

# **501R, 501M, 501D AND 502AA Pumphead manual**

Installation and operating instructions

---

## Warranty

---

Watson-Marlow warrants, subject to the conditions below, through either Watson-Marlow or its authorised distributors, to repair or replace free of charge, including labour, any pumphead which fails within two years of delivery to the end user. Such failure must have occurred because of defect in material or workmanship and not as a result of operation of the product other than in accordance with the instructions given in this manual.

Conditions of and specific exceptions to the above warranty are:

- 1 Consumable items are excluded.
- 2 Products must be returned by prearrangement carriage paid to Watson-Marlow or its authorised distributor.
- 3 All repairs or modifications must have been made by Watson-Marlow or its authorised distributors or with the express permission of Watson-Marlow or its authorised distributors.
- 4 Products which have been abused, misused, or subjected to malicious or accidental damage or electrical surge are excluded.
- 5 Pumpheads used as part of OEM products are limited to a one year warranty.

Warranties purporting to be on behalf of Watson-Marlow made by any person, including representatives of Watson-Marlow or its distributors, which do not accord with the terms of this warranty shall not be binding upon Watson-Marlow unless expressly approved in writing by a Director or Manager of Watson-Marlow.

---

## ii Introduction

---

Thank you for choosing a Watson-Marlow pumphead. This operating instruction covers the 501R, 501M, 501D and 502AA pumpheads. The 501R is designed for single channel use, whereas the 501M, 501D and 502AA provide multi-channel flows.

These heads may be fitted to any of the Watson-Marlow 300 or 500 series of cased drives. For further details of the drives available, consult the current catalogue.

---

### iii Contents

---

#### Part 1: 501R pumphead

Positioning the pumphead	page 4
2 Flow rates	. . page 4
3 Tube loading	. . page 5
4 Adjustment of rollers	. . page 5
5 Care and maintenance	page 6
6 Tubing range	. . page 6
7 Spares	page 6

#### Part 2: 501M multi-channel pumphead

8 Connecting the 501M	page 7
9 Flow rates	page 7
10 Cutting and loading tube . . .	page 8
11 501MX extension pumphead	page 8
12 Care and maintenance . . .	page 8
13 Tubing range	page 9
14 Spares	page 9

#### Part 3: 501D Delta pumphead

15 Connecting the 501D	page 10
16 Flow rates	page 10
17 Cutting and loading tube . . . .	page 11
18 501DX extension pumphead . . .	page 11
19 Care and maintenance	page 11
20 Tubing range	page 12
21 Spares	page 12

#### Part 4: 502AA cassette pumphead

22 Connecting the 502AA	. page 13
23 Flow rates	page 13
24 Cassette loading	. . page 14
25 Cassette removal	. . page 14
26 502AAX extension pumphead	. . page 14
27 Single segment manifold tubing	. . page 15
28 Care and maintenance	page 15
29 Spares	page 15

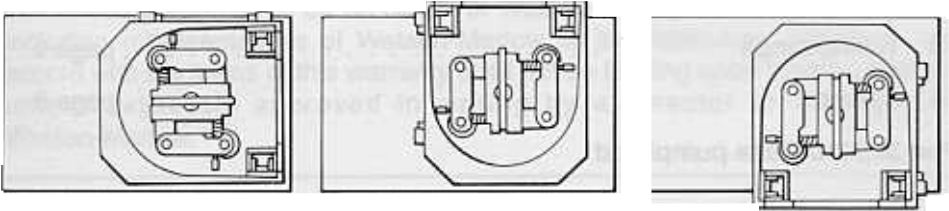
# 501R, 501RL and 501RL2 pumpheads

The 501R and 501RL pumpheads are set during manufacture to accept tubing with wall thicknesses of between 1.6mm and 2.0mm, and internal diameters of up to 8.0mm. For tubing with a 2.4mm wall thickness, the 501RL2 should be used.

The 501RL and 501RL2 pumpheads have a "tool lockable" guard for increased safety and it is recommended that these be used for all the high power drive units such as the 503U, 503P and 504U. A major feature of the 501R range of pumpheads is the option of extended tube life with clockwise rotation, or working against higher pressures with anti-clockwise rotation.

## 1 Positioning the pumphead

Any one of three tubing input/output positions can be selected depending on individual requirements. Only one screw is used to attach the track to the drive. To reposition the track; Remove tubing from the pumphead, and swing out the crank handle to expose the rotor retaining screw. Turn the screw anticlockwise one turn to release the collet, and withdraw the rotor from the shaft. Remove the track locating screw, rotate the track to the new position and replace the screw.



## 2 501R Flow rates

The flow rates given below were obtained using Silicone tubing, with the pumphead rotating clockwise, pumping water at 20C with zero suction and delivery pressures (unless otherwise stated). Where an application is critical, the flow rate should be determined under operating conditions. The important factors are suction and delivery pressures, temperature, and fluid viscosity. Tube life will be reduced when pumping against pressure. Flow rates are given in ml/minute.

Drive	rpm	Tubing internal diameter						
		0.5mm 1/50"	0.8mm 1/32"	1.6mm 1/16"	3.2mm 1/8"	4.8mm 3/16"	6.4mm 1/4"	8.0mm 5/16"
302SM	7	0.3	0.9	2.9	13	27	45	70
	55	2.3	6.7	24	101	220	347	550
	110	4.6	13.6	47	205	446	700	1100
302SM	8	0.4	1.1	3.5	16	32	54	80
	66	2.8	8.0	29	121	264	416	660
	90	3.8	11	38	168	365	572	900
302SW	265	11	33	114	500	1090	1690	2650
503S	10	0.4	1.3	4.2	19	39	64	100
501Z	50	2.1	6.1	22	92	200	315	500
	100	4.2	12.4	43	186	405	635	1000
	170	7.1	21	73	320	700	1080	1700
503U	55	2.3	6.7	24	101	220	347	550
504U	220	9.2	27	96	404	880	1388	2200
503P	30	1.3	3.7	13	55	120	190	300
	160	6.7	20	70	293	640	1010	1600

---

### 3 Tube loading

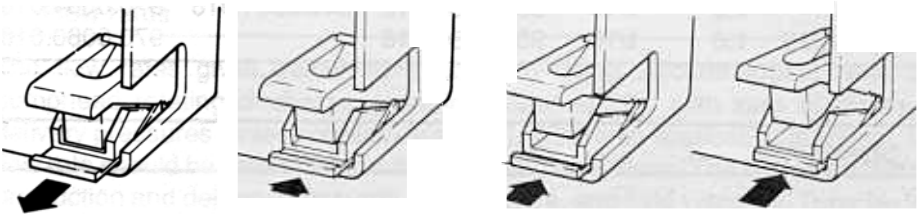
---

**WARNING:** Switch off the drive before loading the tube.

Open the hinged guard and swing out the rotor crank handle until it locks into position. Note that the 501RL and 501RL2 pumpheads are fitted with a "tool lockable" guard.

- 2 Select the length of tubing required, noting that approximately 240mm is required for the track system (measured from the outside faces of the tube clamps).
- 3 Fit one end of the tubing into one of the spring loaded clamps, and then, whilst rotating the rotor with the crank handle, feed the tubing between the rollers and the track, aligning it within the rotor tube guides. The tubing must lie naturally against the track and must not be twisted or stretched.
- 4 Fit the other end of the tubing into the second spring loaded clamp, ensuring that the tubing is not slack in the pumphead, as this can reduce tube life.
- 5 Close the crank handle and shut the guard.
- 6 After the pump has been started, open the downstream clamp for a short period so that the tube can find its natural length.

The 501R pumphead is fitted with four-position tube clamps which can be adjusted by pushing in or pulling out the bars at the top of the upper clamp and the bottom of the lower clamp. Set clamps so that the minimum necessary pressure is applied to the tubing.



---

### 4 Adjustment of the gap between the rollers and track for 501R and 501RL

---

The 501R and 501RL have a factory set gap of 2.6mm between the rollers and the track is suitable for tubing having wall thicknesses of between 1.6 and 2.0mm. For tubing with a 2.4mm wall thickness the 501RL2 has a factory set gap of 3.8mm. Adjustment of the gap will be required if tubing having a wall thickness of less than 1.6mm is to be used. There is an adjusting screw on each of the two roller arms, and each of these screws will require adjustment. The correct gap is twice the wall thickness less twenty percent. Correct adjustment is important: over occlusion will reduce tube life; under occlusion will reduce pumping efficiency.

To change the gap setting, turn each adjusting screw clockwise to increase the gap or anticlockwise to decrease the gap. A full turn changes the gap by 0.8mm.

To restore the original settings of 2.6mm or 3.8mm, turn the adjusting screws until both rollers are just touching the track, then tighten each screw by three and a quarter turns for the 501R and 501RL or four and three-quarter turns for the 501RL2.

## 5 Care and maintenance

If aggressive liquids are spilled on to the pumphead, the head should be removed and cleaned. Remove any tubing from the pumphead, and swing out the crank handle to expose the rotor retaining screw. Turn the screw anticlockwise one turn to release the collet, and withdraw the rotor from the shaft. Unscrew the track retaining screw and detach the track from its spigot.

Check moving parts of the rotor from time to time for freedom of movement. Lubricate pivot points and rollers occasionally with a light lubricating oil.

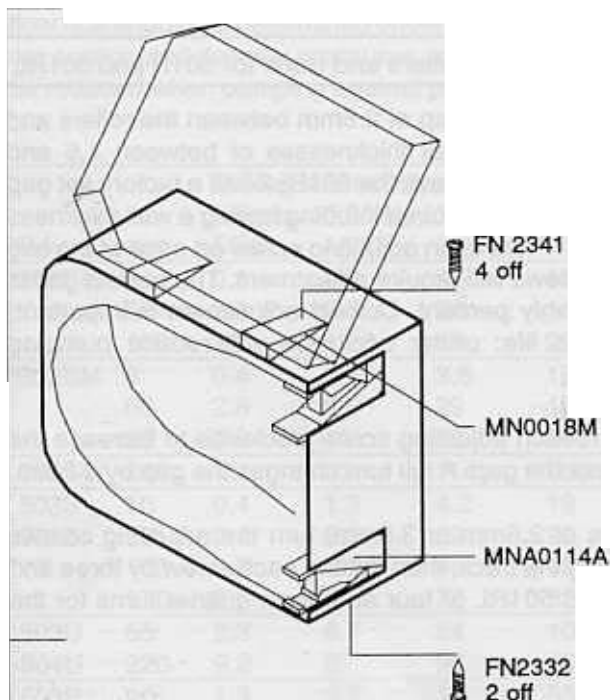
## 6 Tubing range

Bore mm	"	Wall mm	"	Marprene	Silicone	Neoprene
0.5	1/50	1.6	1/16	900.0005.016	910.0005.016	
0.8	1/32	1.6	1/16	900.0008.016	910.0008.016	920.0008.016
1.6	1/16	1.6	1/16	900.0016.016	910.0016.016	920.0016.016
3.2	1/8	1.6	1/16	900.0032.016	910.0032.016	920.0032.016
4.8	3/16	1.6	1/16	900.0048.016	910.0048.016	920.0048.016
6.4	1/4	1.6	1/16	900.0064.016	910.0064.016	920.0064.016
8.0	5/16	1.6	1/16	900.0080.016	910.0080.016	920.0080.016
4.8	3/16	2.4	3/32	900.0048.024	910.0048.024	
6.4	5/16	2.4	3/32	900.0064.024	910.0064.024	

Bore mm	"	Wall mm	"	Butyl	Marvinal	Viton
1.6	1/16	1.6	1/16	930.0016.016	940.0016.016	970.0016.016
3.2	1/8	1.6	1/16	930.0032.016	940.0032.016	970.0032.016
4.8	3/16	1.6	1/16	930.0048.016	940.0048.016	970.0048.016
6.4	1/4	1.6	1/16	930.0064.016	940.0064.016	970.0064.016
8.0	5/16	1.6	1/16	930.0080.016		970.0080.016

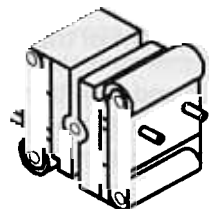
## 7 Spares



### Track assembly

501R: MNA0137A  
501RL and 501RL2: MNA0311A

### Rotor assembly



501R and 501RL: MNA0143A  
501RL2: MNA0312A

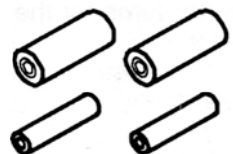
### Springs



SG 0001, 4 off

### Main rollers

MN 0011T, 2 off



### Follower rollers

MN 0012T 2 off

## 501M multichannel pumphead

The 501M is a three roller pumphead which can be fitted with up to ten separate thin wall silicone tubing elements which can be added to or changed without stopping the pump. If more than ten channels are required, up to four 501MX extension modules can be attached to the 501M, each providing ten more channels (subject to drive speed, tube size and application).

### 8 Connecting the 501M

Remove the black aluminium coupling assembly cover. It is sprung, and must be held clear of the rods joining the two plates as it is removed. Separate the flexible coupling into its three parts. The part with the spindle should be fitted to the pumphead rotor through the bronze bearing in the pumphead end casting. Check that the tongue at the end of the spindle is properly engaged by turning the coupling and making sure that the rotor revolves with it.

Slide the other half of the coupling on to the drive output shaft, with the locking screw in line with the flat on the shaft. Place the rubber cruciform on one of the coupling halves. Position the pumphead, with its half coupling, on the drive, and turn the rotor so that the interlocking sections of the coupling can be brought together. Tighten the knurled pumphead retaining screw in one of the three positions (normally the bottom one) on the front panel of the drive.

Slide the half coupling on the drive output shaft forward to mate with the cruciform, and lock in position by tightening the recessed allen screw. Check that the pumphead is securely attached and that the rotor rotates freely before replacing the cover over the coupling.

### 9 Flow rates

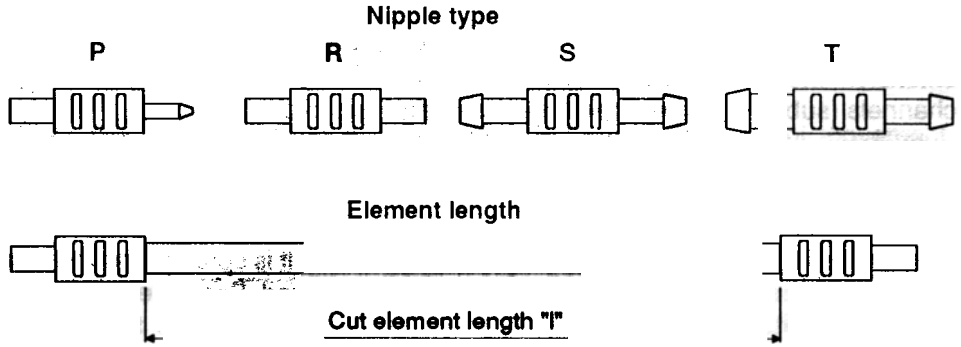
The flow rates given below were obtained using silicone tubing, with the pumphead rotating clockwise, pumping water at 20C with zero suction and delivery pressures (unless otherwise stated). Where an application is critical, the flow rate should be determined under operating conditions. The important factors are suction and delivery pressures, temperature, and fluid viscosity. Tube life will be reduced when pumping against pressure. Flow rates are given in ml/minute.

Drive	rpm	Tubing internal diameter				Flow rates (ml/min)		
		1.0mm 1/25"	1.5mm 1/16"	2.0mm 1/12"	2.5mm 1/10"	3.0mm 1/8"	4.0mm 1/6"	Chan- nels
302SM	7	0.4	0.8	1.3	2.2	3.4	5.5	30
	55	2.9	6.4	10	17	26	43	20
	110	5.7	13	21	34	53	87	10
302SM	8	0.2	0.5	0.7	1.0	1.7	2.4	30
	66	1.8	3.8	6.0	8.2	13	18	20
	90	4.7	11	17	28	43	71	
503S	10	0.5	1.2	1.9	3.1	4.8	7.8	50
	50	2.6	5.8	9.6	15	24	39	40
	100	5.2	12	19	31	48	79	20
	170	8.8	20	32	52	82	134	10
503U	55	2.9	6.4	10	17	26	43	40
504U	170*	8.8	20	32	52	82	134	40
503P	30	0.8	1.7	2.7	3.7	5.9	8.2	50
	160	8.3	19	30	50	77	126	50

\* The 501M pumpheads must not be run at motor drive shaft speeds greater than 170rpm, three quarters of the maximum speed of the 503U and 504U drives.

## 10 Cutting and loading tube

Select nipple connectors and cut tubing elements in accordance with this diagram.



Bore mm	"	Wall mm	"	Select nipple type	Cut element length "l"
1.0	1/25	0.35	1/64	P	89mm, 3 1/2"
1.5	1/16	0.5	1/50	P or R	97mm, 3 13/16"
2.0	1/12	0.5	1/50	P or R	100mm, 3 15/16"
2.5	1/10	0.5	1/50	S or T	102mm, 4"
3.0	1/8	0.5	1/50	S or T	102mm, 4"
4.0	1/6	0.7	1/32	T	105mm, 4 1/8"

Remove the transparent guard from the pumphead. Insert the nipple connectors into the tubing elements, and place each element in position in the pumphead, using the centre slot of each nipple connector initially, with the tube stretched over the top of the rotor. The three slots on each nipple connector allow fine adjustment of the flow rate and delivery pressure.

If it is necessary to prime the tubes, pull each nipple in turn out of its slot on the delivery side, and with the pump running slowly, stretch the tube until it primes. Slip the nipple on the delivery side back into its slot.

It is essential for prolonged tube life to sparingly apply thin lubricants, such as olive oil, to the tubes.

## 11 501MX extension pumphead

Switch off the drive and unplug it from the mains before attaching a 501MX extension pumphead to the 501M. Unscrew and remove the two countersunk screws on the end plate of the 501M, and remove the endplate. Remove the transparent guard of the 501MX and position it against the exposed end casting of the 501M. Engage the two locating pins into the recesses on the 501MX pumphead and locate the drive shaft through the bronze bearing into the end casting.

Ensure that the tongue at the end of the shaft mates properly before the fastening screws are tightened. Fit the end plate to the 501MX and secure it by the countersunk screws. Load tubes into the pumpheads.

## 12 Care and maintenance

If harmful liquids are spilled on the pumphead, it should be cleaned as soon as possible. After every 500 hours of operation, the casting bearings should be treated with a low viscosity oil applied sparingly.



## 13 Tubing range

### Thin wall silicone tubing

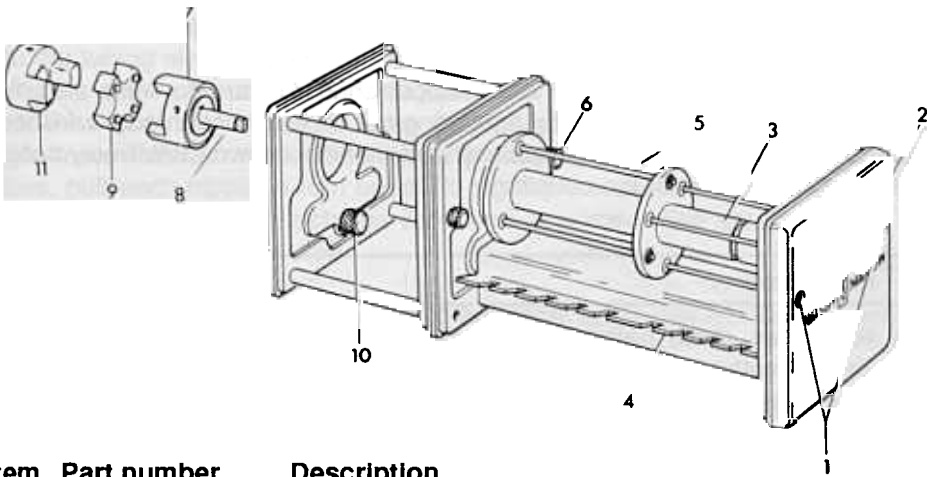
Bore	Product code	Bore	Product code	Bore	Product code
1.0mm	990.0010.003	2.0mm	990.0020.005	3.0mm	990.0030.005
1.5mm	990.0015.005	2.5mm	990.0025.005	4.0mm	990.0040.007

### Accessories

### Product code

Nipple type P for 1.0mm and 1.5mm tubing	999.1000.000
Nipple type R for 1.5mm and 2.0mm tubing	999.1010.000
Nipple type S for 2.0mm and 2.5mm tubing	999.1020.000
Nipple type T for 3.0mm and 4.0mm tubing	999.1030.000
Tube of silicone grease	999.1100.000

## 14 Spares



Item	Part number	Description
1	FN 0241	Retaining screw
2	DE 0270C	End plate
3	DE 0281T	Rotor shaft
4	DE 0275C	Nipple bar
5	DE 0283T	Spindle (6 required)
6	DE 0290B	Fastening screws
7	CN 0082	Coupling 1/4" bore
8	DE 0282T	Shaft
9	CN 0084	Spider
10	DE 0289T	Locking stud
11	CN 0091	Coupling 10mm bore

---

## 501D delta pumphead

---

The 501D is a Delta pumphead which means that the tubing is occluded by being stretched over the delta shaped rotor and therefore needs no track. It can be fitted with up to ten thin wall silicone tubing elements which may be added to or changed without stopping the pump. If more than the ten channels are required, up to four 501DX extension modules can be added, each providing ten more channels (depending upon drive speed, tube size and application). 501D pumpheads are for use in low flow applications and should be operated at speeds of 66rpm or less.

---

### 15 Connecting and positioning

---

Remove the black aluminium coupling assembly cover. It is sprung, and must be held clear of the rods joining the two plates as it is removed. Separate the flexible coupling into its three parts. The part with the spindle should be fitted to the pumphead rotor through the bronze bearing in the pumphead end casting. Check that the tongue at the end of the spindle is properly engaged by turning the coupling and making sure that the rotor revolves with it.

Slide the other half of the coupling on to the drive output shaft, with the locking screw in line with the flat on the shaft. Place the rubber cruciform on one of the coupling halves. Position the pumphead, with its half coupling, on the drive, and turn the rotor so that the interlocking sections of the coupling can be brought together. Tighten the knurled pumphead retaining screw in one of the three positions (normally the bottom one) on the front panel of the drive.

Slide the half coupling on the drive output shaft forward to mate with the cruciform, and lock in position by tightening the recessed Allen screw. Check that the pumphead is securely attached and that the rotor rotates freely before replacing the cover over the coupling.

---

### 16 Flow rates

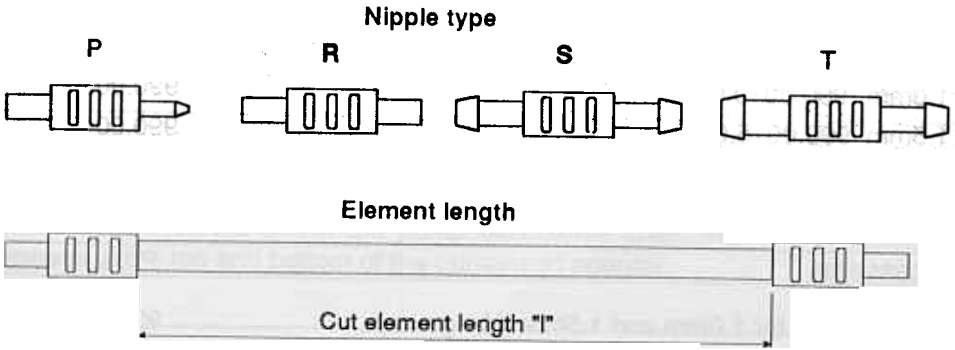
---

The flow rates given below were obtained using silicone tubing, with the pumphead rotating clockwise, pumping water at 20C with zero suction and delivery pressures (unless otherwise stated). Where an application is critical, the flow rate should be determined under operating conditions. The important factors are suction and delivery pressures, temperature, and fluid viscosity. Tube life will be reduced when pumping against pressure. Flow rates are given in ml/minute.

Drive	rpm	Tubing internal diameter				Flow rates (ml/min)			Chan-nels
		1.0mm 1/25"	1.5mm 1/16"	2.0mm 1/12"	2.5mm 1/10"	3.0mm 1/8"	4.0mm 1/6"		
302SM	7	0.2	0.4	0.6	0.8	1.4	2.0	30	
	55	1.5	3.2	5.0	6.8	11	15	20	
302SM	8	0.2	0.5	0.7	1.0	1.7	2.4	30	
	66	1.8	3.8	6.0	8.2	13	18	20	
503S	10	0.3	0.6	0.9	1.2	2.0	2.8	50	
	55	1.4	2.9	4.5	6.2	10	14	50	
503U									
504U	55	1.5	3.2	5.0	6.8	11	15	20	
503P	30	0.8	1.7	2.7	3.7	5.9	8.2	50	

## 17 Cutting and loading tube

Select nipple connectors and cut tubing elements in accordance with this diagram.



Bore mm	"	Wall mm	"	Select nipple type	Cut element length "l"
1.0	1/25	0.35	1/64	P	72 89mm, 3 1/2"
1.5	1/16	0.5	1/50	P or R	76 97mm, 3 13/16"
2.0	1/12	0.5	1/50	P or R	79 100mm, 3 15/16"
2.5	1/10	0.5	1/50	S or T	80 102mm, 4"
3.0	1/8	0.5	1/50	S or T	84 102mm, 4"
4.0	1/6	0.7	1/32	T	86 105mm, 4 1/8"

Remove the transparent guard from the pumphead. Insert the nipple connectors into the tubing elements, and place each element in position in the pumphead, using the centre slot of each nipple connector initially, with the tube stretched over the top of the rotor. The three slots on each nipple connector allow fine adjustment of the flow rate and delivery pressure. If it is necessary to prime the tubes, pull each nipple in turn out of its slot on the delivery side, and with the pump running slowly, stretch the tube until it primes. Slip the nipple on the delivery side back into its slot.

It is essential for prolonged tube life to sparingly apply thin lubricants, such as olive oil, to the tubes.

## 18 501DX extension pumphead

Switch off the drive and unplug it from the mains before attaching a 501DX extension pumphead to the 501D. Unscrew and remove the two countersunk screws on the end plate of the 501D, and remove the endplate. Remove the transparent guard of the 501DX and position it against the exposed end casting of the 501D. Engage the two locating pins into the recesses on the 501DX pumphead and locate the drive shaft through the bronze bearing into the end casting.

Ensure that the tongue at the end of the shaft mates properly before the fastening screws are tightened. Fit the end plate to the 501DX and secure it by the countersunk screws. load tubes into the pumpheads.

## 19 Care and maintenance

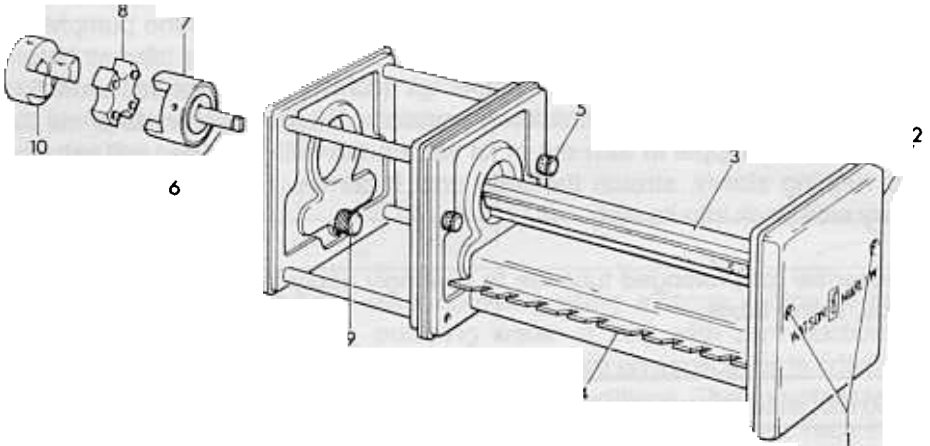
If harmful liquids are spilled on the pumphead, it should be cleaned as soon as possible. After every 500 hours of operation, the casting bearings should be treated with a low viscosity oil applied sparingly.

## 20 Tubing range

Thin wall silicone tubing					
Bore	Product code	Bore	Product code	Bore	Product code
1.0mm	990.0010.003	2.0mm	990.0020.005	3.0mm	990.0030.005
1.5mm	990.0015.005	2.5mm	990.0025.005	4.0mm	990.0040.007

Accessories	Product code
Nipple type P for 1.0mm and 1.5mm tubing	999.1000.000
Nipple type R for 1.5mm and 2.0mm tubing	999.1010.000
Nipple type S for 2.0mm and 2.5mm tubing	999.1020.000
Nipple type T for 3.0mm and 4.0mm tubing	999.1030.000
Tube of silicone grease	999.1100.000

## 21 Spares



Item	Part number	Description
1	FN 0241	Retaining screw
2	DE 0270C	End plate
3	DE 0280C	Rotor
4	DE 0275C	Nipple bar
5	DE 0290B	Fastening screws
6	DE 0282T	Shaft
7	CN 0082	Coupling 1/4" bore
8	CN 0084	Spider
9	DE 0289T	Locking stud
10	CN 0091	Coupling 10mm bore

## 502AA Cassette pumphead

The 502AA pumphead is a easy loading cassette pumphead available in 4, 8, 12 and 16 channel versions. If a greater number of channels are needed, then 12 or 16 channel 502AAX extension pumpheads can be added.

### 22 Connecting the 502AA

Fit the pumphead over the boss on the drive ensuring that the tongue of the drive shaft locates on the slot in the pumphead centre shaft. Tighten the retaining screws at the top and bottom of the pumphead adaptor.

### 23 Flow rates

These flow rates were obtained pumping water at 20C with zero suction and delivery pressures. If flow rate is critical, it should be measured under operating conditions where the important factors are suction and delivery, temperature and viscosity. Flow rates are given in ml/minute.

	rpm	Tubing internal diameter				Flow rates (ml/min)			
		0.13mm 0.005"	0.19mm 0.007"	0.25mm 0.01"	0.38mm 0.015"	0.50mm 0.02"	0.63mm 0.025"	0.76mm 0.03"	
302SM	7	0.003	0.009	0.02	0.03	0.06	0.08	0.11	
	55	0.026	0.07	0.16	0.27	0.43	0.63	0.85	
	110	0.053	0.14	0.31	0.53	0.86	1.25	1.69	
302SM	8	0.004	0.011	0.02	0.04	0.07	0.10	0.13	
	66	0.031	0.082	0.19	0.32	0.52	0.76	1.02	
	90	0.043	0.11	0.25	0.43	0.70	1.09	1.38	
503S	10	0.005	0.01	0.03	0.05	0.08	0.11	0.15	
501Z	50	0.024	0.06	0.14	0.24	0.39	0.57	0.77	
	100	0.048	0.12	0.28	0.48	0.77	1.14	1.54	
	170	0.082	0.21	0.48	0.82	1.33	1.94	2.62	
503U	55	0.026	0.07	0.16	0.27	0.43	0.63	0.85	
504U	170*	0.082	0.21	0.48	0.82	1.33	1.94	2.62	
503P	30	0.014	0.037	0.085	0.14	0.23	0.34	0.46	
	160	0.077	0.20	0.45	0.77	1.25	1.83	2.47	

	rpm	Tubing internal diameter				Flow rates (ml/min)			
		0.88mm 0.035"	1.02mm 0.04"	1.14mm 0.045"	1.29mm 0.05"	1.42mm 0.055"	1.47mm 0.058"	1.52mm 0.06"	
302SM	7	0.15	0.20	0.26	0.32	0.41	0.44	0.53	
	55	1.20	1.58	2.04	2.48	3.18	3.48	3.76	
	110	2.40	3.17	4.07	4.95	6.36	6.95	7.52	
302SM	8	0.18	0.24	0.31	0.38	0.49	0.53	0.58	
	66	1.44	1.90	2.45	2.98	3.82	4.18	4.51	
	90	1.96	2.59	3.33	4.05	5.20	5.69	6.15	
503S	10	0.22	0.29	0.37	0.45	0.58	0.63	0.68	
501Z	50	1.09	1.44	1.85	2.25	2.89	3.16	3.42	
	100	2.18	2.88	3.70	4.50	5.78	6.32	6.84	
	170	3.71	4.90	6.29	7.65	9.83	10.7	11.6	
503U	55	1.20	1.58	2.04	2.48	3.18	3.48	3.76	
504U	170*	3.71	4.90	6.29	7.65	9.83	10.7	11.6	
503P	30	0.65	0.86	1.11	1.35	1.73	1.88	2.05	
	160	3.49	4.61	5.92	7.20	9.25	10.1	10.9	

\* 502AA pumpheads must not be run at motor drive shaft speeds greater than 170rpm, three quarters of the maximum speed of the 503U and 504U drives.

	rpm	1.65mm 0.065"	1.85mm 0.07"	2.05mm 0.08"	2.38mm 0.09"	2.54mm 0.1"	2.79mm 0.11"	Max Channels
302SM	7	0.53	0.68	0.82	1.00	1.28	1.43	32
	55	4.14	5.37	6.46	7.83	10.0	11.2	20
	110	8.27	10.7	12.9	15.7	20.1	22.4	10
302SM	8	0.64	0.82	0.98	1.20	1.54	1.72	32
	66	4.97	6.44	7.75	9.40	12.0	13.4	20
	90	6.77	8.75	10.6	12.8	16.4	18.3	10
503S	10	0.75	0.98	1.17	1.42	1.82	2.04	32
501Z	50	3.76	4.88	5.87	7.12	9.12	10.2	48
	100	7.52	9.76	11.7	14.2	18.2	20.4	32
	170	12.8	16.6	20.0	24.2	31.0	34.7	20
503U	55	4.14	5.37	6.46	7.83	10.0	11.2	48
504U	170*	12.8	16.6	20.0	24.2	31.0	34.7	48
503P	30	2.26	2.93	3.53	4.27	5.47	6.12	48
	160	12.0	15.6	18.8	22.8	29.2	32.7	48

\* 502AA pumpheads must not be run at motor drive shaft speeds greater than 170rpm, three-quarters of the maximum speed of the 503U and 504U drives.

---

## 24 Cassette loading

---

The cassettes are designed only for use with manifold pump tubing. Place the tube, without twisting or stretching it, into the tube retaining slots. Depress the cam adjustment lever which will move the cassette leg inwards. Load the cassettes into the pumphead starting at the drive end. Ensure that both retaining lips are properly engaged, then raise the cam adjustment lever to its vertical position to give the normal tube occlusion. The final delivery pressure can be varied slightly by adjusting the cam lever position.

**CAUTION** All cassettes should be in position in the pumphead, even if some do not contain tubing, before the pump is switched on. During running a cassette may be removed for tube changing but must be replaced as soon as possible.

---

## 25 Cassette removal

---

Depress the cam adjustment lever fully and lift out the cassette. There is no need to switch the drive module off to remove a cassette for tube changing. The removal of a cassette will not disturb the pumping action of any other but the pump must not be run for long periods of time without all the cassettes in place.

---

## 26 502AAX extension pumphead

---

To fit an extension pumphead, remove the end cover plate from the 502AA to expose the two locating pins and the drive shaft slot. Spring off the planetary gear system cover plate from the 502AAX extension pumphead.

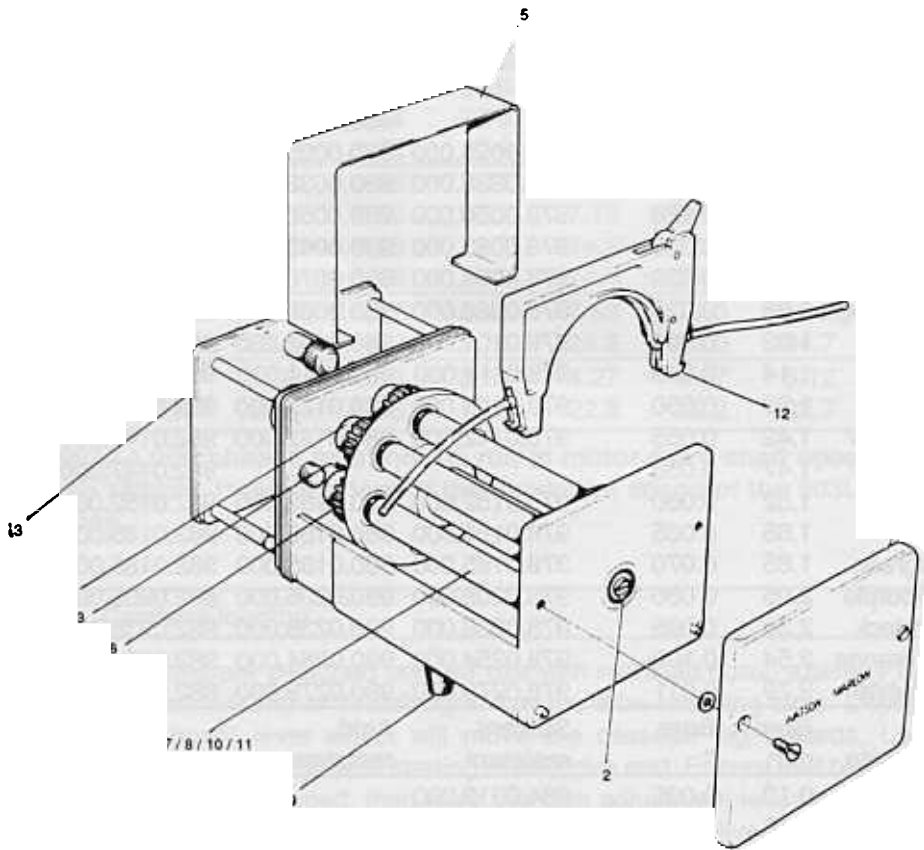
Locate the 502AAX extension pumphead on to the two locating pins, ensuring that the tongue of its drive shaft engages in the slot in the shaft of the 502AA. Tighten the two knurled retaining screws on the right and left of the 502AAX gearbox. Replace the planetary gear system cover plate. If a third pumphead is to be added, repeat this procedure. Fit the end plate to the last pumphead.

## 27 Single segment manifold tubing for AA pumpheads

Colour code	Bore mm	Bore "	Marprene	PVC	Silicone
Orange/black	0.13	0.005		980.0013.000	
Orange/red	0.19	0.007		980.0019.000	
Orange/blue	0.25	0.010	978.0025.000	980.0025.000	
Orange/green	0.38	0.015	978.0038.000	980.0038.000	
Orange/yellow	0.50	0.020	978.0050.000	980.0050.000	
Orange/white	0.63	0.025	978.0063.000	980.0063.000	982.0063.000
Black/black	0.76	0.030	978.0076.000	980.0076.000	982.0076.000
Orange/orange	0.88	0.035	978.0088.000	980.0088.000	982.0088.000
White/white	1.02	0.040	978.0102.000	980.0102.000	982.0102.000
Red/red	1.14	0.045	978.0114.000	980.0114.000	982.0114.000
Grey/grey	1.29	0.050	978.0129.000	980.0129.000	982.0129.000
Yellow/yellow	1.42	0.055	978.0142.000	980.0142.000	982.0142.000
Translucent	1.47	0.058			982.0147.000
Yellow/blue	1.52	0.060	978.0152.000	980.0152.000	982.0152.000
Blue/blue	1.65	0.065	978.0165.000	980.0165.000	982.0165.000
Green/green	1.85	0.070	978.0185.000	980.0185.000	982.0185.000
Purple/purple	2.05	0.080	978.0205.000	980.0205.000	982.0205.000
Purple/black	2.38	0.095	978.0238.000	980.0238.000	982.0238.000
Purple/orange	2.54	0.100	978.0254.000	980.0254.000	982.0254.000
Purple/white	2.79	0.111	978.0279.000	980.0279.000	982.0279.000
Colour code	Bore mm	Bore "	Solvent resistant	Acid resistant	
Orange/black	0.13	0.005	984.0013.000		
Orange/red	0.19	0.007	984.0019.000		
Orange/blue	0.25	0.010	984.0025.000		
Orange/green	0.38	0.015	984.0038.000		
Orange/yellow	0.50	0.020	984.0050.000	986.0050.000	
Orange/white	0.63	0.025	984.0063.000	986.0063.000	
Black/black	0.76	0.030	984.0076.000	986.0076.000	
Orange/orange	0.88	0.035	984.0088.000	986.0088.000	
White/white	1.02	0.040	984.0102.000	986.0102.000	
Red/red	1.14	0.045	984.0114.000	986.0114.000	
Grey/grey	1.29	0.050	984.0129.000	986.0129.000	
Yellow/yellow	1.42	0.055	984.0142.000	986.0142.000	
Yellow/blue	1.52	0.060	984.0152.000	986.0152.000	
Blue/blue	1.65	0.065	984.0165.000	986.0165.000	
Green/green	1.85	0.070	984.0185.000	986.0185.000	
Purple/purple	2.05	0.080	984.0205.000	986.0205.000	
Purple/black	2.38	0.095	984.0238.000	986.0238.000	
Purple/orange	2.54	0.100	984.0254.000	986.0254.000	
Purple/white	2.79	0.110	984.0279.000	984.0279.000	

## 28 Care and maintenance

When the pumphead needs cleaning, switch the drive off and isolate it from the mains. Withdraw the cassettes from the pumphead and remove the tubing. Wash the cassettes in water and mild detergent. If fluid has been spilled into the pumphead, removal of the pumphead from the drive will make cleaning easier. Periodically, inspect all moving parts for wear and ensure all bearings and rollers are free to rotate.



- |    |              |   |
|----|--------------|---|
| 1  | BB 0003      | Bearing, roller                               |
| 2  | BB 0014      | Bearing, centre shaft                         |
| 3  | DE 0264B     | Gear, centre, 45 teeth, brass                 |
| 4  | DE 0265S     | End plate                                     |
| 5  | DE 0293S     | Gearbox cover                                 |
| 6  | DE 0301M     | Gear, 35 teeth, plastic, 6 required           |
| 7  | DE 0466T     | Roller, 4 channel                             |
| 8  | DE 0467T     | Roller, 16 channel                            |
| 9  | DE 0494A     | Foot  |
| 10 | DE 0552T     | Roller, 12 channel                            |
| 11 | DE 0553T     | Roller, 8 channel                             |
| 12 | DEA0014A     | Cassette assembly                             |
| 13 | 053.5001.000 | Pumphead adaptor for 300 or 500 series drives |