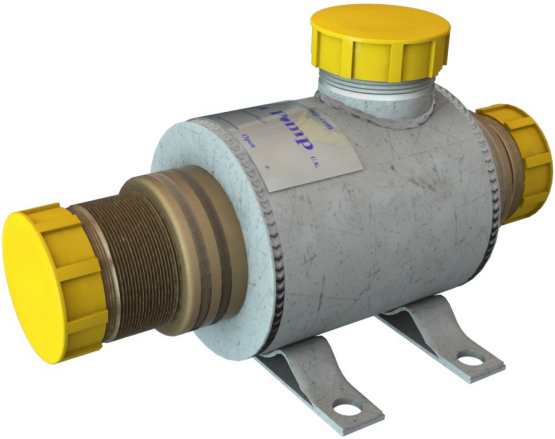
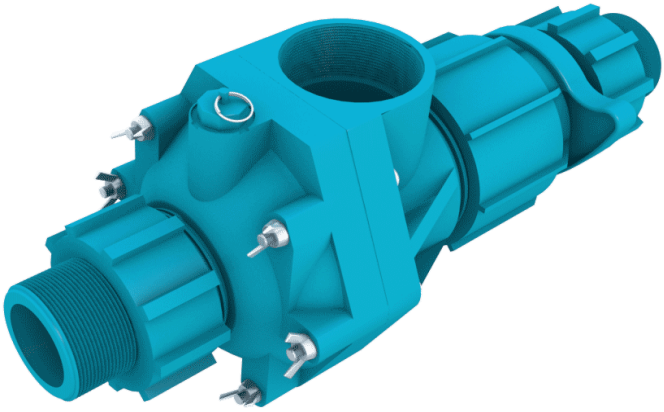
Papa Pomp®

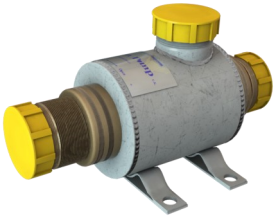
WATER POWERED TECHNOLOGY

Operation, Installation & Maintenance Guide

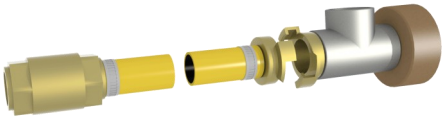




Included Items



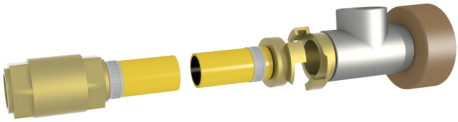
Metal pump



Delivery hose assembly

Plastic pump

C Spanner



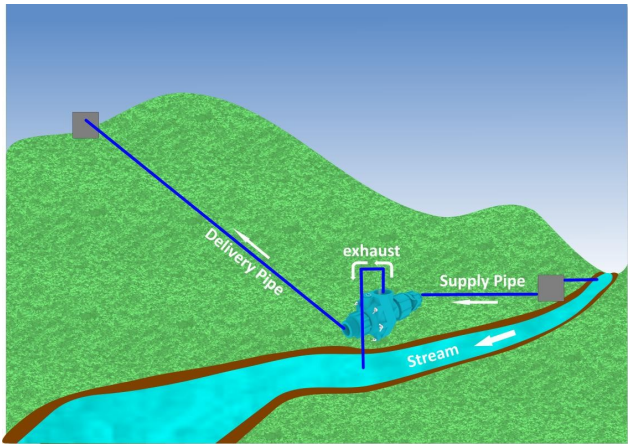
Delivery hose assembly

Contents

About the Papa Pump

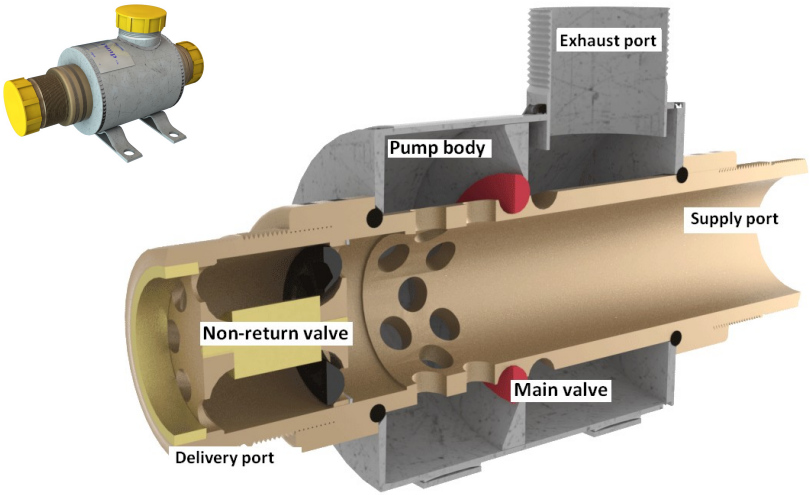
Updating the traditional hydraulic water ram pumps, Papa's patented technology and materials advances the operating principle into the 21st century. Developed within the UK in the mid-90s, the Papa water powered pump is used in many countries to provide water for a wide variety of uses. With the addition of the revolutionary thermoplastic version Papa continues to ensure that your water transport requirements are cost-effective and delivered in a reliable and sustainable system.

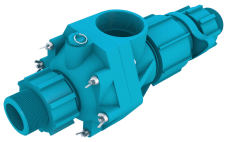
Simple water power

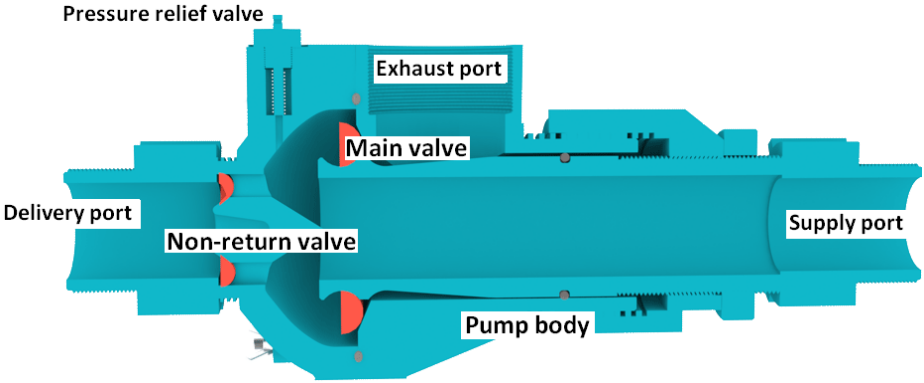


By utilising a naturally flowing water source the Papa pump is able to transport up to 30% of that water to the desired location, allowing the residual water to be returned to the natural source. With minimal maintenance and zero fuel costs and emissions, the Papa Pump will provide you with a clean and efficient solution to your water transportation requirements including agriculture, horticulture, irrigation, domestic and industrial use.

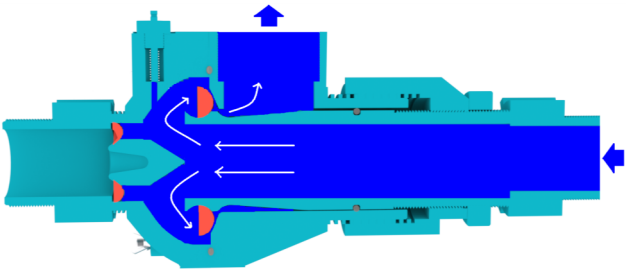
Papa technology



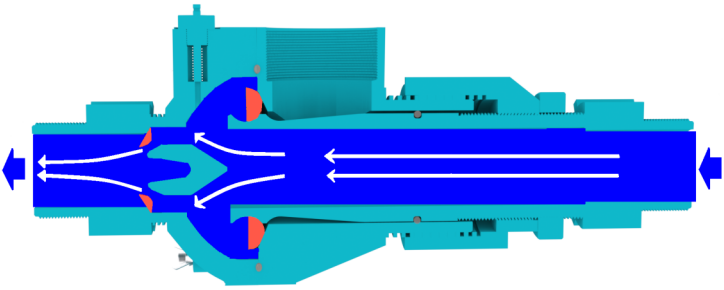




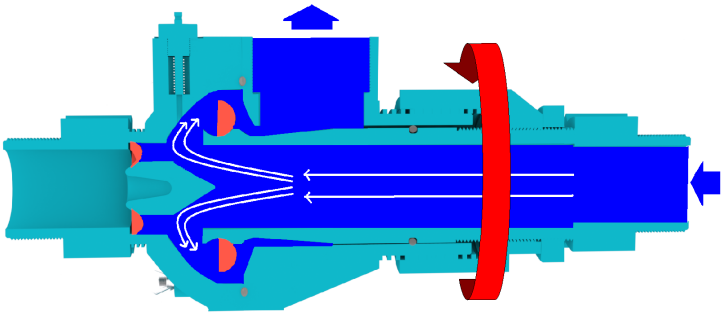
How the Papa Pump works



Water enters pump via supply port and flows around main valve to exhaust port.



As the flow increases around the main valve a differential pressure occurs causing the valve to suddenly close. The flow and mass of water is then directed through the non-return valve and into the delivery port at a higher pulsed pressure. This pressure suddenly reduces causing the main valve to reopen and the cycle to repeat.

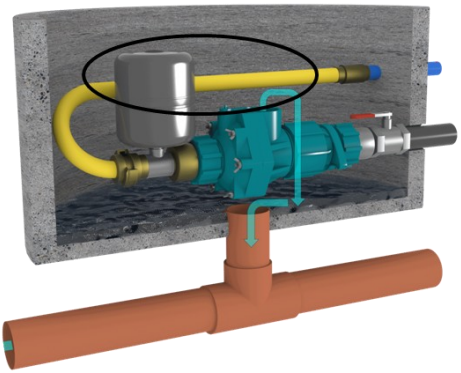


Turning the adjuster to open the valve allows flow through the pump to be regulated so that a greater flow generates a greater pressure and water delivery.

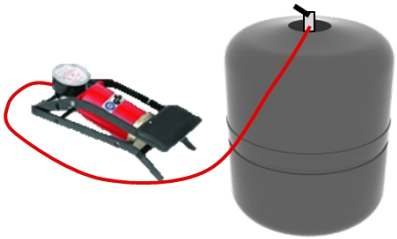
Adjusting Accumulator Pressure

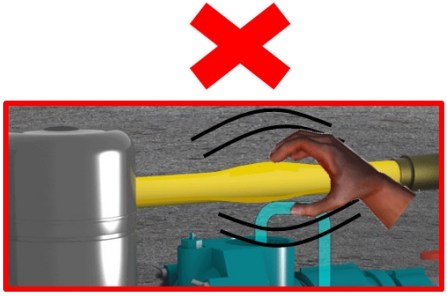
When pulse water enters the accumulator from the pump, the diaphragm is pushed upwards and air in the chamber is compressed to a high pressure.

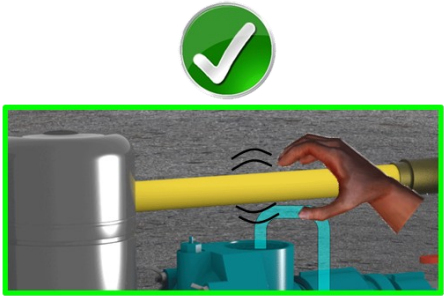
When the pulse stops, the air then expands and pushes the diaphragm back down, forcing the water out through the delivery pipe.



Set air pressure to equivalent delivery head pressure before attaching pressure vessel.



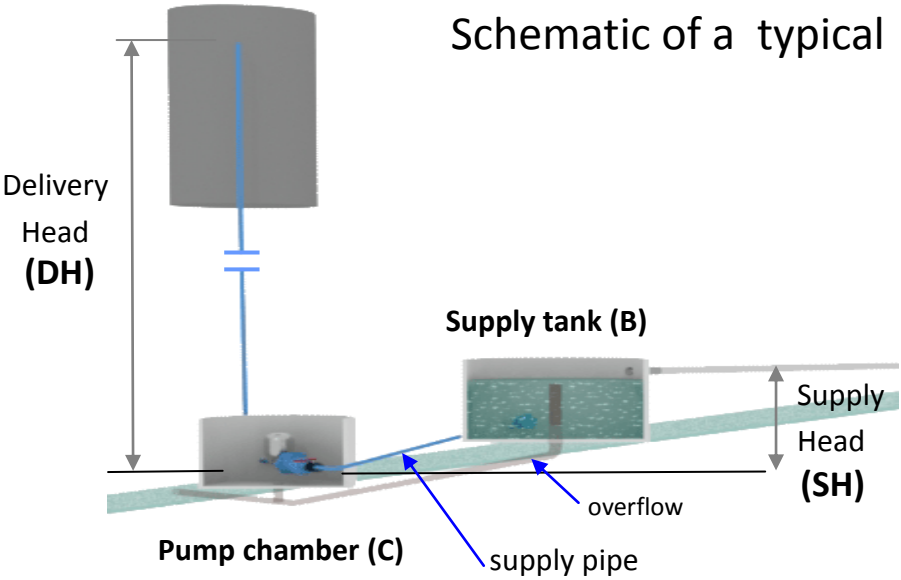




Adjust air pressure in accumulator so that pulse in pipe is at a minimum

Operating

Schematic of a typical

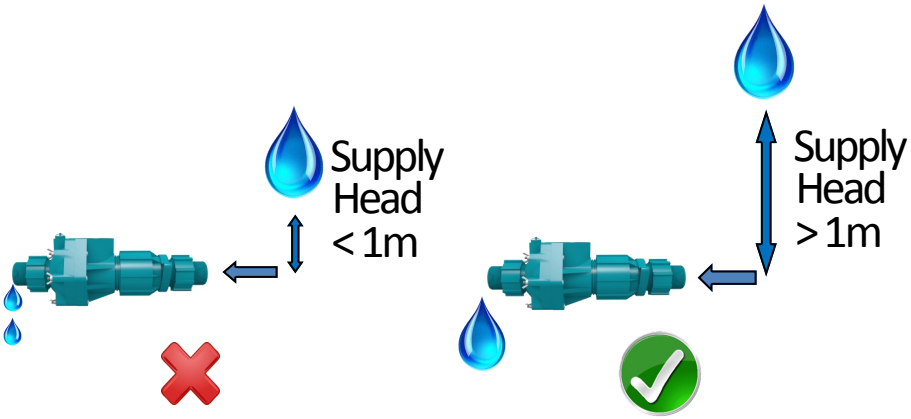


Note:

Max **DH = 30 x SH**

Supply pipe length = 3 - 10 X supply head

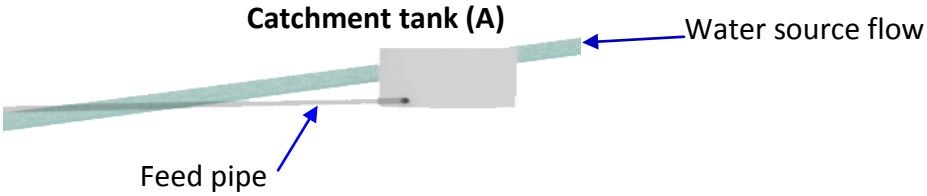
A Large water volume + small SH = Small water volume + large DH



Principles

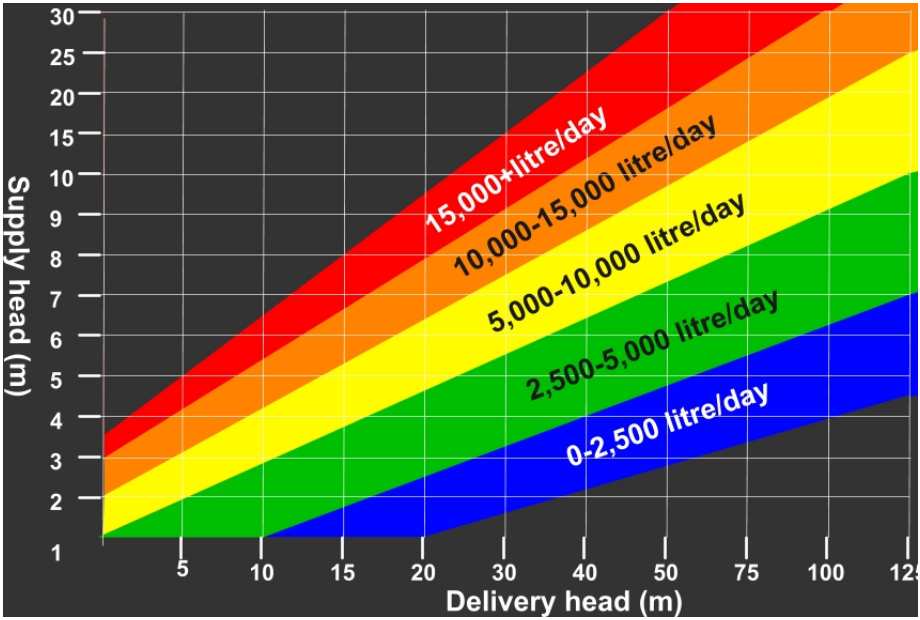
pump installation

Note: High level spring supplies may be fed directly into Supply Tank (B) without requiring a catchment tank (A)

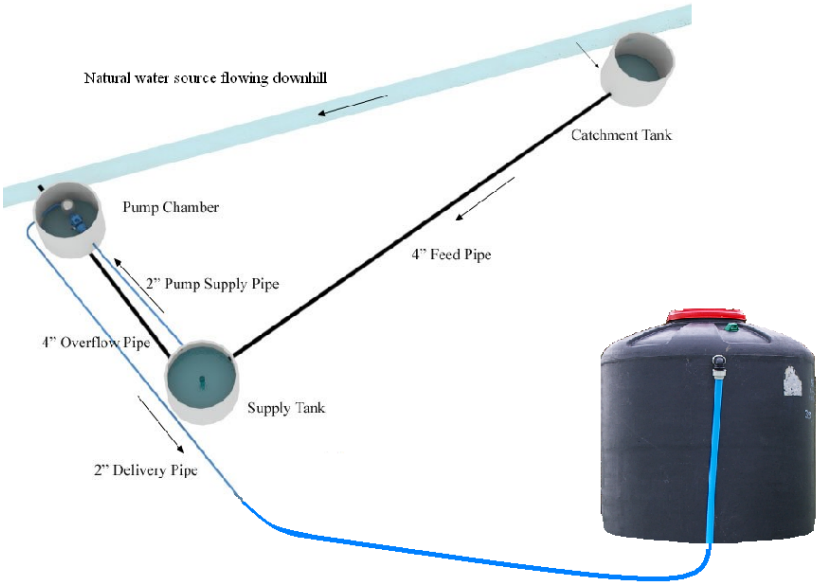


Pump performance guide

NB. All figures for 50 litres/min. For more data see appendix.

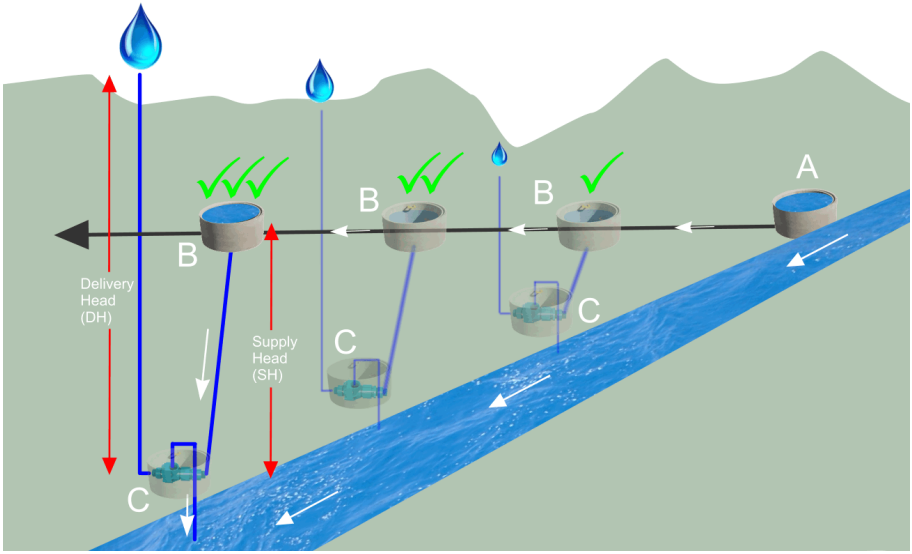


Site layout



For an installation, a natural water source is needed.

Note: for greatest efficiency, the maximum possible supply head is required.



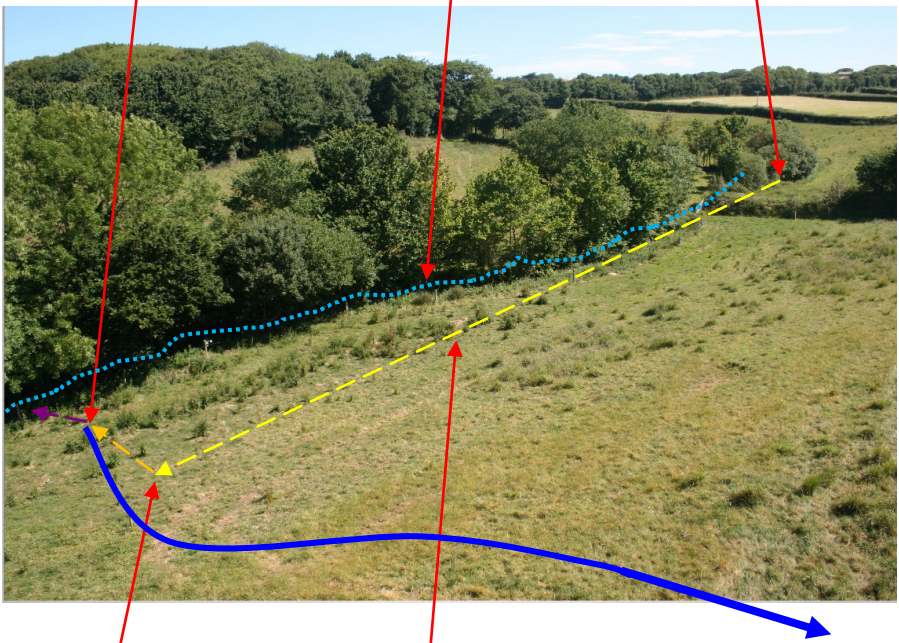
Installation example

The image below shows an example installation site.

The pump chamber will be placed here, providing a short route for the exhaust water back to the river.

Water source (a small river) follows the line of trees.

The catchment tank will be located here, giving a good location for the water inlet.



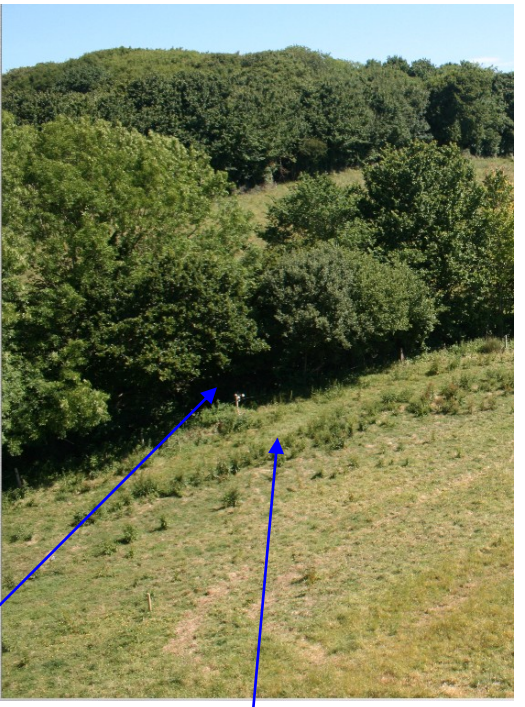
The supply tank will be located here, giving around 1 metre supply head.

The feed pipe will be dug out along here, roughly following the line of bare grass.

The delivery pipe will be laid out along this way, leading to a plastic storage tank 130 metres away and 20 metres higher than the supply head.

Completed

Ground works



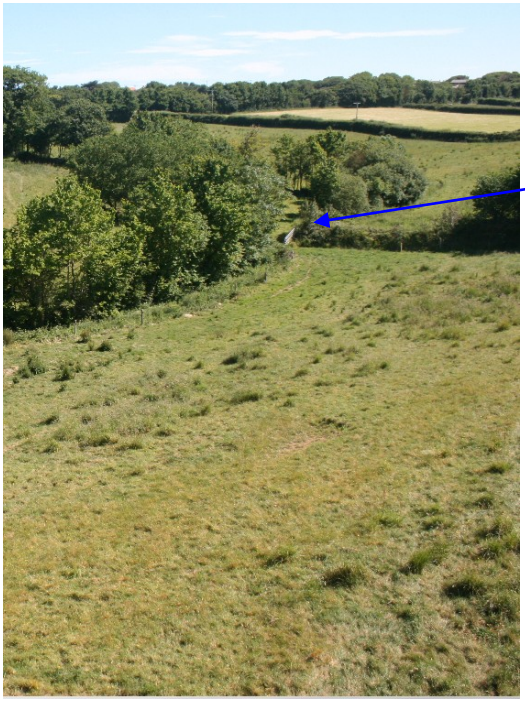
Pump chamber

Supply tank

Pump Installed

Supply tank interior

installation



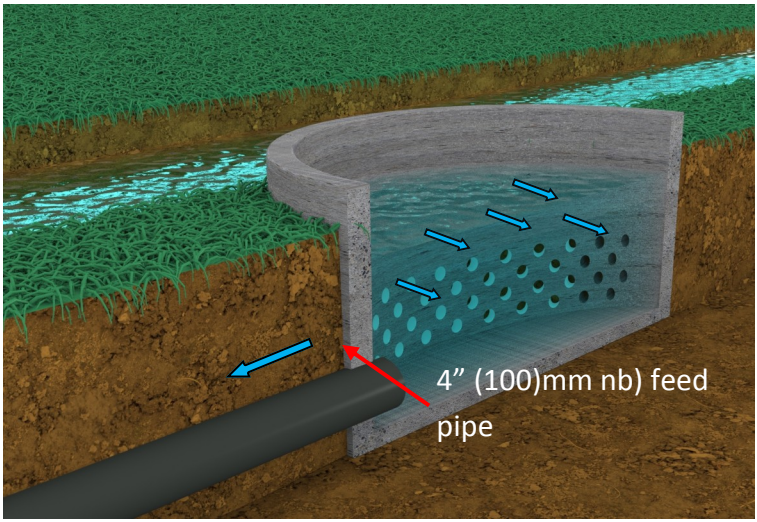
Collection tank

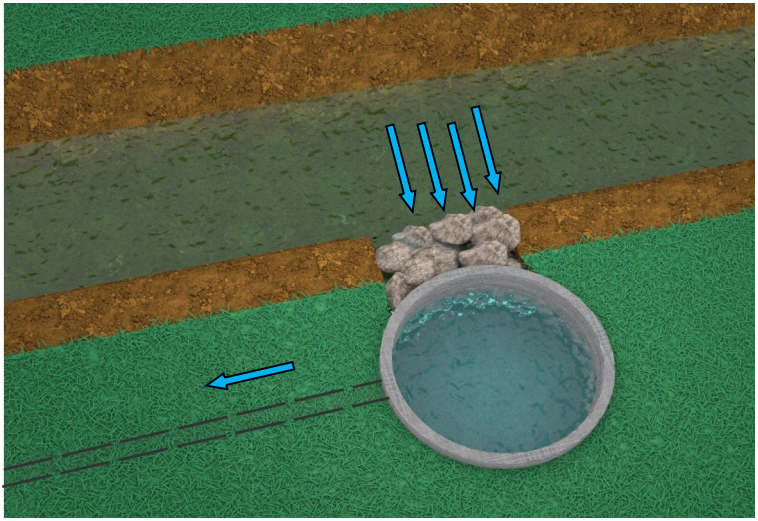
Collection tank interior

Preparing the route for supply pipe

Recommended set up

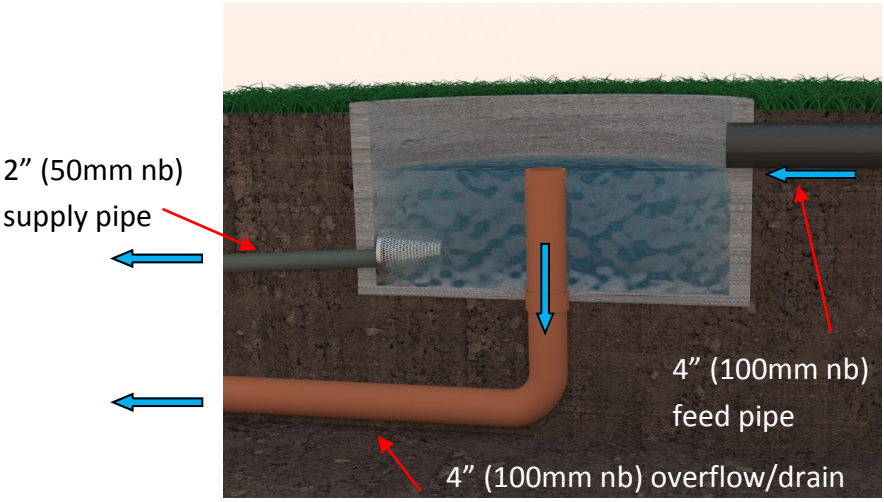
Tank A -Catchment Tank



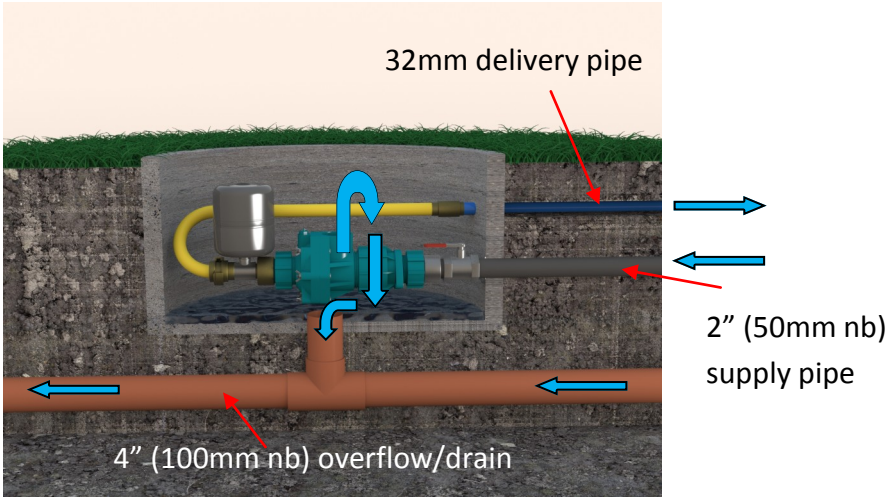


Nb = Nominal bore (internal pipe diameter)

Tank B -Supply Tank



Tank C -Pump Chamber

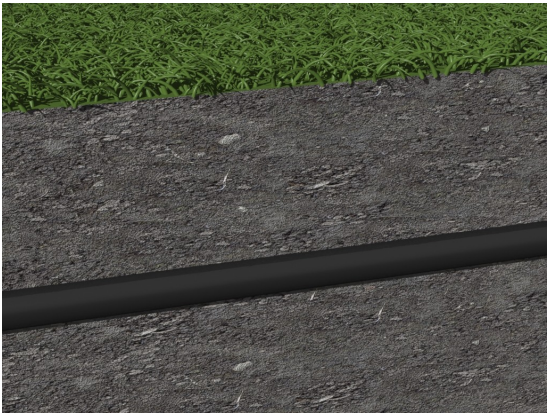


Safety

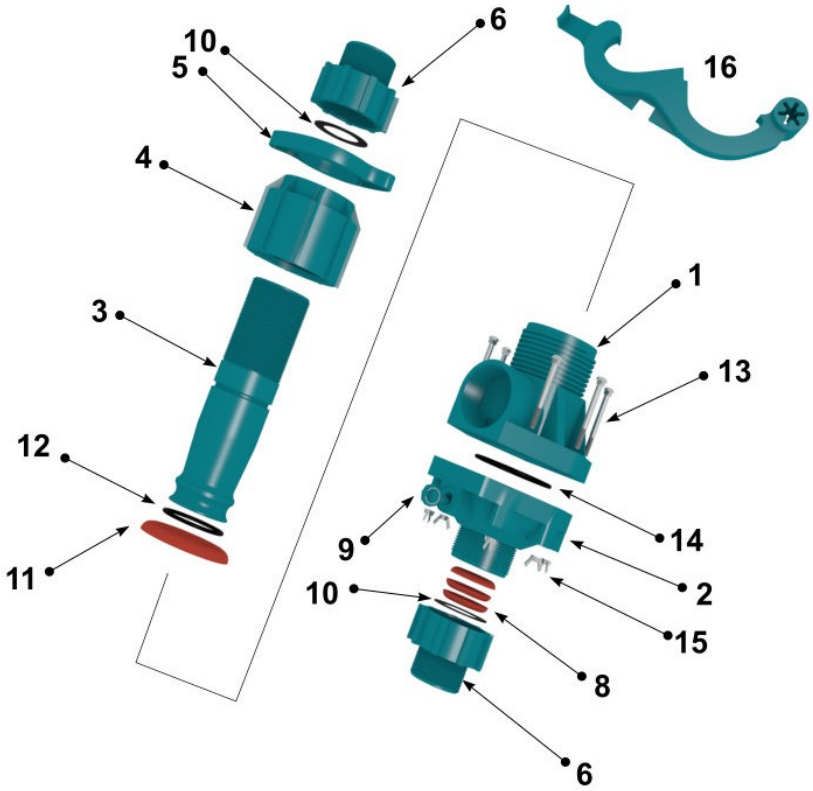
Installation Checklist

- **Check your proposed site for any public utilities such as land drains, electricity or telephone cables**
- The terrain may be important if there is much groundwork to be carried out. Digging rock can be difficult!
- Consider whether some form of filter or screening is required. Generally speaking, all but spring water supplies tend to carry unwanted debris at some time or another and a catchment tank beside a stream or river is a straightforward but necessary aspect
- Check your land boundaries before undertaking long-distance groundwork. Neighbours can be very sensitive over such issues but remember, everyone needs water, including neighbours. Why not get them involved!

Note: Abstracting water from any watercourse may require approval from the relevant Environmental Regulator.



Pump parts list



1	Body	9	Pressure Relief Valve
2	Cone	10	Seal
3	Shaft	11	Main Valve
4	Adjuster	12	Shaft 'O' Ring
5	Lock Nut	13	M6 Coach Bolt
6	Adaptor	14	'O' Ring
7		15	M6 Wing Nut
8	One-way Valve x 3	16	'C' Spanner

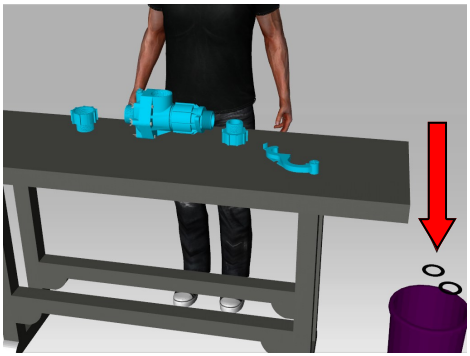
Pump maintenance

Maintenance is simple and involves a periodic check to ensure all waterways are clear and that the pump is still operating correctly. The Main Valve(11) and the One -way valve (8) are the only moving parts and should last for many years of normal use. The pressure vessel will require inspection for leaks and damage and will also require a periodic air charge to maintain air pressure.

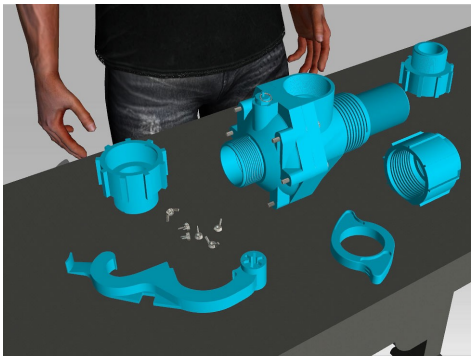
How to change the pump valves

Changing the valves (8) & (11) is a straightforward procedure and can easily be carried out in the field if required. Firstly close the supply ball valve and slowly unscrew the pressure vessel to release pressure. DO NOT UNSCREW PRESSURE VESSEL FULLY UNTIL THE PRESSURE IS RELEASED. Turn and remove the Q/R coupling and remove the tee, then follow the steps below.

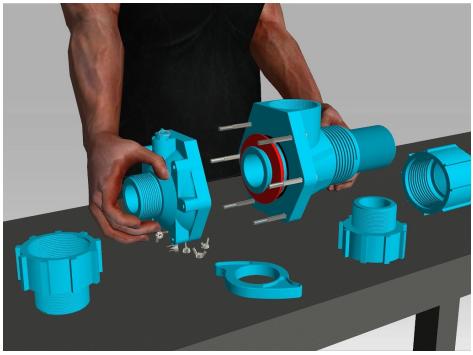
Remove the adaptors (6) using the 'C' spanner (16) and discard the old seals (10).



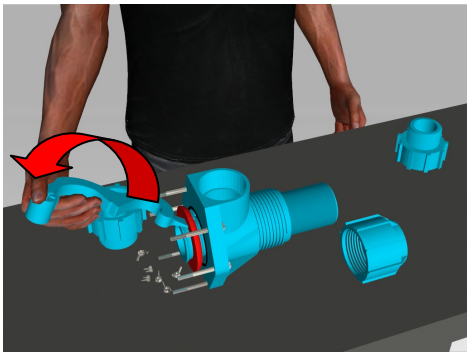
Unscrew the Lock Nut (5) and then remove the Adjuster (4) and all the Wing Nuts (15) using the 'C' spanner (16).



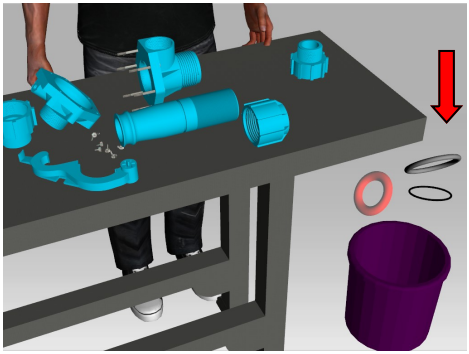
Separate the Cone (2) from the Body (1). The Coach Bolts (13) may be left in situ.



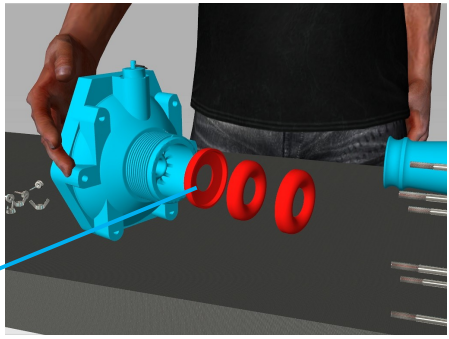
Remove the Main Seal (11) using the 'C' spanner.



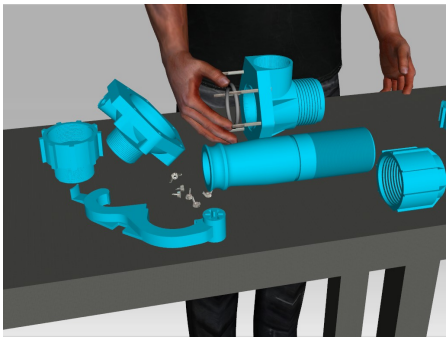
Remove the 'o' ring (14) then extract the Shaft (3). Discard the seal (11) and the 'o' rings (12) & (14).



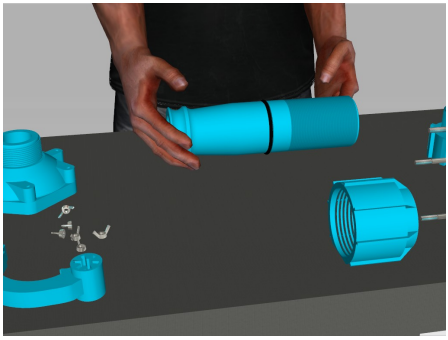
Taking the Cone (2), remove the 3 One-way Valves (8), noting orientation. Discard and replace the worn One-way Valve components (8).



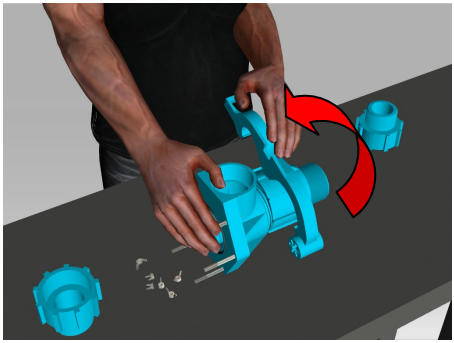
Fit new ‘o’ ring (14) to Body (1).



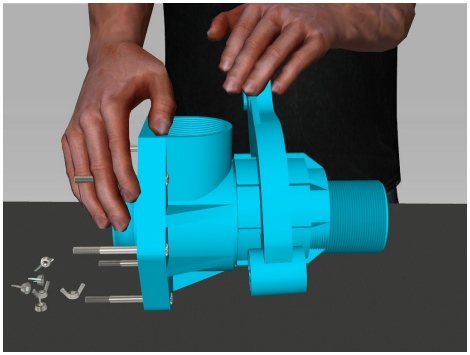
Fit new ‘o’ ring (12) to Shaft (3).



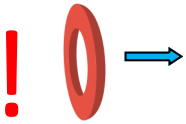
Re-assemble the Shaft (3) and the Adjuster (4) using the ‘C’ spanner (16).

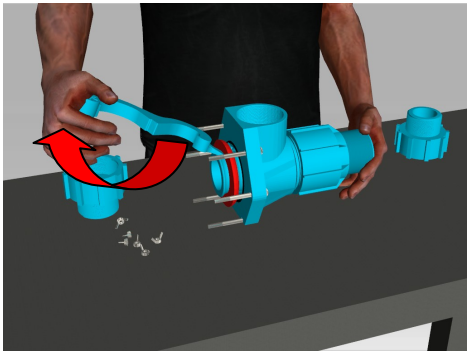


Screw the Adjuster (4) almost to the end of the thread on the Body (1).

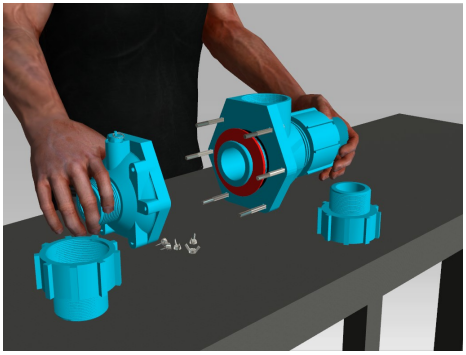


Take the new Main Valve (11) and fit to Shaft (3), noting the radius on the seal faces the threaded end of the Shaft (3)

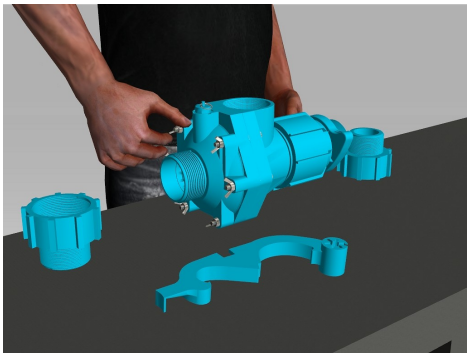




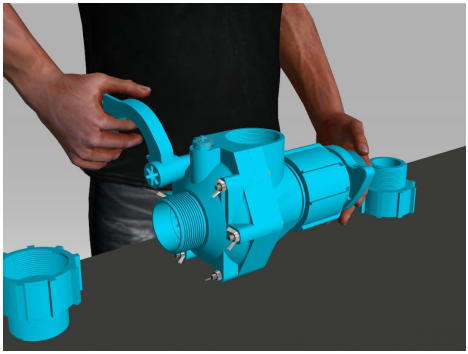
Clean the mating faces of the Body (1) and the Cone (2) and reassemble.

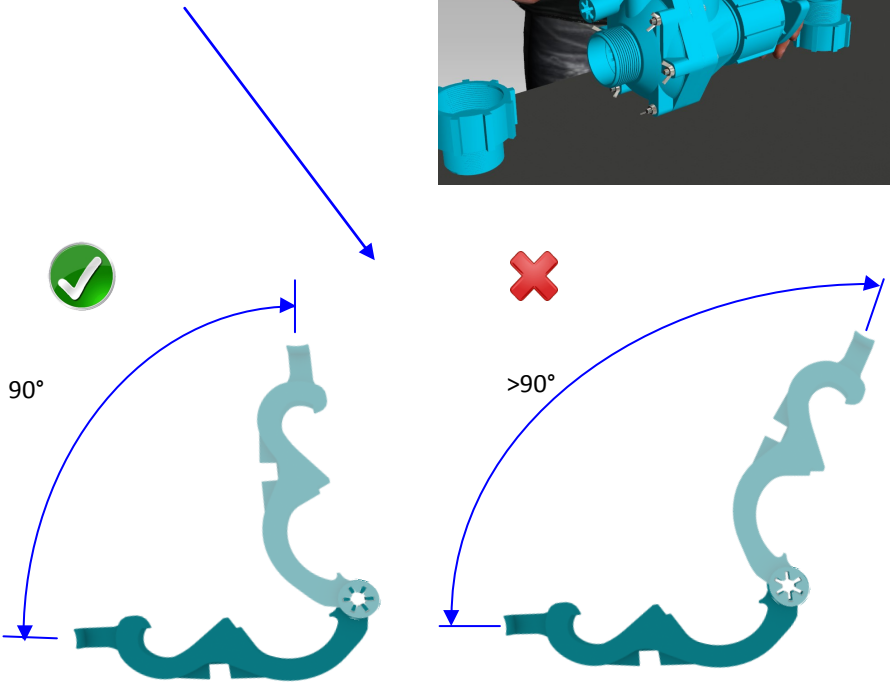


Re-assemble the Wing Nuts (15) by hand.

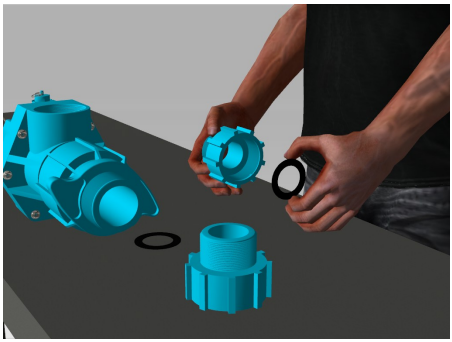


Tighten the Wing Nuts (15) using the ‘C’ spanner (16), turning 90° only

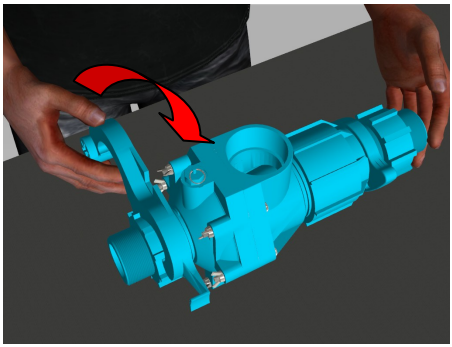




Fit the new Seals (10) to the Adaptors (6).



Re-fit the Adaptors (6).



Your Papa pump is now ready for re-installation and adjustment.

HOW TO START, THEN ADJUST THE PAPA PUMP

(plastic version)

To start your pump, the air needs to be expelled from both the supply pipe and the pump. This process is referred to as 'priming' and the time required to achieve this will depend on the pipe length and gradient. *A short pipe and steep gradient will allow the system to be primed more effectively than systems which have long pipes and gradual gradients.*

The operational sequence required to prime and adjust the pump is as follows:

turn the adjuster (4) in the direction (+) to fully open the pump main valve fully. The 'C' spanner (16) can be used to assist if required (see illustration below)

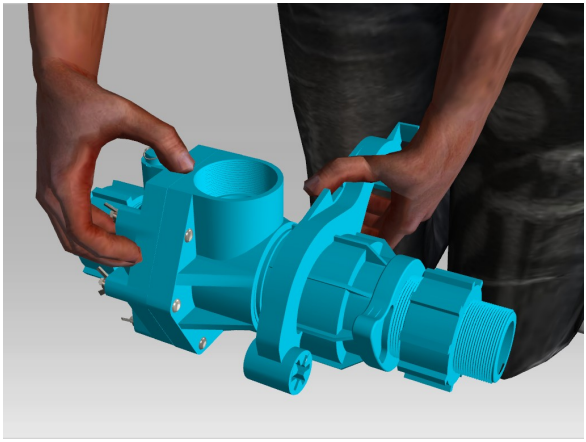
Open the supply ball valve so that water is allowed to flow through the pump and expel any air. (Be careful not to allow the supply tank water level to fall thus allowing air to enter the supply pipe when priming). The supply ball valve can be closed intermittently to allow this level to be maintained during the priming process.

With most of the visible air removed, turn the adjuster (4) in the opposite direction (-) until the pump 'beats'. If the pump beats but no further water flows, close the supply ball valve, lift up the pressure relief valve (9), release, and re-open the supply ball valve. Repeat this process until the pump operates continuously.

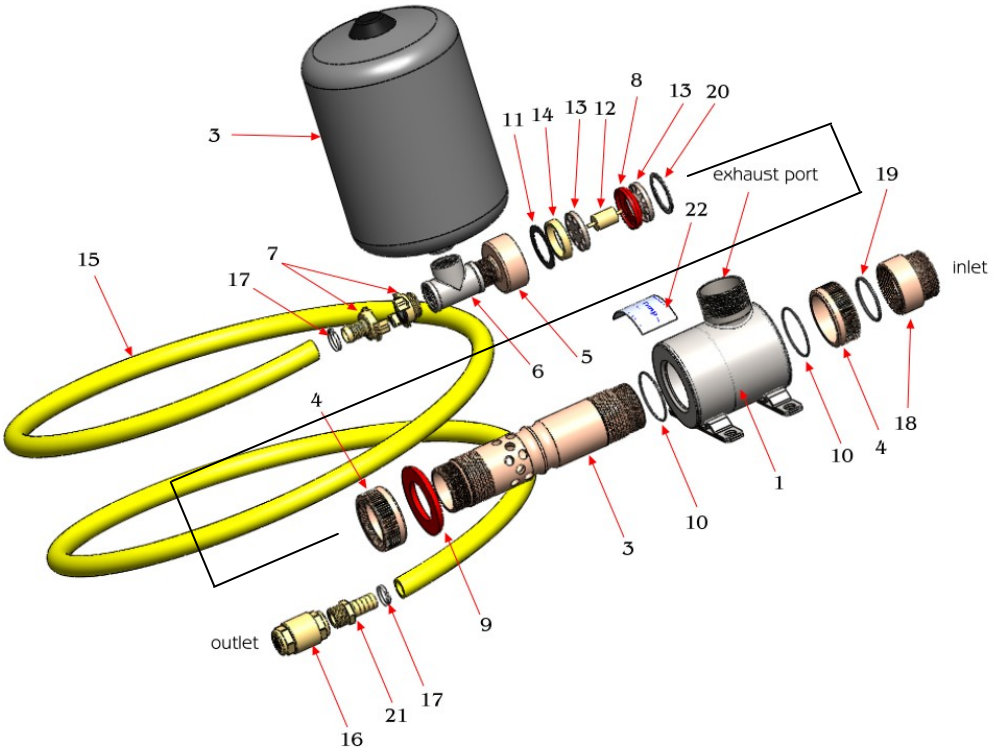
Adjust the pump setting with the adjuster (4) so that a small overflow is permitted from the supply tank.

If the pump operates with an irregular beat, this means that air is still present in the supply pipe. The pump will often 'self prime' when operating, provided the air is first removed and the pump does not stop.

In extreme cases it may be preferable to first prime the whole system using a separate powered pump or pressurised water source to back-fill all the pipework via the Papa pump exhaust port, although with time and patience priming can always be achieved using the described method.



Metal pump parts list



1 Main Body
2 Barrel
3 Accumulator (supplied to order)
4 Knurled Adjuster
5 Reducer
6 Tee
7 Q/R hose connector
8 NRV valve member
9 Main Valve member
10 Adjuster ‘O’ ring
11 Adaptor Seal
12 Valve Spigot
13 Valve Seat
14 Valve Spacer
15 Hose
16 NRV (metal)
17 Hose Clip
18 Adaptor
19 Adaptor ‘O’ ring
20 Retainer
21 Hose Tail
22 Label

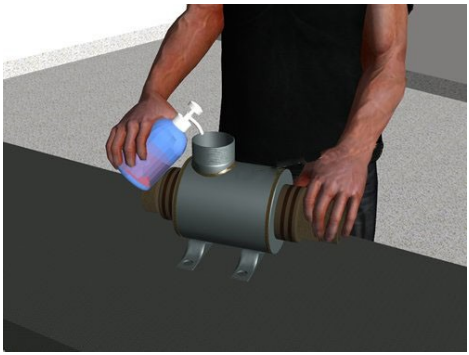
Metal pump maintenance

Maintenance is simple and involves a periodic check to ensure all waterways are clear and that the pump is still operating correctly. The Main Valve member (9) and the NRV Valve member (8) are the only moving parts and should last for many years of normal use. The pressure vessel will require inspection for leaks and damage and will also require a periodic air charge to maintain air pressure.

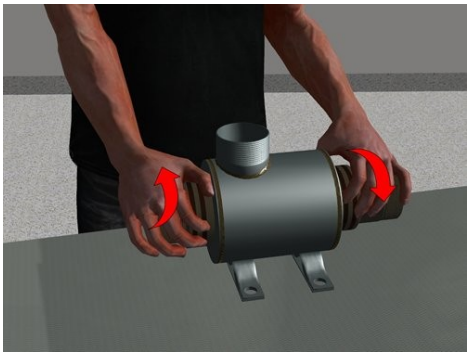
How to change the pump valves

Changing the Main Valve member (9) is a straightforward procedure and can easily be carried out in the field if required. Firstly, close the supply ball valve and then slowly unscrew the pressure vessel to release pressure. DO NOT UNSCREW THE VESSEL FULLY UNTIL THE WATER PRESSURE IS RELEASED. Remove the coupling (7) and release and remove the adaptor assembly (5,6,7).
Twist pump assembly anti-clockwise to release the Barrel (2) from the supply adaptor. Release adjusters (4) and continue to unscrew the Barrel (2) from the supply adaptor. Then follow the steps below.

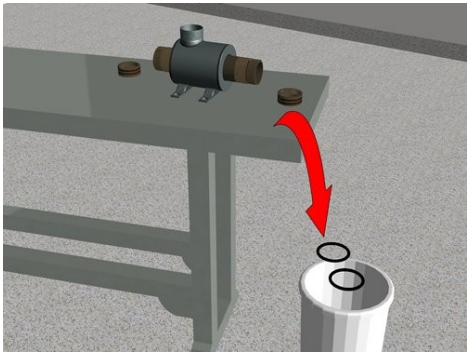
Apply a soap-like lubricant down the Exhaust Port and if necessary clean any exposed threads



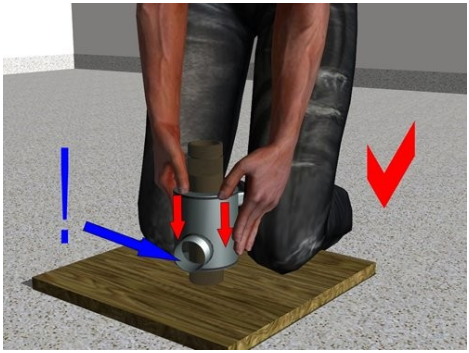
Unscrew both Knurled Adjusters (4).

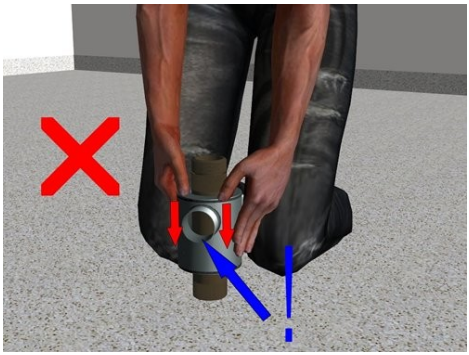


Discard the old ‘O’ rings (10)

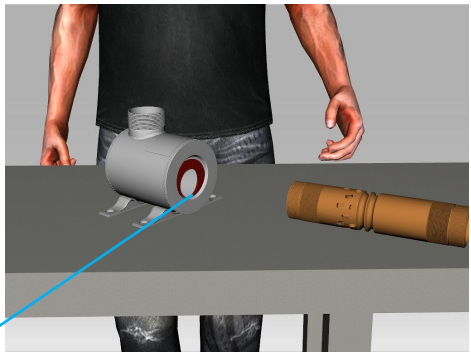


Holding the delivery end of the Barrel (2), pull it from the Outer Casing (1) in the direction of output, taking care not to damage the threads



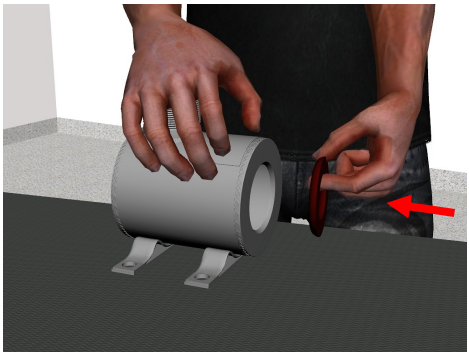


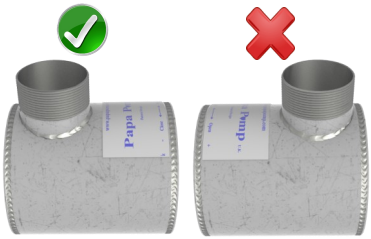
The Main Valve member (9) will be left inside the Main Body (1). Extract it and dispose, then clean all the parts ready for re-assembly

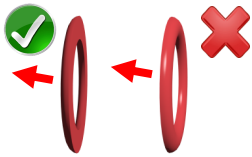


Take the new Main Valve member(9) and lubricate.

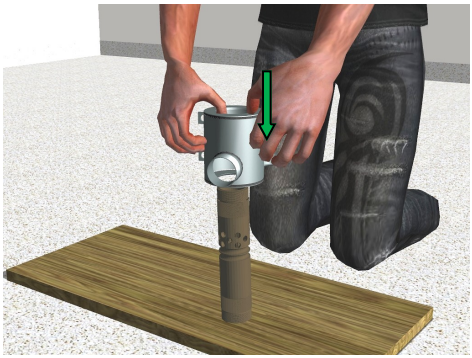
Insert Main Valve member (9) into the Main Body (1) from the output end.

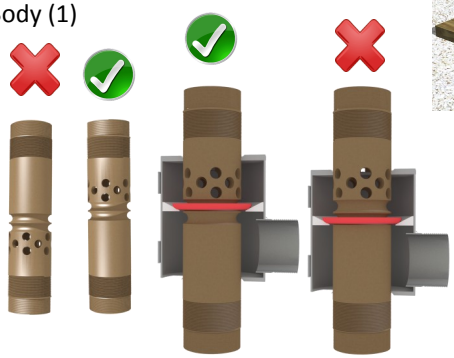




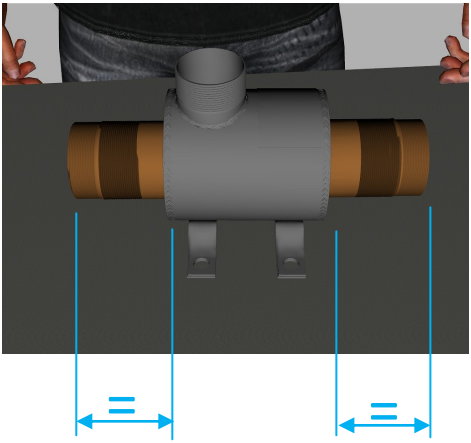


Re-insert the Barrel (2) into the Main Body (1)

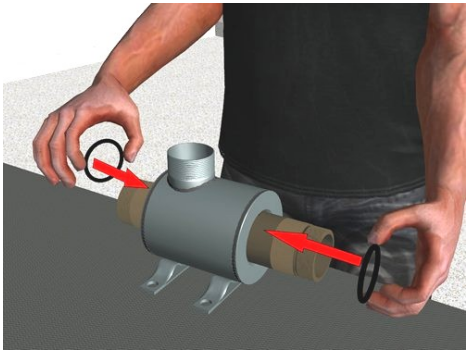




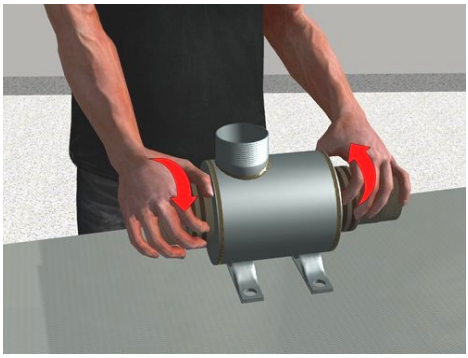
Push the Barrel (2) through until you feel resistance as the Main Valve member (9) finds its seating, then pull back until you feel firm resistance. The Barrel (2) will now be approximately central in the Main Body (1)



Fit new ‘O’ rings (10)

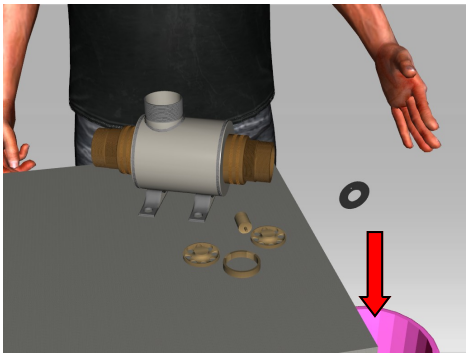


Re-fit the Knurled Adjusters (4) at each end to hand-tight.

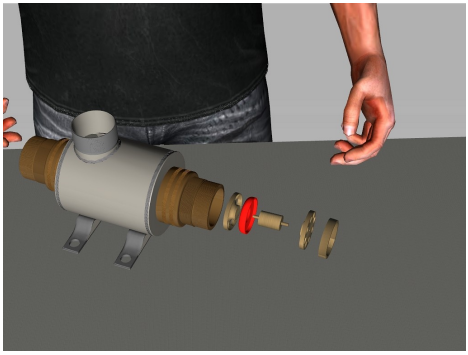


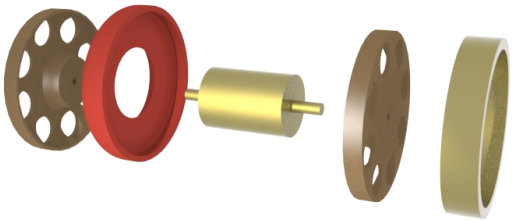
Remove the Valve Spacer (14), the Valve Seats (13), the Valve Spigot (12) and the NRV Valve member (8) from the end of the Barrel (2) using a screwdriver.

Discard the old NRV Valve member (8)



Refit one Valve Seat (13) followed by the new NRV Valve member (8), the Valve Spigot (12), the second Valve Seat (13) and finally the Valve Spacer (14)





Your Papa pump is now ready for re-installation and adjustment.

HOW TO START, THEN ADJUST THE PAPA PUMP (metal version)

To start your pump, the air needs to be expelled from both the supply pipe and the pump. This process is referred to as 'priming' and the time required to achieve this will depend on the pipe length and gradient. *A short pipe and steep gradient will allow the system to be primed more effectively than systems which have long pipes and gradual gradients.*

The operational sequence required to prime and adjust the pump is as follows:

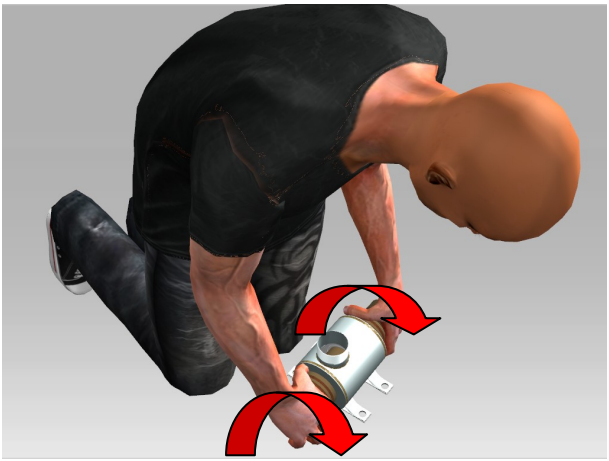
Turn the two adjusters (4) in the direction (+) to fully open the pump main valve. Apply a slight hand pressure to secure them on their 'O' ring seals. (turning the adjusters simply allows the main body (1) to move relative to the Barrel (2).

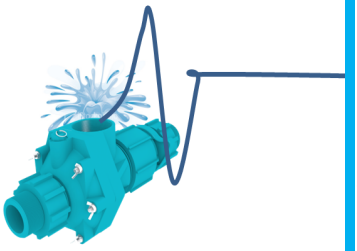
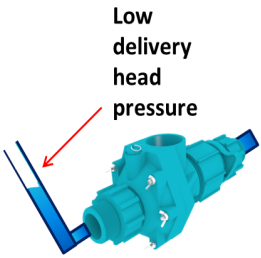
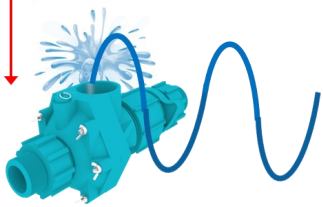
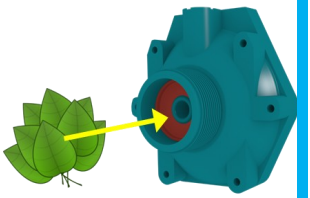
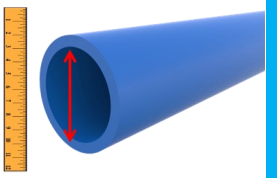
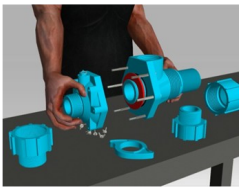
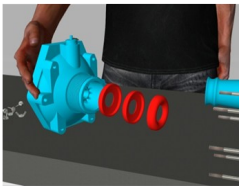
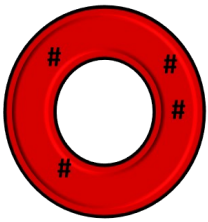
Open the supply ball valve so that water is allowed to flow through the pump and expel any air (be careful not to allow the supply tank water level to fall thus allowing air to enter the supply pipe when priming). The supply ball valve can be closed intermittently to allow this level to be maintained during the priming process.

With most of the visible air removed, turn the adjusters (4) in the opposite (-) direction until the pump 'beats'. If the pump beats and no further water flows, close the supply ball valve and release the adjusters (4) towards (+) allowing the pump main body to be pushed back and the main valve to re-open. (This will often require a reasonable force as there will be some water pressure acting on the seals. Releasing the adjusters (4) some distance from the pump main body (1) will allow the body to be moved more easily).

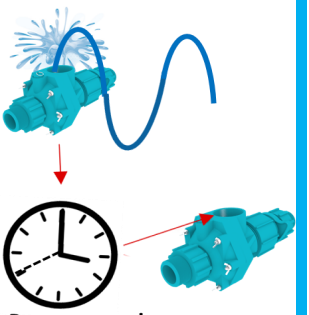
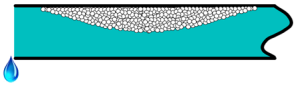
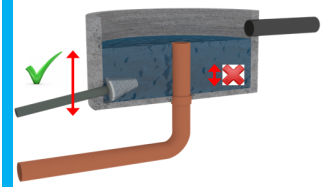
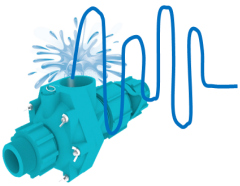
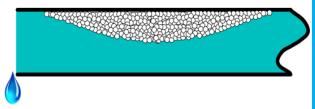
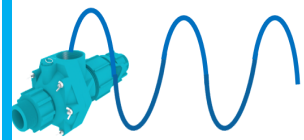
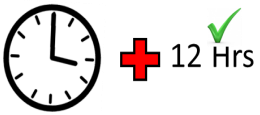
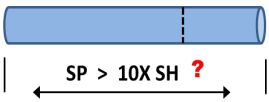
Re-set the pump main body (1) and the adjusters (4) to the previous position and re-open the supply ball valve allowing the pump to 'beat' again. Repeat this process until the pump operates continuously.

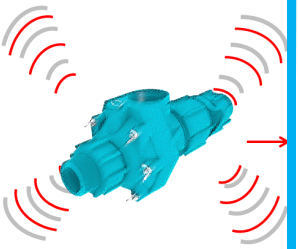
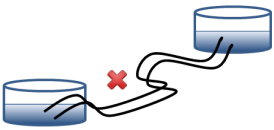
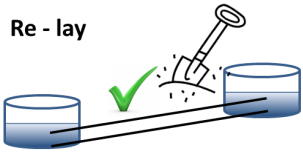
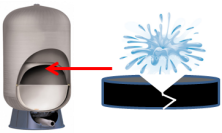
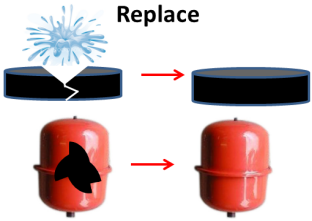
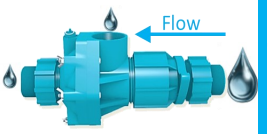
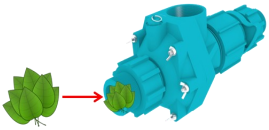
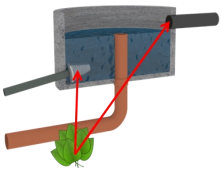
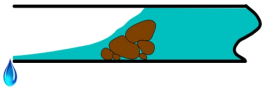
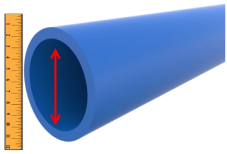
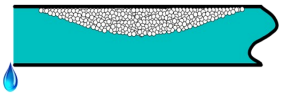
Adjust the pump setting with the adjusters (4) so that a small overflow is permitted from the supply tank.

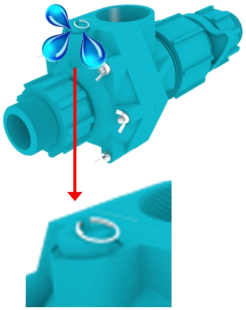
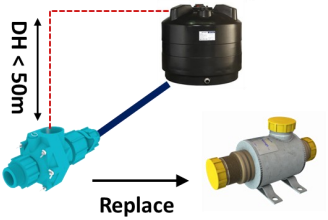
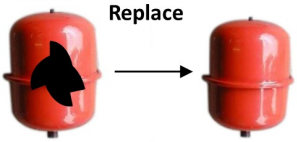


Fault	Common Causes	Action
 Pump beats once then stops	 Low delivery head pressure	See “How to start and adjust pump”
 Water Delivery low  Pump operating normally	 Check for blockage in pump valves SP < 3 X SH  2” (50mm)	Check   

Finding

Fault	Common Causes	Action
 Pump starts but stops after a period of time	Air in supply pipe 	See "How to start and adjust pump"
	Low water supply 	See "low flow rate through pump"
 Irregular Beat	Air in supply pipe 	  12 Hrs
	 SP > 10X SH ? Check	See "How to start and adjust pump"

Fault	Common Causes	Action
 Pump Shakes excessively during operation		 Check pressure Vessel PSI
		Re - lay 
		Replace 
 Low Flow Rate Through Pump		
		
	 S.H	 2” (50mm)
		

Fault	Common Causes	Action
 Pressure release valve leaking	 DH > 50m ✖ DH < 50m ✓ 	  Replace  Replace

Water:

Pipes:

Air:

Most likely causes, relating to system faults

Blockage:

Technical: [See “how to start and adjust pump” and “pump maintenance”]

Appendix

Pump Performance guide

Delivery Head (DH) (or lift) in meters

Supply Head (Fall) In Feet	6	8	9	12	15	23	31	47	62	77	92	123	Supply Head (or fall) in Meters
100											20	18	31
75										20	18	13	23
50								20	18	14	12	9	15
40								19	14	11	9.5	7	12
35								17	12	9.5	8	6	11
30							19	14	11	8	7	5	9
25						20	18	12	9	7	5.5	4	
20						17	14	9	7	5.5	4.5	3	6
15					17	13	10	7	4.5	3.5	3	2	
10			20	16	13	8	6	4	2.5	2	1.5	1	3
9			18	14	11	7	5	3	2	1.5	1.5		
8		20	16	12	9	6	4	3	2	1.5	1		
7		17	14	19	8	5	4	2	1.5	1	1		
6	18	14	11	8	6	4	3	2	1.5	1			2
5	14	12	9	6	5	3	2	2	1				
4	10	8	6	5	3	2	2	1					
3	6	5	4	3	2	1	1						1
2	4	3	2	2	1	1							
	20	25	30	40	50	75	100	150	200	250	300	400	

Delivery Head (or Lift) In Feet

These delivery performance figures relate to the % (percentage) of supply flow

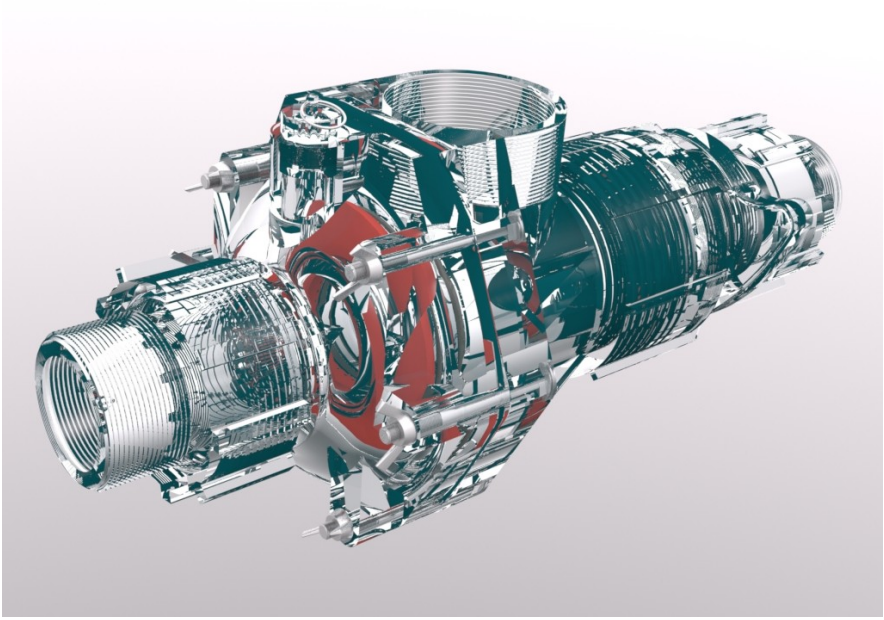
The supply flow will vary according to the supply head (SH). The figures conditional on a rigid steel supply pipe being used. For supply pipes of less rigid material, the performance will be less efficient with increasing delivery head (DH)

Friction Chart (for MDPE Pipes)

Internal pipe diameter (mm)	Flow rate in Litres/minute											
15	0.18	1	2.5	8	16	25	35					
20	0.04	0.2	0.5	1.8	3.5	5	7	10	16	25		
25	0.02	0.1	0.2	0.54	1.4	2	3	4	6	10	20	30
30		0.04	0.1	0.3	0.6	1	1.4	1.8	3	4.5	8	16
35		0.02	0.05	0.16	0.3	0.45	0.7	1	1.6	2.5	4.5	8
40		0.01	0.03	0.06	0.16	0.25	0.35	0.5	0.8	1.3	2.5	4.5
50			0.01	0.03	0.06	0.1	0.15	0.2	0.35	0.5	1	1.6
60				0.01	0.03	0.05	0.07	0.1	0.14	0.25	0.45	0.7
70					0.01	0.02	0.03	0.05	0.08	0.12	0.25	0.4
80						0.01	0.02	0.03	0.04	0.06	0.12	0.2
90	Extra Delivery Head (meters) generated						0.01	0.01	0.03	0.04	0.07	0.12
100	by frictional losses per 100m of pipe								0.01	0.02	0.04	0.07
	1	3	5	10	15	20	25	30	40	50	75	100

Specifications

	Metal pump	Plastic pump
Casing	Stainless steel	Injection moulded glass-filled nylon
Barrel	Bronze	As above
Max. output (litres/day)	18000	20000
Max. head (metres)	150	50
Max. pressure (Bar)	15	5
Weight (kg)	6.5	2
Length (cm)	34	30
Width (cm)	15	18
Height (cm)	17	16



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