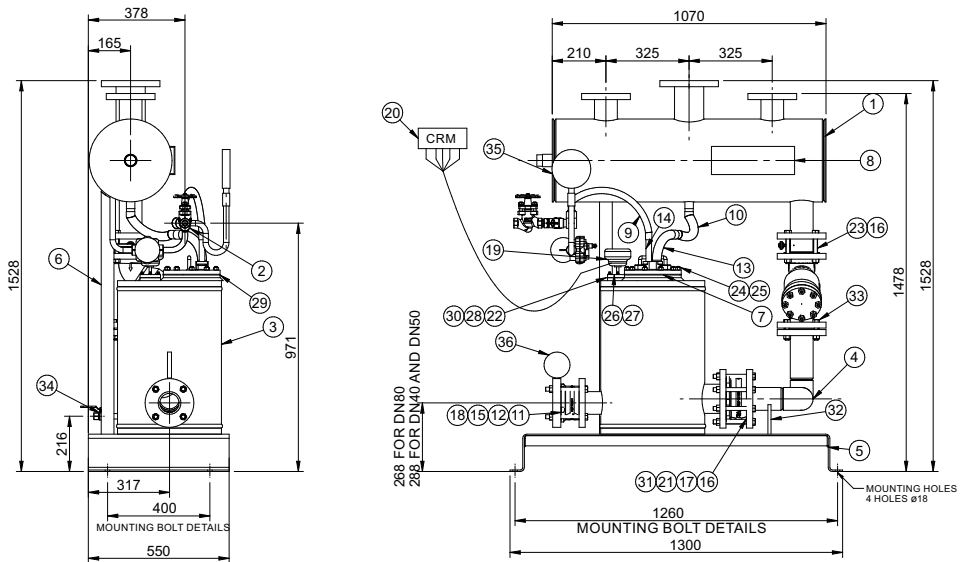


Figure 2 : Detail of Pressure Powered Pump Package Unit - High Pressure with IJ and CRM485R

Sr. No.	Description	Sr. No.	Description
1	Receiver Assembly	20	Condensate Recovery Meter Unit
2	Steam Inlet Connection Assembly	21	Inlet Check Valve
3	Shell Assembly	22	Reed Sensor Flange
4	Condensate Inlet Assembly	23	Hex Head Bolts
5	Frame Assembly	24	Stud
6	Support Assembly	25	Nut
7	Actuator Mechanism Assembly	26	Stud
8	Nameplate	27	Nut
9	Steam Inlet Hose	28	Sensor Mounting Flange
10	Exhaust Hose	29	Mechanism Gasket
11	Check Valve Outlet	30	Reed Flange Gasket
12	ANSI Class 150 Flange	31	Hex Head Bolts
13	BSPT (M) 90 Deg Bend	32	Condensate Line Support
14	BSPT Pipe Nipple	33	Hex Head Bolts
15	Hex Head Bolts	34	Ball Valve
16	Nut	35	Pressure Gauge Steam
17	Check Valve Gasket	36	Pressure Gauge Condensate Outlet
18	Check Valve Gasket		
19	Reed Sensor Assembly		

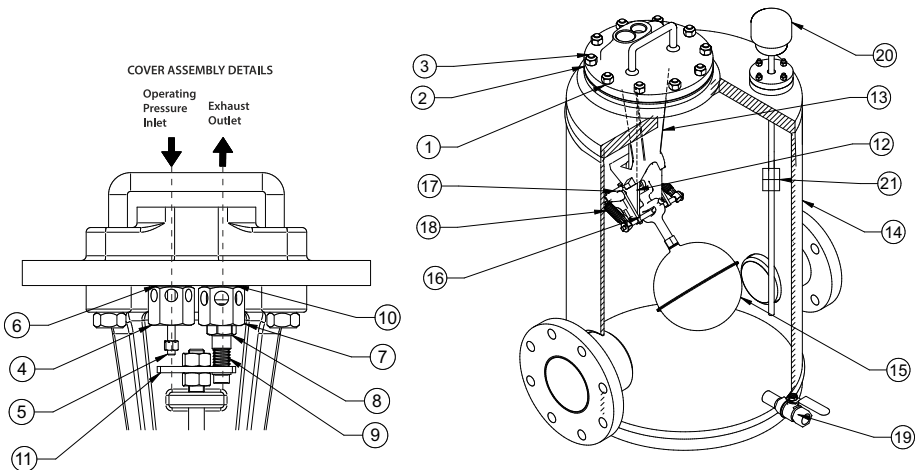


Figure 3 : Mechanism Detail of PPPU - HP

Material:

Sr. No.	Description	Material	Standard
1	Cover	Carbon Steel	ASTM A216 Gr. WCB
2	Cover Gasket	Non Asbestos Sheet	-
3	Stud and Nut	Carbon Steel	ASTM A193 Gr. B7/ A194 Gr.2H
4	Inlet Valve Seat	Stainless Steel	ASTM A276 Gr. 304
5	Inlet Valve Stem	Stainless Steel	ASTM A276 Gr. 304
6	Inlet Seat Gasket	Copper	-
7	Exhaust Valve Seat	Stainless Steel	ASTM A276 Gr. 304
8	Exhaust Valve Head	Stainless Steel	SS316
9	Exhaust Spring	Stainless Steel	ASTM A276 Gr. 431
10	Exhaust Seat Gasket	Copper	-
11	Valve Actuator Disc	Stainless Steel	ASTM A276 Gr. 304
12	Push Rod	Stainless Steel	ASTM A276 Gr. 304
13	Mechanism Support	Stainless Steel	ASTM A351 Gr. CF8
14	Body	Carbon Steel	ASTM A516 Gr. 70
15	Float	Stainless Steel	ASTM A240 Gr. 304
16	Linkage Mechanism	Stainless Steel	ASTM A351 CF 8
17	Push Rod Actuator	Stainless Steel	ASTM A351 CF 8
18	Spring	Inconel	-
19	Drain Valve	Forged Carbon Steel	ASTM A105
20	Flow-temp Sensor	Stainless Steel	-
21	Sensor Float	Stainless Steel	ASTM A240 Gr. 304

3.6 How to Select and Size:

Select the pump size according to the capacity requirement of the application from the inlet, back pressure and filling head conditions given in the table below.

$$\text{Back pressure (h)} = [\text{H} \times 0.1 \text{ bar g}] + \text{FP bar g} + \text{LP bar g}$$

where H=height to which condensate is to be lifted in mtrs.

FP= Frictional pressure drop of discharge

LP=Line Pressure

3.7 Capacity Chart :

When installed with recommended filling head above top of pump = 305 mm.

For liquid specific gravity (0.9 to 1)

PPPPU-HP Capacity (motive steam)								
40NB			50NB			80NB		
Motive Pr. Bar g	Back Pr. Bar g	Capacity, Kg/h	Motive Pr. Bar g	Back Pr. Bar g	Capacity , Kg/h	Motive Pr. Bar g	Back Pr. Bar g	Capacity , Kg/h
2	0.5	2660	2	0.5	3840	2	0.5	4760
2	1	2015	2	1	2635	2	1	3085
3	0.5	3050	3	0.5	4195	3	0.5	8000
3	1	2700	3	1	3375	3	1	4580
4	0.5	3095	4	0.5	4755	4	0.5	7480
4	1	2870	4	1	3940	4	1	5030
4	2	2375	4	2	2785	4	2	3205
5	0.5	3240	5	0.5	4775	5	0.5	7965
5	1	3051	5	1	4180	5	1	5760
5	2	2555	5	2	3340	5	2	4040
5	3	2115	5	3	2655	5	3	2905
6	0.5	3285	6	0.5	4935	6	0.5	8464
6	1	3140	6	1	4430	6	1	5954
6	2	2790	6	2	3635	6	2	4565
6	3	2395	6	3	3110	6	3	3465
6	4	2015	6	4	2395	6	4	2635
7	0.5	3315	7	0.5	5010	7	0.5	9030
7	1	3150	7	1	4650	7	1	6135
7	2	2790	7	2	3895	7	2	4705
7	3	2480	7	3	3290	7	3	3605
7	4	2160	7	4	2690	7	4	2785
7	5	1905	7	5	2280	7	5	2165
8	0.5	3360	8	0.5	5180	8	0.5	9290
8	1	3255	8	1	4755	8	1	7695
8	2	2885	8	2	4080	8	2	5345
8	3	2605	8	3	3365	8	3	4185
8	4	2295	8	4	2880	8	4	3240
8	5	2035	8	5	2545	8	5	2530
8	6	1840	8	6	2090	8	6	1945
9	0.5	3415	9	0.5	5210	9	0.5	9460
9	1	3285	9	1	4820	9	1	7860
9	2	3015	9	2	4095	9	2	5645
9	3	2625	9	3	3385	9	3	4330
9	4	2340	9	4	2920	9	4	3425
9	5	2070	9	5	2645	9	5	2630
9	6	1940	9	6	2300	9	6	2265
9	7	1630	9	7	1970	9	7	1944
10	0.5	3425	10	0.5	5235	10	0.5	9350
10	1	3295	10	1	4845	10	1	8205
10	2	3045	10	2	4110	10	2	5690
10	3	2655	10	3	3420	10	3	4455
10	4	2375	10	4	2995	10	4	3690
10	5	2120	10	5	2765	10	5	3560
10	6	2015	10	6	2495	10	6	3240
10	7	1875	10	7	2230	10	7	2740
10	8	1620	10	8	1980	10	8	2520
10	8.5	1500	10	8.5	1775	10	8.5	2225
11	0.5	3435	11	0.5	5290	11	0.5	9460
11	1	3360	11	1	4865	11	1	8910
11	2	3085	11	2	4215	11	2	6480
11	3	2750	11	3	3475	11	3	5140

PPPPU-HP Capacity (motive steam)								
40NB			50NB			80NB		
Motive Pr. Bar g	Back Pr. Bar g	Capacity, Kg/h	Motive Pr. Bar g	Back Pr. Bar g	Capacity, Kg/h	Motive Pr. Bar g	Back Pr. Bar g	Capacity, Kg/h
11	4	2410	11	4	3030	11	4	4240
11	5	2210	11	5	2795	11	5	3800
11	6	2115	11	6	2560	11	6	3685
11	7	1885	11	7	2355	11	7	3230
11	8	1735	11	8	2135	11	8	2685
11	8.5	1670	11	8.5	1980	11	8.5	2495
12	0.5	3470	12	0.5	5345	12	0.5	9900
12	1	3360	12	1	4915	12	1	9295
12	2	3115	12	2	4320	12	2	7125
12	3	2855	12	3	3550	12	3	5480
12	4	2460	12	4	3095	12	4	4345
12	5	2235	12	5	2815	12	5	3940
12	6	2120	12	6	2590	12	6	3750
12	7	1895	12	7	2370	12	7	3275
12	8	1780	12	8	2230	12	8	2750
12	8.5	1735	12	8.5	2065	12	8.5	2605
13	0.5	3505	13	0.5	5370	13	0.5	10085
13	1	3390	13	1	4960	13	1	9460
13	2	3125	13	2	4355	13	2	7320
13	3	2885	13	3	3625	13	3	5940
13	4	2465	13	4	3120	13	4	4545
13	5	2270	13	5	2860	13	5	4005
13	6	2125	13	6	2625	13	6	3790
13	7	1925	13	7	2425	13	7	3320
13	8	1830	13	8	2290	13	8	2835
13	8.5	1760	13	8.5	2135	13	8.5	2720
14	0.5	3525	14	0.5	5425	14	0.5	10180
14	1	3400	14	1	5030	14	1	9460
14	2	3135	14	2	4390	14	2	7370
14	3	2895	14	3	3650	14	3	6035
14	4	2480	14	4	3160	14	4	4545
14	5	2280	14	5	2855	14	5	4015
14	6	2130	14	6	2645	14	6	3815
14	7	1930	14	7	2450	14	7	3360
14	8	1840	14	8	2355	14	8	2975
14	8.5	1795	14	8.5	2275	14	8.5	2840

3.8 Capacity Multiplying Factors for Other Filling Heads

Filling Head	DN40	DN50	Dn80
152	0.7	0.7	0.84
305	1.0	1.0	1.0
610	1.2	1.2	1.08
914	1.35	1.35	1.20

3.9 Capacity Multiplying Factors for Motive Gas Supplies

% Back pressure vs. Motive pressure BP/ MP)

10%	20%	30%	40%	50%	60%	70%	80%	90%
1.04	1.06	1.08	1.10	1.12	1.15	1.18	1.23	1.28

3.10 Example:

Condensate load	1600 kg/hr.
Steam/air pressure available for operating pump	5.0 bar g
Vertical lift from pump to return piping	9 m
Pressure in return piping (piping friction negligible)	1.72 bar g
Filling head on pump	0.3048 mtrs.

Solution:

- 1 Calculate "h", the total lift or back pressure against which the condensate must be pumped.

$$= (9 \times 0.1) + 1.72 = 2.62 \text{ bar g}$$
- 2 From capacity table with 5.0 bar g operating inlet pressure and 3.0 bar g back pressure choose a DN 40 pump which has a capacity of 2115 kg/hr.

Note from Capacity Factor Charts

- A Pump capacity if filling head is 0.610 mtr.

$$= 1.2 \times 2115 = 2538 \text{ kg/hr.}$$

4. Product Working Principle:

Note: For this section refer to Figure 4

A PPPPU-HP 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).

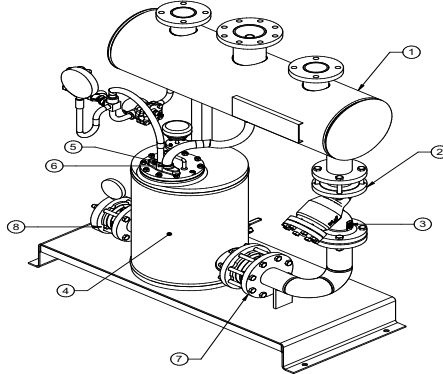


Figure 4: Pressure Powered Pump Package Unit- High Pressure

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 (8) open. When condensate flows by gravity through inlet check valve in to pump body (14), the float (15) will become buoyant and rise.

As the float **(15)** continues to rise, the mechanism link **(16)** is engaged which increases tension in the springs **(18)**. When the float **(15)** has risen to its upper tripping position, the linkage mechanism **(16)** snaps upward over center. The energy in the springs **(18)** is released as the push rod **(17)** is moved upward, to simultaneously open the motive steam inlet valve **(5)** and close the exhaust valve **(9)**. 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 **(14)** exceeds the backpressure in the condensate discharge line, it opens the outlet check valve and forces out the condensate in the discharge line.

As the condensate level in the pump body **(14)** falls, the float **(15)** is lowered and mechanism link **(16)**, which again increases the tension in the springs **(18)**. When the float **(15)** reaches the lower tripping position, the linkage mechanism **(16)** snaps downward over center. The energy in the springs **(18)** is released as the push rod **(17)** is moved downward, to simultaneously open the exhaust valve **(8)** 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 **(14)** 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 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.

Refer installation and maintenance sheet supplied with pump.

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 . 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-HP 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 . Motive supply inlet line should be sufficient large (recommended DN25 (1")).
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.

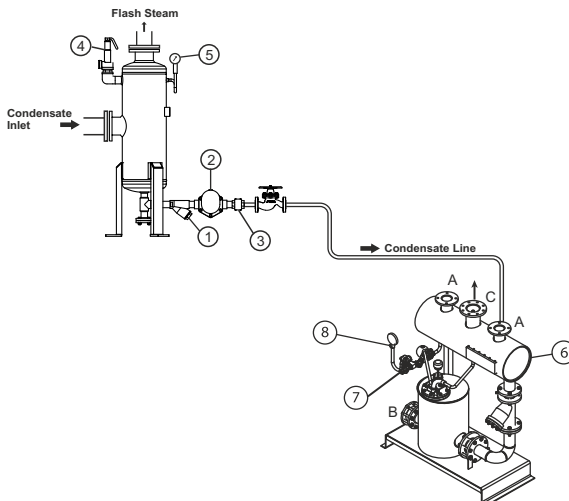


Figure 5: Installation of PPPPU-HP with Forbes Marshall Flash Vessel

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



Pump is provided with an outlet flange. Weld the flange to the discharge line and assemble it back to pump ensuring correct direction of the outlet discharge line.

For flange welding coat the welded joint with primer and suitable high temperature point immediately after that welding before corrosion sets in.

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 pump .

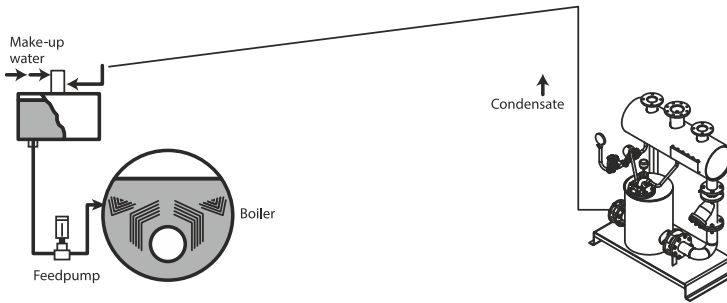
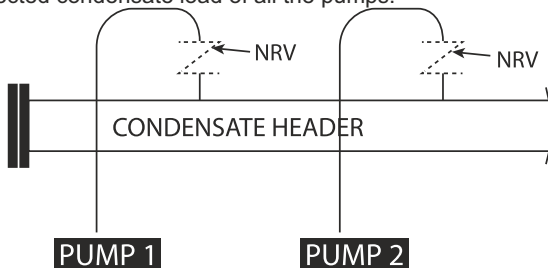


Figure 6 : Routing the condensate line to the Feed Water Tank

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

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.



*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 Forbes Marshall PPPPU-HP along with a Flash vessel arrangement, if condensate flashing is expected when exposed to atmosphere. For trouble free operation of PPPPU-HP, 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 the PPPPU-HP 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 Fig. 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.

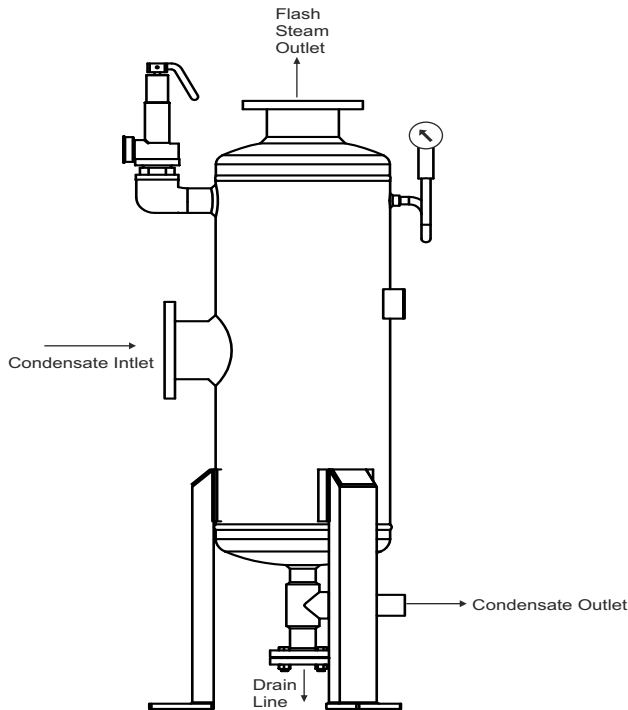
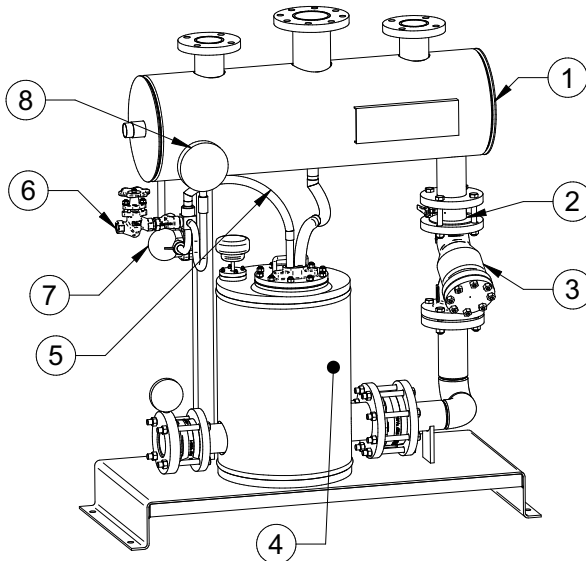


Figure 8 : Flushing procedure of Forbes Marshall flash vessel

6.2 Flushing Procedure in the absence of a Forbes Marshall Flash Vessel (Refer Figure 9)

1. Wherever process condensate is directly connected to pump receiver & Forbes Marshall flash vessel module is not part of PPPPU-HP, open the pump condensate strainer cap (3) & screen to flush the foreign particles and contaminated condensate. Similarly, motive steam / airline (5) 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 (6) and ensure that the motive media pressure should not exceed as mentioned on the pump name plate.
3. Make sure that the motive line drain trap (7) is operational.
4. Open the pump condensate isolation valve (2) and allow the condensate to flow to the pump receiver (1) and subsequently to pumping chamber (4).
5. Now the pump should pump periodically.
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 gauge (8) & ensure that the motive pressure is at least 1.5 to 2 barg more than the total back pressure.



**Figure 9 : Flushing procedure of Pressure Powered Pump
Package Unit-High Pressure**

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. After suitable isolation repairs can be carried out with the product in the line. PPPPU 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 Pressure Powered Pump Package Unit.

NO.	PARAMETERS TO BE CHECKED	FREQUENCY FOR CHECKING VARIOUS PARAMETERS					
		Daily	Weekly	Monthly	Quarterly	Half Yearly	Annually
A	Pressure Powered Pump Package Unit / 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 PPPPU motive pressure	Y					
12	Checking of flash steam pressure in flash vessel	Y					
13	Cleaning of motive line trap internals				Y		
14	Cleaning of steam traps 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
22	Cleaning pump internal assembly						Y

7.2 Tool Kit: To carry out any maintenance of the PPPPU-HP use the tools mentioned in the table below.

Size	Part	Component	Tool used and Size
DN 40 / 50 / 80	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)
		Stopper bracket bolt	Box spanner 8 mm (A/F)
		Float Arm Bolt	Open Spanner 10 mm (A/F)
		For Split Pin Assembly	Nose Plier
DN 40 / 50 / 80	External Assembly	Read switch assembly 4 No M8X35mm studs; M8 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
DN 40	Condensate inlet connection	Strainer assembly (M12 X 60mm)	Box spanner 18/19 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)
DN 50	Condensate inlet connection	Butterfly valve (M16 X 110mm)	Box spanner 24 mm (A/F)
		Strainer assembly (M16 X 70mm)	Box spanner 24 mm(A/F)
		Disc check valve (M16 X 160mm)	Box spanner 24 mm (A/F)
	Condensate return connection	Disc check valve (M16 X 160mm)	Box spanner 24 mm (A/F)
DN 80	Condensate inlet connection	Butterfly valve (M16 X 130mm)	Box spanner 24 mm (A/F)
		Strainer assembly (M16 X 70mm)	Box spanner 24 mm(A/F)
		Disc check valve (M16 X 160mm)	Box spanner 24 mm (A/F)
	Condensate return connection	Disc check valve (M16 X 160mm)	Box spanner 24 mm (A/F)

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

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 PPPPU-HP internal assembly:

- 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.
- Unscrew all ten nuts (3) present on the cover (1) and lift the cover and internal mechanism assembly from the pump body (14).
- Arrange the whole assembly onto the vice such that the internals are placed on top and clamp the cover.
- Remove the assembly nuts to free the whole assembly from the cover.
- Remove the old gasket (2), and clean the gasket area. If required replace with a new one.
- Fit the PPPPU-HP internal assembly onto the cover. Carefully engage the exhaust valve (8) onto the actuator disc (11) and screw the nuts.
- Unclamp the cover and insert the whole assembly back inside the pump body (14).
- Tighten the cover nuts (3). Apply Torque 85 - 90 Nm. Follow opposite nut tightening sequence to ensure uniform gasket tightening.

7.3.2 Procedure to Maintain/Replace float assembly:

1. Follow steps 1 to 3 of section 7.3.1
2. Unscrew the float **(15)** from the float arm using appropriate spanner.
3. Screw the new float using Loctite 272 adhesive onto the threads. Apply 50Nm Torque to secure the float tightly on its place.
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 ten nuts **(3)** present on the cover **(1)** and lift the cover and mechanism assembly from the pump body **(14)**.
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 allen bolt mounted on Exhaust valve head **(8)**. By holding in spanner.
6. Unscrew the Exhaust valve seat.
7. Clean the metal gasket and replace if required.
8. Fit the exhaust valve head and seat, spring and washer.
9. Now fit the PPPPU-HP internal assembly onto the cover. Carefully engage the exhaust valve onto the actuator disc **(11)** and screw the nuts.
10. Unclamp the cover and insert the whole assembly back inside the pump body. While reinstalling the cover.
11. Tighten the cover nuts **(3)**. Apply Torque 85-90 Nm.

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 **(5)**.
3. Clean the metal gasket and replace if required.
4. Fit the inlet valve head and seat.
5. Now fit the PPPPU internal assembly onto the cover **(1)**. Carefully engage the exhaust valve **(8)** onto the actuator disc **(11)** and screw the nuts.
6. Unclamp the cover and insert the whole assembly back inside the pump body **(14)**. While reinstalling the cover.
7. Tighten the cover nuts **(3)**. Apply Torque 85-90 Nm.

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 **(14)**.
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 **(18)** from the linkage mechanism **(16)**
5. Clean the springs **(18)** 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**

8. Troubleshooting:

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

Failure Mode	Possible Cause	Remedy
Pump stops working	a) Motive supply closed	a) Open valves to supply motive pressure to pump
	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.
	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.

Failure Mode	Possible Cause	Remedy
Pump working, overflows only during discharge.	a) Check inlet Check Valve	a) Lap the seat and if the problem persists replace Check Valve
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 separator or process traps (if there is no flash separator), 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 Check Valve stuck open or leaking.	g) Open the 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.

9. Available Spares:

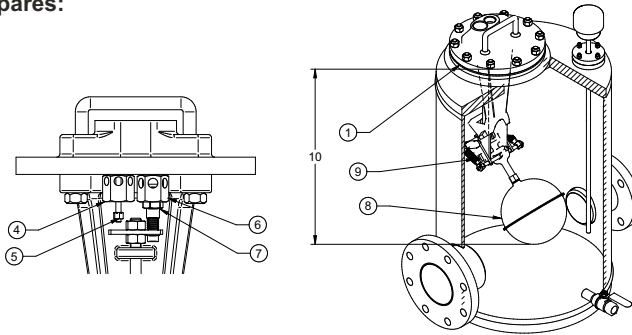


Figure 9: Available Spares for PPPU-HP

SPARES	PART NO.	SPARE CODES
SPARE KIT FOR PPPU-HP INTERNALS	10	SPARE-PPPPUHP-MKT
SPARE KIT FOR GASKET	1	SPARE-PPPPUHP-GKIT
SPARE KIT FOR PPPU-HP INLET VALVE SEAT AND HEAD ASSEMBLY	4,5	SPARE-PPPPUHP-IVKIT
SPARE KIT FOR PPPU-HP EXHAUST VALVE SEAT AND HEAD ASSEMBLY	6,7	SPARE-PPPPUHP-EVKIT
FLOAT ASSEMBLY	8	SPARE-PPPPUHP-FKIT
SPARE KIT FOR PPPU-HP SPRING ASSEMBLY(SET OF 2)	9	SPARE-PPPPUHP-SKIT

How to Order:

Example : DN40 Pressure Powered Pump Package Unit - High Pressure (PPPPU-HP).

10. Warranty Period:

As per ordering information and agreements in the contract.



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Codel International

Krohne Marshall

Forbes Vyncke

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