

Installation and Maintenance Manual Forbes Marshall Pumping Trap PPT-A





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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.



Preface:

1.

2.

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

Forbes Marshall Pumping Trap, PPT-A

Size: DN25 x DN40

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.



This symbol denotes CAUTION, WARNING or DANGER

Important Safety Notes:



Read this section carefully before installing/operating/maintaining the product. The precautions listed in this manual are provided for personnel and equipment safety. Furthermore, Forbes Marshall accepts no responsibility for accidents or damage occurring as a result of failure to observe these precautions. Note that the product is designed to perform for non-contaminated fluids only. A contamination in the form of chemical, foreign particle etc. can lead to problem with product performance and life of the product.

If these products in compliance with the operating instructions are, properly installed, commissioned, maintained and installed by qualified personnel (refer Section 2.7) the safety operations of these products can be guaranteed. General instructions for proper use of tools and safety of equipments, pipeline and plant construction must also be complied with.

2.1 Intended use:

Check if the product is suitable for intended use/ application by referring to the installation and maintenance instructions, name plates and technical information sheets.

- 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 gasespass through the product.

2.4 Depressurizing of systems and normalizing of temperature:

Ensure isolation and safety venting of any pressure to the atmospheric pressure. Even if the pressure gauge indicates zero, do not make an assumption that the system has been depressurized.

To avoid danger of burns allow temperature to normalize after isolation.

2.5 Tools and consumables:

Ensure you have appropriate tools and / or consumables available before starting the work. Use of original Forbes Marshall replacement parts is recommended.

2.6 Protective clothing:

Consider for the requirement of any protective clothing for you/ or others in the vicinity for protection against hazards of temperature (high or low), chemicals, radiation, dangers to eyes and face, noise and falling objects

2.7 Permits to work:

All work to be carried out under supervision of a competent person. Training should be imparted to operating personnel on correct usage of product as per Installation and Maintenance instruction. "Permit to work" to be complied with (wherever applicable), in case of absence of this system a responsible person should have complete information and knowledge on what work is going on and where required, arrange to have an assistant with his primary goal and responsibility being safety. "Warning Notices" should be posted wherever necessary

2.8 Handling:

There is a risk of injury if heavy products are handled manually. Analyze the risk and use appropriate handling method by taking into consideration the task, individual, the working environment and the load.

2.9 Freezing:

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

2.10 Product Disposal:

It is necessary to dispose this product only in accordance with local regulations at the authorized, qualified collecting point specified for equipment's and its parts—Please refer the part details mentioned in the material table of this manual. Please follow all waste disposal guidelines (Management & Handling) as published by local governing authorities in India & abroad

2.11 Returning products:

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

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



Brief Product Information:

3.1 Description:

3.

The Forbes Marshall Pressure Pumping Trap - Automatic, PPT-A, is a compact condensate recovery system specifically designed to remove condensate from steam heat exchanger and process equipment under all operating conditions - even under vacuum (stall condition). The pressure pumping trap has an inbuilt receiver to store condensate. The pump and trap mechanism is incorporated within the same body envelope ensuring automatic switch over from trap mode to pump mode and vice versa.

3.2 Size and Pipe Conditions:

Inlet connection : DN 25 Flange as per #150 Outlet connection : DN 40 Flange BTS DN 25

3.3 Limiting Conditions:

Body design	= 8.7 bar (g) at 220 Deg.C
Motive pressure	= Steam/compressed air at 3 to 8.7 bar g
Maximum Back Pressure	= 4.2 bar g
Installation Head above	= 200 mm



Figure 1 : Forbes Marshall Pumping Trap

Sr. No	DESCRIPTION	MATERIAL			
1	COMPACT CONDENSATE PUMP SHELL	C.S. ERW PIPE			
2	EXHAUST ASSEMBLY	C.S.			
3	RECEIVER SHELL	C.S.			
4	CONDENSATE INLET LINE	C.S. ERW PIPE			
5	BALL VALVE FOR CONDENSATE INLET	Forged Carbon Steel			
6	DN20 FMSTR31 STRAINER	C.I.			
7	DN25 FMDCV FOR CONDENSATE INLET	S.S			
8	DN25 FMDCV FOR CONDENSATE OUTLET	S.S			
9	DN15 DRAIN	C.S.			
10	NAME PLATE	AL			
11	DN15 STEAM INLET CONNECTION	C.S.			
12	DN15 FIG 12 STRAINER STEAM INLET	C.I.			
13	DN15 PISTON VALVE STEAM INLET	F.C.S.			
14	COVER PLATE ASSEMBLY	CI			
15	TRAP ASSEMBLY	SS/CS			
16	LEG SUPPORT	MS			
17	CONDENSATE INLET CONN	MS			

All Dimensions in mm



3.4 Capacities:

Pumping Capacity			Traping Ca	pacity	
Motive Pressure (Steam) bar (g)	Back Pressure bar (g)	Pumping Capacity Kg/hr	Differential Pressure bar (g)	Condensate Flow Rate kg/hr	
7	1	590	1	2040	
7	2	550	2	2550	
7	3	475	3	3825	
7	4	390	4	4250	
6	1	580	5	5660	
6	2	520	6	5880	
6	3	425	7	6650	
6	4	300	Example:		
5	1	550	For 7 Bar g upstream Pressure & 1 Bar g back Pressure		
5	2	430			
5	3	320	(Motive Steam pressure for		
4	1	440	Pump 7 Bar g)		
4	2	340	As Pump 590 kg/hr		
3	1	325	As Trap 5880 kghr		

3.5 Typical Installation Schematic of PUMPING TRAP







To help us size the PUMPING TRAP for your application, simply provide us following in format

А	Installation head from base of th pump to centerline of heat exchanger/ process condensate outlet	Min. 1.2 m
В	Motive Steam pressure available to power the pump trap	Bar (g)
С	Pressure in condensate return system	Bar (g)
D	Height of condensate return from floor level	m
Е	Heat exchanger full load on operating pressure	Bar (g)
F	Maximum steam load on heat exchanger	KG/H
G	Maximum secondary fluid temperature	C
н	Maximum controlled temperature of secondary fluid	C

3.6 Salient Feature of PUMPING TRAP :

• PUMPING TRAP will ensure process plant or equipment remains totally drained of condensate under all operating condition (stall condition), even under vacuum. This optimizes thermal efficiency of heat exchanger, ensures quieter equipment operation, avoids tube failure of heat exchanger & reduces maintenance cost.

• PUMPING TRAP forms closed loop system, there is no escape of steam to the plant room & no energy loss from even flash steam, in fact steam for motive supply is returned back to system.

- Self contained Compact Unit.
- High Capacity in one single package.
- Requires no electrical energy. Suitable for hazardous environment.



Working Principle:

4.

Forbes Marshall Pumping Trap, PPT-A consists of both float trap mechanism and a pressure powered pump mechanism. When there is positive differential pressure across the pressure powered trap, it works like a normal float trap to discharge the condensate out. The float mechanism acts on the buoyancy principle. As the condensate fills in the body, the trap mechanism float is lifted up, which in turn opens the main valve in proportion to the float lift. This ensures complete evacuation of the condensate. When steam comes in after the condensate, the float falls down, hence effectively closing the outlet on steam. However, when there is a negative differential pressure across PPT-A, it works like a steam operated pump. Steam is used as motive media to operate the pump mechanism. In the normal position before startup the pump mechanism float is at the lowest position with the motive steam valve closed and, the exhaust valve open. When condensate flows by gravity through inlet check valve in to pump body, the pump float will become buoyant and rise.

As the pump mechanism float continues to rise, the mechanism link is engaged which increases tension in the springs. When the pump mechanism float has risen to its upper tripping position, the linkage mechanism snaps upward over center. The energy in the springs is released as the push rod is moved upward, to simultaneously open the motive steam inlet valve and close the exhaust valve. Steam flow through the inlet valve increases the pressure within the body and closes the inlet check valve. When the pressure in the body shell exceeds the back pressure in the condensate discharge line, it opens the discharge check valve & forces out the condensate in discharge line.

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

When the pressure in the PPT-A body 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.



Installation Guidelines:



5.

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.

5.1. Installation of Forbes Marshall Pumping Trap [PPT-A] :

- 1. PPT-A unit consists of a receiver shell, mechanical pump with compact condensate pump shell having two float mechanisms, inlet isolation valve, strainer, motive steam line, and inlet and outlet disc check valves.
- Connect the condensate line coming from equipment to the line with receiver shell. Please ensure that the receiver shell inlet is at lower level than the condensate outlet line of the equipment or so the condensate travels by gravity to the receiver shell.
- Please connect the motive steam to the DN 15 motive connection provided along with PPT-A.
- 4. Condensate discharge line of PPT-A should be routed to the common condensate header.

5.2. Typical installation of Forbes Marshall Pumping Trap [PPT-A]:



Figure 3: Typical installation of Forbes Marshall Pumping Trap [PPT-A]



5.3. Care to be taken while routing the condensate pump discharge line:

- 1. The line size should be equal to or more than outlet flange size provided with PPT-A.
- As far as possible, the discharge line should have minimum bends. Ideally the discharge line should be lifted immediately after the PPT-A to the maximum elevation in the circuit and then to be connected to common condensate header with a downward slope. This ensures minimum back pressure on the PPT-A.
- 3. Make sure that NRV supplied with PPT-A is installed with flow direction towards common condensate line.
- 4. If more than one PPT-A 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 Forbes Marshall Pumping Trap.



Figure 4: More than one PPT-A connected to common condensate line



Start-up and Commissioning:

6.

6.1. Flushing of lines: [Refer Figure 1]

As part of pre-installation all fluid handling equipment particularly piping should be thoroughly cleaned of scale and the internal debris which accumulates during construction. This is accomplished by blowing or flushing with air, steam, water and other suitable medium.

Follow this step to carry out flushing of lines.

- 1. Close the ball valve (5) for condensate inlet, now pen the condensate strainer (6) cap and screen to flush the foreign particles and contaminate in the condensate. Drain the condensate 10-15 minute until clear condensate starts coming out, whichever is earlier.
- Similarly, motive line should also be flushed by first closing the piston valve (13) fully, unscrew the strainer (12) now open the piston valve ensure clean motive media coming out.

6.2. Commissioning: [Refer figure 1]

After installation or maintenance ensure that the system is fully functioning by confirming fluid is passing through it.

- 1. After flushing of line is complete, ensure ball valve (6) of condensate line inlet and piston valve (13) of motive line is fully open respectively
- 2. Ensure that the motive media pressure should not exceed maximum operating inlet motive pressure limit.
- 3. Make sure that the motive line drain trap is operational.
- 4. Ensure that the motive line pressure supplied to PPT-A is at least 4.2 bar g more than the back pressure at the outlet of the PPT-A.
- 5. Check for leaks and attend if any.



Maintenance Guidelines:



7.

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

7.1 Routine and Preventive Maintenance:

Please refer to the maintenance schedule mentioned in the table below to undertake routine maintenance of PPT-A.

NO.	PARAMETERS TO BE CHECKED	FREQUENCY FOR CHECKING VARIOUS PARAMETERS					
Α	PRESSURE POWERED TRAP - AUTOMATIC	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	DCV Cleaning					Y	
7	Operate motive line valve			Y			
8	Operate Condensate inlet valve			Y			
9	Lubrication of piston valves				Y		
10	Checking of PPT-A motive pressure	Y					
11	Cleaning of motive line trap internals				Y		
12	Visual inspection for leakages		Y				
14	Check air quality (in case motive media is air)		Y				
15	Repair or replace the trap – when testing shows leaks	Y					
16	Arrest any other leaks	Y					



7.2. Tool Kit:

To carry out any maintenance of the PPT-A please use the tools mentioned in the table $\ensuremath{\mathsf{below}}$

Part	Component	Tool used and Size
	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)
Internal Mechanism Assembly	Bush assembly and stop bolt	Box Spanner 13 mm (A/F)
, locomony	Stopper bracket bolt	Box spanner 8 mm (A/F)
	Float Arm Bolt	Open Spanner 10 mm (A/F)
	For Split Pin Assembly	Nose Plier
	Read switch assembly 4 No M6 studs; M6 X 4mm nuts	Ring spanner 10 mm (A/F)
External Accombly	Internal assembly cover (M12 X 50)	Open spanner 18 / 19 mm (A/F)
External Assembly	Motive inlet and exhaust hose pipe connection	Pipe wrench
	Trap Cover Unit	Open spanner 16 mm (A/F)
O	Ball valve	Box spanner 13 mm (A/F)
condensate inlet	Strainer cap	Box spanner 26 mm (A/F)
	Disc check valve	Box spanner 24 mm (A/F)
Condensate return connection	Disc check valve	Box spanner 24 mm (A/F)

7.3. Maintenance/Replacement Procedure: [Ref. Fig. 1]

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

7.3.1. Procedure to Maintain/Replace the whole PPT-A internal assembly:

- 1. Before carrying out any maintenance, close the ball valve (5) for condensate inlet, now remove inlet & exhaust line flange to disassemble cover plate assembly (14).
- Unscrew all the stud and nuts present on the cover plate assembly (14) and lift the cover plate assembly (14) and internal mechanism assembly from the compact condensate pump shell (1).
- 3. Remove the old gasket, and clean the gasket area. Replace with new gasket.
- 4. Remove the assembly nuts to free the internal mechanism assembly from the cover plate assembly (14).
- Ensure motive line and exhaust line valve are clean also make sure ball float is positively buoyancy internal mechanism assembly. If damaged or corroded replace with new one.
- 6. Insert the whole assembly back inside the compact condensate pump shell (1).
- 7. Tighten the cover nuts to suitable torque.



7.3.2. Procedure to Maintain/Replace pump float assembly :

- Before carrying out any maintenance, close the ball valve (5) for condensate inlet, now remove inlet and exhaust line flange to disassemblecover plate assembly (14).
- Unscrew all the stud and nuts present on the cover plate assembly (14) and lift the cover plate assembly (14) and internal mechanism assembly from the compact condensate pump shell (1).
- 3. Remove the old gasket, and clean the gasket area. Replace with new gasket.
- 4. Arrange the whole assembly onto the vice such that the internal mechanism assembly is placed on top and clamp the cover plate assembly (14).
- 5. Unscrew the float from the float arm using appropriate spanner.
- 6. Screw the new float using Loctite 272 adhesive onto the threads.
- 7. Insert the whole assembly inside the compact condensate pump shell (1) and screw the nuts.

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

- Before carrying out any maintenance, close the ball valve (5) for condensate inlet, now remove inlet and exhaust line flange to disassemble cover plate assembly (14).
- Unscrew all the stud and nuts present on the cover plate assembly (14) and lift the cover plate assembly (14) and internal mechanism assembly from the compact condensate pump shell (1).
- 3. Remove the old gasket, and clean the gasket area. Replace with new gasket.
- 4. Arrange the whole assembly onto the vice such that the internals are placed on top and clamp the cover plate assembly (14).
- 5. Unscrew the internal mechanism assembly and unscrew the exhaust valve seat and head assembly using proper size spanner respectively, clean the exhaust valve seat and head from dirt or foreign particle present in it. If damage replace with new the exhaust valve seat and head assembly.
- 6. Clean the metal gasket and replace if required.
- 7. Fit the exhaust valve head and seat assembly
- 8. Now fit the internal mechanism assembly onto the cover plate assembly (14). Carefully engage the exhaust valve onto the actuator disc and screw the nuts.
- 9. Unclamp the cover plate assembly (14) and insert the whole assembly back inside the compact condensate pump shell (1). While reinstalling the cover.
- 10. Tighten the cover nuts.



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

- 1. Before carrying out any maintenance, close the ball valve (5) for condensate inlet, now remove inlet & exhaust line flange to disassemble cover plate assembly (14).
- Unscrew all the stud and nuts present on the cover plate assembly (14) and lift the cover plate assembly (14) and internal mechanism assembly from the compact condensate pump shell (1).
- 3. Remove the old gasket, and clean the gasket area. Replace with new gasket.
- 4. Arrange the whole assembly onto the vice such that the internals are placed on top and clamp the cover plate assembly (14).
- 5. Unscrew the internal mechanism assembly and unscrew the inlet valve seat and head assembly using proper size spanner respectively, clean the inlet valve seat and head from dirt or foreign particle present in it. If damage replace with new the inlet valve seat and head assembly
- 6. Clean the metal gasket and replace if required.
- 7. Fit the inlet valve head and seat assembly
- 8. Now fit the internal mechanism assembly onto the cover plate assembly (14).
- 9. Unclamp the cover plate assembly (14) and insert the whole assembly back inside the pump body. While reinstalling the cover.
- 10. Tighten the cover nuts.

7.4.5. Procedure to Maintain/Replace the springs :

- Before carrying out any maintenance, close the ball valve (5) for condensate inlet, now remove inlet & exhaust line flange to disassemble cover plate assembly (14).
- Unscrew all the stud and nuts present on the cover plate assembly (14) and lift the cover plate assembly (14) and internal mechanism assembly from the compact condensate pump shell (1).
- 3. Remove the old gasket, and clean the gasket area. Replace with new gasket.
- 4. Arrange the whole assembly onto the vice such that the internals are placed on top and clamp the cover plate assembly (14).
- 5. Remove the split pins.
- 6. Remove the washer & the springs from the linkage internal mechanism assembly.
- 7. Clean the springs and replace if required.
- 8. Put the washer and split pins back.
- 9. Insert the whole assembly back inside the pump body.
- 10. Tighten the cover nuts.



7.4.6. Procedure to maintain the Valve Housing Assembly:

- 1. Isolate the PPT-A by closing the ball valve (5) for condensate inlet in the compact condensate pump shell (14).
- 2. Unscrew the condensate outlet DCV (8), and let the condensate present in the outlet pipe flush out.
- 3. Now unscrew the eight nuts present on the trap assembly (15) and lift off the cover along with the internal valve housing.assembly
- 4. Unscrew valve housing assembly nuts, and dismantle the valve housing assembly
- 5. Replace the old valve housing assembly and gaskets with new ones and refit the same.
- 6. Refit the trap assembly (15) and screw the condensate outlet DCV (8).

7.4.7. Procedure to Maintain/Replace trap float assembly

- 1. Isolate the PPT-A by closing the ball valve (5) for condensate inlet in the compact condensate pump shell (14).
- Unscrew the condensate outlet DCV (8), and let the condensate present in the outlet pipe flush out.
- 3. Now unscrew the eight nuts present on the trap assembly (15) and lift off the cover along with the internal valve housing assembly
- 4. Unscrew the float.
- 5. Use Loctite 272 adhesive on the threads and screw in the new float.
- 6. Refit the trap assembly (15) and screw the condensate outlet DCV (8).



8. Troubleshooting:

If the expected performance is unachievable after the installation of the Forbes Marshall Pumping Trap, check the following points for appropriate corrective measures.

Failure Mode	Possible Cause	Remedy
	a) Motive supply closed	 a) Open valves to supply motive pressure to pump. Check the motive steam line strainer, clean it if found clogged.
	b) Condensate inlet line closed or inadequate flow.	 b) Open condensate valves. Check upstream strainers and clean if found clogged.
	c) Condensate discharge line closed	 c) Open all discharge lines. Check outlet DCV direction – should be installed with the flow direction towards common condensate header. Check the discharge line stop valve- keep it in full open condition.
PPT-A stops working	d) Motive pressure insufficient to overcome back pressure.	d) Check static back pressure should not exceed 4.2 bar g and motive steam line pressure should be more than back pressure. Refer capacity chart.
	e) Trap mechanism not discharging at all.	e) Check for the valve and seat assembly for blockage
	f) Trap mechanism float punctured.	f) Replace the float.
	g) Pump mechanism float punctur (In this case PPT-A will stop working only when there is negative pressure difference across it).	g) Replace the float.



Failure Mode	Possible Cause	Remedy	
	a) Check inlet Disc Check Valve	a) Lap the seat and if the problem persists replace Disc Check valve.	
	b) Pump under sized.	 b) Verify the rated capacity as per the capacity table. Increase check valve size or install additional pump as required. 	
PPT-A working, but the process	 c) Insufficient motive pressure to achieve rated capacity. Check for steam starvation. 	c) Check motive pressure setting and maximum back pressure during operation. Compare with capacity table, increase motive pressure as required to meet the load requirements.	
temperature is also reducing	d) Restriction in condensate inlet line.	d) Clean the strainerCheck that all valves are fully open.	
	e) Outlet check valve stuck open	e) Isolate check valves and relieve the line pressure. Clean the disc check valves.	
	f) Condensate return line size lesser than the pump discharge line.	f) Condensate return line should always be equal to or more than discharge line.	
		a) Check valve and seat assembly of the trap mechanism for any deposition and clean it	
PPT-A leaking	Steam leaking continuously through the outlet	 b) Clean and lap the seating area if light scratches found on the seat 	
		c) Lightly stamp the SS ball on the seating area.	



9. Available Spares:

SPARES	SPARE CODES
SPARE KIT FOR PPT-A INTERNALS	S2001086
SPARE KIT FOR GASKET SET (SET OF 5)	S2001087
SPARE KIT FOR PPT-A INLET VALVE SEAT AND HEAD ASSEMBLY	S2001088
SPARE KIT FOR PPT-A EXHAUST VALVE SEAT AND HEAD ASSEMBLY	S2001089
FLOAT ASSEMBLY FOR PUMP MECHANISM	S2001030
SPARE KIT FOR PPT-A SPRING ASSEMBLY(SET OF 2)	S2001046
FLOAT ASSEMBLY FOR TRAP MECHANISM	S2038691
VALVE HOUSING ASSEMBLY	S2039568

How to Specify:

Example: Forbes Marshall make Pumping Trap PPT-A

10. Warranty Period:

As per the ordering information and agreement in the contract.



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