

503U /RL

Auto-control pump
Installation and operating instructions

Publication PB 0123

- 1 The 503U/RL operates on single-phase mains electricity supplies only. It has a voltage selector switch which must be set for the local mains supply voltage (120V for 100-120V 50/60Hz supplies, or 240V for 220-240V 50/60Hz supplies).
- 2 Set front panel **auto/manual** switch for auto or manual control. If pump is to be controlled from a process signal, make proper connections to rear panel 25D plug and set range and offset potentiometers (refer section 6).
- 3 Load tubing into pumphead and lock pumphead closed.
- 4 Select the direction of rotation and start pump by turning the mains switch on (I). Clockwise rotation gives longer tube life. Anticlockwise rotation allows pump to operate against higher discharge pressures.
- 5 If pump is to be manually controlled, set running speed using the front panel potentiometer. The liquid crystal display will show the actual pump speed.
- 6 The ten turn potentiometer features a locking knob. Pull the knob out to unlock and press in to relock.
- 7 Press **max** switch down (non-latching) to prime pump at maximum speed.
- 8 Turn the mains switch to off (0) to stop pump.

Watson-Marlow Limited warrants, subject to the conditions below, through either Watson-Marlow Limited or its authorised distributors, to repair or replace free of charge, including labour, any part of this product which fails within two years of delivery of the product 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 such as fuses are excluded.
- 2 Products must be returned by prearrangement carriage paid to Watson-Marlow Limited or its authorised distributor.
- 3 All repairs or modifications must have been made by Watson-Marlow Limited or its authorised distributors or with the express permission of Watson-Marlow Limited or its authorised distributors.
- 4 Products which have been abused, misused, or subjected to malicious or accidental damage or electrical surge are excluded.

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

Thank you for choosing the Watson-Marlow 503U/RL auto-control pump. The 503U drive includes an impressive speed control ratio (better than 100:1) and a high-torque motor/gearbox. It accepts six different pumpheads for flow rates up to 2.2 litre/minute.

A sophisticated signal conditioner is built-in to the 503U/RL, which allows the pump to be automatically controlled from any analogue process signal up to 60V or 32mA and a switch on the front panel allows instant change between auto and manual control. Signal overload is indicated by a red LED indicator, at which point the motor will be held at maximum speed.

The 503U/RL can be stopped, started, reversed and speed controlled from remote switches and a potentiometer and all remote functions are 0/5V TTL compatible.

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Supplies

The 503U/RL operates on single phase mains electricity supplies only. It is fitted with a mains voltage selector which must be set to either 120V for 100-120V 50/60Hz supplies or 240V for 220-240V 50/60Hz supplies.

A mains cable fitted with a moulded plug is supplied with the pump, but if another plug is to be fitted, the colour coding of the mains lead must be observed. The mains cable for 220-240V supplies is coded so that the live lead is coloured brown, the neutral lead is coloured blue, and the earth lead is coloured green and yellow. The mains cable for 100-120V supplies is coded so that the live lead is coloured white, the neutral lead is coloured black, and the earth lead is coloured green.

If the pump is to be used under manual control, ensure that the switch on the front panel is set to its **manual** position. If the pump is to be used under automatic control, ensure switch on front panel is set to its **auto** position and that the range potentiometer and offset potentiometer (accessible through the rear panel) are properly set (see section 6).

The 503U/RL can be operated at ambient temperatures from 0C to 37C. Storage temperatures from -40C to 70C are permissible, but allow time for acclimatisation before use.

Please check

Should the pump fail to operate, check that mains electricity is available at the unit, that the voltage selector switch is in the correct position, that the fuse is intact and that the pump is not stalled by incorrect fitting of tubing. If the pump is to be used under manual control and fails to operate, check that the switch on the front panel is in its manual position. If the pump is to be used under automatic control and fails to operate, check that the switch on the front panel is set to its auto position, that the signal range and signal offset potentiometers are properly set, that connections (and link, if a current signal is being used) to the 25D socket are properly made, that the process signal is available at the unit, and that the process signal is not out of range causing the signal overload indicator to illuminate.

WARNING

There are dangerous voltages (at mains potential) inside the unit. If access is required, isolate the pump from the mains before removing the cover.

This product is not designed for use in, and should not be used for, patient connected applications.

The 503U can be fitted with any of six different pumpheads. For more information about the 501RL see Part 2 of this manual. For details of other pumpheads, please refer to the relevant operating instructions.

The flow rates given below were obtained using silicone tubing (except for the 502AA where vinyl tubing was used), 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. Maximum numbers of pumpheads/channels permissible are also given.

Standard operating conditions

501RL flow rates (ml/min)							
	Tubing internal diameter						
	0.5mm	0.8mm	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm
rpm	1/50"	1/32"	1/16"	1/8"	3/16"	1/4"	5/16"
55	2.3	6.7	24	101	220	347	550
220	9.2	27	94	410	892	1400	2200

501RL

303 flow rates (ml/min)							
	Tubing internal diameter						
	0.5mm	0.8mm	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm
rpm	1/50"	1/32"	1/16"	1/8"	3/16"	1/4"	5/16"
55	1.7	3.9	15	55	121	198	275
220	6.6	15.4	60	220	484	792	1100

303

Maximum number of 303 pumpheads							
	Silicone tubing internal diameter						
	0.5mm	0.8mm	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm
rpm	1/50"	1/32"	1/16"	1/8"	3/16"	1/4"	5/16"
55	6	6	6	6	6	6	5
220	6	6	6	6	6	6	5
	Marprene, Tygon, Neoprene, and Viton tubing internal diameter						
	0.5mm	0.8mm	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm
rpm	1/50"	1/32"	1/16"	1/8"	3/16"	1/4"	5/16"
55	6	6	6	6	4	3	3
220	6	6	6	6	4	3	3

502AA

502AA flow rates (ml/min)								
Tubing internal diameter								
	0.13mm	0.19mm	0.25mm	0.38mm	0.50mm	0.63mm	0.76mm	
rpm	0.005"	0.007"	0.01"	0.015"	0.02"	0.025"	0.03"	Channels
55	0.026	0.07	0.16	0.27	0.43	0.63	0.85	48
170*	0.082	0.21	0.48	0.82	1.33	1.94	2.62	48
Tubing internal diameter								
	0.88mm	1.02mm	1.14mm	1.29mm	1.42mm	1.47mm	1.52mm	
rpm	0.035"	0.04"	0.045"	0.05"	0.055"	0.058"	0.06"	Channels
55	1.20	1.58	2.04	2.48	3.18	3.48	3.76	48
170*	3.71	4.90	6.29	7.65	9.83	10.7	11.6	48
Tubing internal diameter								
	1.65mm	1.85mm	2.05mm	2.38mm	2.54mm	2.79mm		
rpm	0.065"	0.07"	0.08"	0.09"	0.1"	0.11"		Channels
55	4.14	5.37	6.46	7.83	10.0	11.2		48
170*	12.8	16.6	20.0	24.2	31.0	34.7		48

*502AA pumpheads must not be run at speeds greater than 170rpm, three quarters of the maximum speed of the 220rpm 503U drive.

505L

505L double tubing element flow rates (ml/min)							
Tubing internal diameter							
	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm	9.6mm	
rpm	1/16"	1/8"	3/16"	1/4"	5/16"	3/8"	
55	40	125	230	385	495	605	
220	155	500	925	1540	1980	2420	

304MC, 304MCX and 504MC2 flow rates (ml/min)								
Tubing internal diameter								
	0.13mm	0.19mm	0.25mm	0.38mm	0.50mm	0.63mm	0.76mm	
rpm	0.005"	0.007"	0.01"	0.015"	0.02"	0.025"	0.03"	Channels
55	0.04	0.15	0.26	0.46	0.83	1.50	2.30	15
110*	0.09	0.30	0.52	0.92	1.70	3.10	4.60	15
Tubing internal diameter								
	0.88mm	1.02mm	1.14mm	1.29mm	1.42mm	1.47mm	1.52mm	
rpm	0.035"	0.04"	0.045"	0.05"	0.055"	0.058"	0.06"	Channels
55	3.20	4.10	5.00	6.60	8.30	8.80	9.40	15
110*	6.40	8.10	9.90	13.0	17.0	18.0	19.0	15
Tubing internal diameter								
	1.65mm	1.85mm	2.05mm	2.38mm	2.54mm	2.79mm		
rpm	0.065"	0.07"	0.08"	0.09"	0.1"	0.11"		Channels
55	11.0	14.0	17.0	20.0	24.0	26.0		15
110*	22.0	28.0	33.0	40.0	47.0	53.0		15

308MC, 308MCX and 508MC2 flow rates (ml/min)								
Tubing internal diameter								
	0.13mm	0.19mm	0.25mm	0.38mm	0.50mm	0.63mm	0.76mm	
rpm	0.005"	0.007"	0.01"	0.015"	0.02"	0.025"	0.03"	Channels
55	0.04	0.14	0.23	0.41	0.70	1.30	1.90	15
110*	0.09	0.28	0.47	0.83	1.40	2.60	3.90	15
Tubing internal diameter								
	0.88mm	1.02mm	1.14mm	1.29mm	1.42mm	1.47mm	1.52mm	
rpm	0.035"	0.04"	0.045"	0.05"	0.055"	0.058"	0.06"	Channels
55	2.60	3.30	4.40	5.20	6.10	6.60	7.20	15
110*	5.30	6.60	8.80	10.0	12.0	13.0	14.0	15
Tubing internal diameter								
	1.65mm	1.85mm	2.05mm	2.38mm	2.54mm	2.79mm		
rpm	0.065"	0.07"	0.08"	0.09"	0.1"	0.11"		Channels
55	8.30	9.90	12.0	14.0	17.0	18.0		15
110*	17.0	20.0	24.0	29.0	33.0	36.0		15

* 304MC, 504MC, 308MC, and 508MC pumpheads must not be run at speeds greater than 110rpm, half the maximum speed of the 220rpm 503U drive.

Flow precision depends upon the accuracy and consistency of the tubing. All Watson-Marlow tubing is formulated, manufactured and quality controlled to our own specification

501RL and 303 pumpheads

Tubing for 501RL and 303 pumpheads						
Bore		Wall		Marprene	Silicone	Neoprene
mm	"	mm	"			
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
Bore		Wall		Butyl *	Tygon	Viton
mm	"	mm	"			
1.6	1/16	1.6	1/16	930.0016.016	950.0016.016	970.0016.016
3.2	1/8	1.6	1/16	930.0032.016	950.0032.016	970.0032.016
4.8	3/16	1.6	1/16	930.0048.016	950.0048.016	970.0048.016
6.4	1/4	1.6	1/16	930.0064.016	950.0064.016	970.0064.016
8.0	5/16	1.6	1/16	930.0080.016		970.0080.016

*• Butyl tubing not suitable for 303 pumpheads

505L low-pulse pumphead

505L Silicone double tubing elements						
Bore		Wall		Product code		
mm	"	mm	"			
1.6	1/16	2.4	3/32	910.E016.024		
3.2	1/8	2.4	3/32	910.E032.024		
4.8	3/16	2.4	3/32	910.E048.024		
6.4	1/4	2.4	3/32	910.E064.024		
8.0	5/16	2.4	3/32	910.E080.024		
9.6	3/8	2.4	3/32	910.E096.024		

Tubing for other pumpheads is listed in the relevant operating instructions.

Set the **auto/manual** switch on the front panel to its manual position and use the direction switch to select the direction of rotation. Start the pump by turning the mains switch on front panel to on (I).

Control ratio

The speed control ratio of the 503U/RL is better than 100:1 giving a minimum speed of around 2rpm on the 220rpm drive and 0.5 rpm on the 55 rpm drive. It features a front panel, ten turn potentiometer, fitted with a locking knob. Pull the outer knob towards you to unlock, set the speed (as shown in "revolutions per minute" on the LCD display), and push in the outer knob to re-lock. For rapid priming depress the **MAX** switch (non latching) to give maximum speed; on release the drive will return to its original speed setting. Use the direction switch to change the direction of rotation may at any time.

If the pump has been running under automatic control, and is now to run under manual control, it is only necessary for the **auto/manual** switch on the front panel to be moved to its **manual** position. It is not necessary for the process signal to be disconnected from the pump or for the calibration potentiometers to be adjusted.

Auto/manual selection

The 503U/RL can be controlled by any analogue process signal up to 60V or 32mA, and will provide a rising or falling flow rate against a rising signal. When the pump is set to provide a rising flow rate against a rising signal, this is defined as a **non-inverted** response. When the pump is set to provide a falling flow rate against a rising signal, this is defined as an **inverted** response.

Definitions

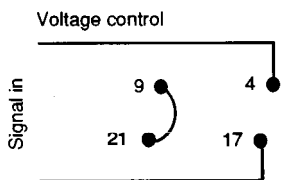
Signal range is the difference in the signal between that which is to produce maximum speed (flow rate) and that which is to produce minimum speed (flow rate). A 0V to 12V signal has a signal range of 12V. A 4mA to 20mA signal has a signal range of 16mA. **Signal offset** is the signal level at which the pumphead is just about to start rotating. With a 4mA to 20mA signal (to provide a non-inverted response), the signal offset is 4mA. Note that if the same signal is to provide an inverted response, then the signal offset is 20mA, because that is the level at which the pump is just about to start. (It will be rotating fastest when the signal is 4mA).

Offset and Range

Never apply mains voltage across any pins on the 25D socket as permanent damage, not covered by warranty, will result. Up to 60V may be applied across pins 4 and 17, but not across other pins because permanent damage, not covered by warranty, may result.

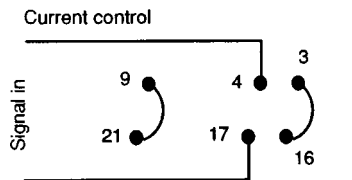
Warning

For the pump to be controlled by a process signal, the auto/manual switch on the front panel must be switched to its **auto** position (or the remote auto/manual switch must be in its auto position, if used, refer section 6). The process signal must be connected to the 25D plug provided, which should then be inserted in the rear panel 25D socket. If the front panel auto/manual switch is to be used, link pins 9 and 21 in the 25D plug. If the signal rises above its calibrated maximum, the action of the signal conditioner will be to maintain the motor running at maximum speed.



Input resistance 220 kohm		
Response	Range	Offset
Non-inverted	5 to 30	0 to 30
Inverted	5 to 30	0 to 30

Sense	Pin 4	Pin 17
Non-inverted	+	-
Inverted	-	+



Input resistance 470ohm		
Response	Range	Offset
Non-inverted	5 to 30	0 to 30
Inverted	5 to 30	0 to 30

Sense	Pin 4	Pin 17
Inverted	-	+
Link pins 3 and 16		

Although the input impedance for current signals is 470ohm, it is possible to modify a 503U drive to accept signals from systems which require other input impedances. Please contact Watson-Marlow for more detailed information if this is necessary.

6 Calibration for auto-control

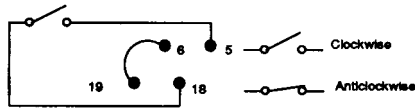
The process signal (or suitable signal from another source) can be used in the calibration procedure providing that it meets the requirements given here: For voltage modes, a stable, variable dc voltage source (for example, a laboratory power supply having a source resistance of 5kohm or less) can be used in conjunction with a dc voltmeter. The maximum voltage into the pump must not exceed 60V. For current modes, the same dc voltage source may be used, (provided that it will supply the current required) in conjunction with a dc milliAmpere meter. The maximum permissible current is 32mA.

When using a current signal, ensure that the link is connected between pins 3 and 16. For voltage signals there is no link. When the signal has been connected to the pump through the 25D plug and socket, the signal conditioner must be calibrated using the two potentiometers for signal range and signal offset in the rear panel recess. As part of this calibration procedure, it will be necessary for the user to determine when the pumphead rotor is just about to start rotating, and when the pumphead rotor is running at maximum speed.

To calibrate the signal conditioner, first set the signal source to the signal offset or, if there is no offset, to zero volts or zero milliAmperes. Adjust the signal offset potentiometer to the point where the pumphead is just about to start turning. When this has been done, the signal source should be set to its maximum speed signal, and the signal range potentiometer adjusted to give the maximum required speed as shown on the lcd display.

These two calibration steps should be repeated until interaction between adjustments is eliminated. The drive is now set to operate under process control. Attach a label to the rear panel showing the signal and response for which the drive is set. The front panel potentiometer is not in circuit when the drive is operating under process control and may safely be left at any setting.

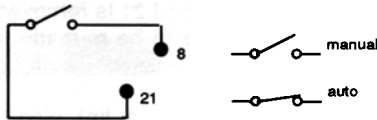
The 503U/RL may be controlled from a remote location by wiring to the 25D connector at the rear of the drive (this is not a Data port)



Remote direction control

Note: To enable direction control from a remote switch, disable the front panel switch by adding a link between pins 6 and 19. This link must be removed before the front panel switch may be used.

Remote switch

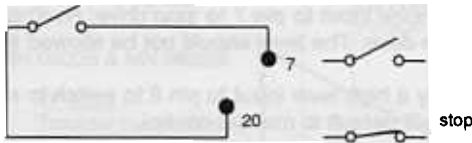


Enable front panel switch



Remote auto/manual selection

Note: To enable auto/manual selection from the front panel switch, link pins 9 and 21. If auto/manual selection from a remote switch (wired to pins 8 and 21) is preferred, do NOT link pins 9 and 21.



Remote stop/start



Ensure the link between pins 9 and 21 is fitted if front panel auto/manual switch is to be used.

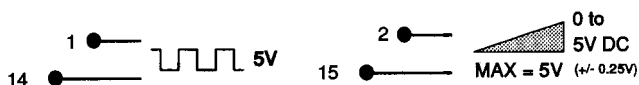
Remote potentiometer

A remote potentiometer may be wired as shown, replacing the current/voltage input signal. If using a remote potentiometer, do NOT apply a voltage/current control input signal as well. The drive will require calibration; refer to Section 7.

A remote potentiometer must be correctly connected. Incorrect connection may result in permanent damage, not covered by warranty.

Warning

Two alternative tachometer outputs are provided. Select the desired output by selecting the appropriate pins on the 25D connector.



4840Hz = maximum drive speed

Direction, stop, and manual/auto remote switches may be replaced by TTL compatible (0V = low , 5V = high) logic inputs.

When using logic inputs to control the auto/manual selection, it is essential to ensure the link between Pins 9 and 21 is removed to disable the front panel switches. This link will have to be re-made to re-enable front panel control.

When using logic inputs to control the direction, link pins 6 and 19 to disable the front panel direction switch. This link will have to be removed before the front panel control is enabled.

Direction: apply a low level input to pin 5 to change direction to counter clockwise. With no input the drive will default to clockwise.

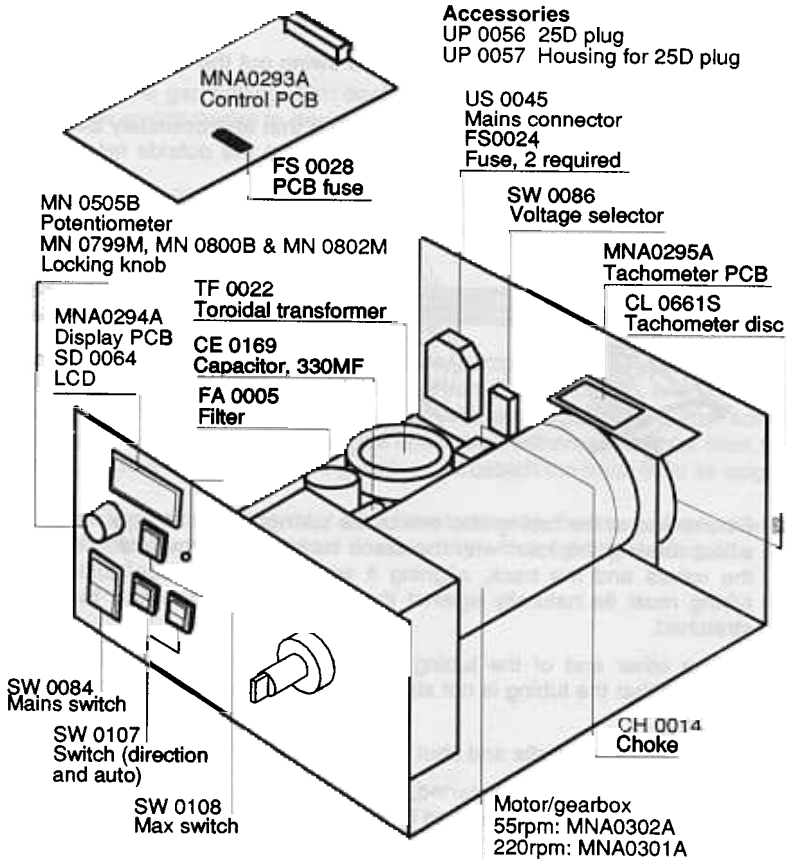
Stop: apply a low level input to pin 7 to stop drive. **Run:** apply a high level input to pin 7 to run drive. The level should not be allowed to float.

Manual/auto: apply a high level input to pin 8 to switch to auto control. With no input the drive will default to manual control.

Nominal maximum rotor speeds	55rpm 220rpm
Control range	Better than 100:1
Voltage/frequency	100-120/220-240V 50/60Hz
Power consumption	100VA
Operating temperature range	0C to 37C (32F to 99F)
Storage temperature range	-40C to 70C (-40F to 150F)
Weight	6.2kg (14lbs)
Standards	CEE10, IEC 335-1, IEC 34-5 (IP31), ESCHLE

Scheduled maintenance of the 503U/RL is not required. When the pump needs cleaning, remove the pumphead and use a mild solution of detergent in water. Do not use strong solvents. If the gearbox is dismantled, it should be refilled with a good quality grease such as Andersol 761.

In the current situation of heightened concern over the handling of hazardous materials, any equipment which has been contaminated with, or exposed to, body fluids, toxic chemicals or any other substance hazardous to health must be decontaminated before it is returned for service. A certificate (a suitable blank form is included at the rear of this operating instruction), or signed statement, that the equipment has been decontaminated must be attached to the shipping carton.



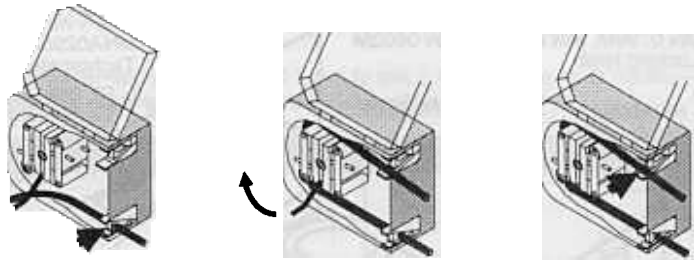
The 501RL is set during manufacture to accept tubing with wall thicknesses of between 1.6mm and 2.0mm, and internal diameters of up to 8.0mm. The 501RL pumphead is equipped with a "tool lockable" guard for increased safety. This should be locked shut whilst the pump is in use.

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 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. Remove the track locating screw, and lift clear the track. Rotate the track to the new position and replace the track locating screw.

Warning

Switch off the drive before loading the tube.

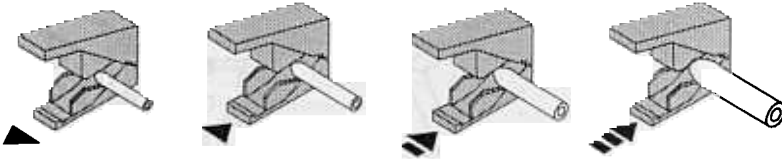
- 1 Unlock and open the hinged guard and swing out the rotor crank handle until it locks into position.
- 2 Select the length of tubing required, noting that approximately 240mm is required for the track system, (measured from the outside faces of the tube clamps).



- 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 and lock 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 501RL 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.

Tube clamps



17 Adjustment of the gap between the rollers and track

The 501RL has a factory set gap of 2.6mm between the rollers and the track and is suitable for tubing having wall thicknesses of between 1.6 and 2.0mm. 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.

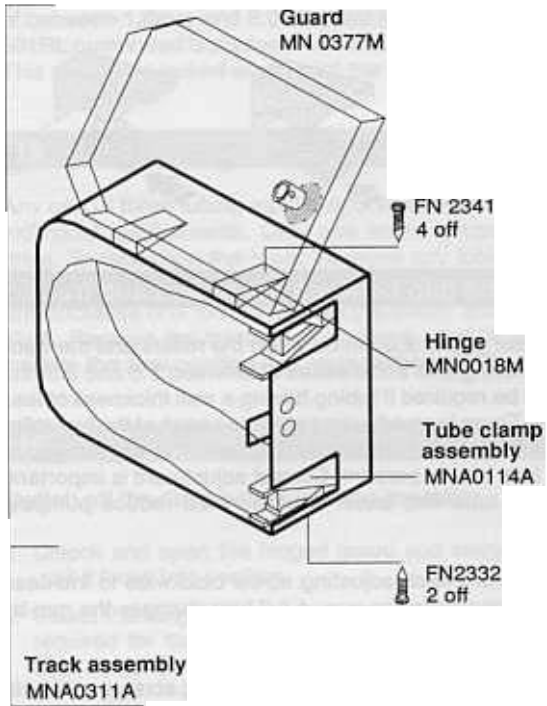
To restore the original settings of 2.6mm, turn the adjusting screws until both rollers are just touching the track, then tighten each screw by three and a quarter turns.

Restore original settings

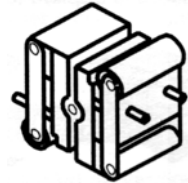
18 Care and maintenance

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.



Rotor assembly



MNA0143A

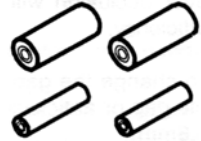
Springs



SG 0001, 4 off

Main rollers

MN 0011T, 2 off



Follower rollers
MN 0012T 2 off

Watson-Marlow Limited Health and Safety clearance

1.0 Pumps returned for service should be cleaned. If they have been contaminated with, or exposed to, body fluids, toxic chemicals or any other substance hazardous to health you are responsible for its decontamination.

2.0 This Form must be used when returning pumps and equipment for service at Watson-Marlow (or its distributor).

3.0 A completed copy of this form should be Faxed (Fax number 0326 76009) or sent by first class post to Watson-Marlow (or its distributor) to ensure that we have the information before receipt of the equipment.

A further copy should be attached to the outside of the shipping case.

Failure to complete the form or comply with the procedure will lead to delays in servicing the equipment.

4.0 Company _____

Address _____

Phone _____

Post code _____

Fax number _____

5.0 Please complete the following sections

5.1 Pump type _____

5.2 Serial number _____

5.3 Details of substances pumped

5.3.1 Chemical names:

(a) _____

(b) _____

(c) _____

(d) _____

5.3.2 Precautions to be taken in handling these substances:

(a) _____

(b) _____

(c) _____

(d) _____

5.3.3 Action to be taken in the event of human contact:

(a) _____

(b) _____

(c) _____

(d) _____

5.3.4 Cleaning fluid to be used if residue of chemicals is found during servicing:

(a) _____

(b) _____

(c) _____

(d) _____

5.4 Any further relevant information:

5.5 If substances are not hazardous or toxic, please complete section 5.5.1.

If substances are hazardous or toxic, please complete section 5.5.2.

5.5.1 I hereby confirm that the equipment specified has not pumped or come into contact with any toxic or hazardous substances.

Signed _____

Name _____

Position _____

Date _____

5.5.2 I hereby confirm that the only toxic or hazardous substances that the equipment specified has pumped or come into contact with are those named, and that the information given is correct, and the carrier has been informed of the hazardous nature of the consignment.

Signed _____

Name _____

Position _____

Date _____

5.6 Carrier to be used _____

Delivery date _____

Important

Before returning any product for service, this form must be completed and sent to Watson-Marlow or its official distributor undertaking the service