

# 505Dz



## Contents

Declarations	Page 2
Three year warranty	Page 3
Information for returning pumps	Page 3
Safety	Page 3
Recommended Procedures	Page 4
<b>Part 1: 505Dz Drive</b>	
Siting	Page 5
Electrical connection	Page 5
Accuracy and dose time guidelines	Page 5
Flow rates	Page 6
Tubing range	Page 7
Accessories	Page 7
<b>Part 2: Operation</b>	
Overview	Page 8
DOSE	Page 9
CALIBRATE	Page 12
SETUP	Page 12
Remote	Page 13
Error messages	Page 13
Care and maintenance	Page 13
<b>Part 3: 501RL Pumphead</b>	
Description	Page 14
Installation	Page 14
Tube loading	Page 15
Roller adjustment	Page 15
Care and maintenance	Page 16
Spares	Page 16
<b>Part 4: Appendices</b>	
Reduced voltage operation	Page 17
Specification	Page 17
Spares	Page 18
Outline drawing	Page 19
Decontamination certificate	Page 20

## Declarations

### Declaration of conformity



When the 505Dz/RL pump is used as a stand alone unit it complies with:

Machinery Directive 98/37/EC EN60204-1

Low voltage Directive 73/23/EEC EN61010-1

EMC Directive 89/336/EEC EN50081-1/EN50082-1

### Declaration of incorporation

When the 505Dz/RL pump, is to be installed into machines or is to be assembled with other machines for installations, it must not be put into service until the relevant machinery into which it is to be incorporated has been declared in conformity with the provisions of the Machinery Directive 98/37/EC EN60204-1.

Responsible person: Dr R Woods, Managing Director, Watson-Marlow Limited, Falmouth, Cornwall, TR11 4RU, England.

Telephone 01326 370370 Fax 01326 376009

## **Three year warranty**

Watson-Marlow Limited warrants, subject to the conditions below, through either Watson-Marlow Limited, its subsidiaries, or its authorised distributors, to repair or replace free of charge, including labour, any part of this product which fails within three 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:

- Consumable items such as rollers and tubing are excluded.
- Products must be returned by pre-arrangement carriage paid to Watson-Marlow Limited, its subsidiaries, or its authorised distributor.
- All repairs or modifications must have been made by Watson-Marlow Limited, its subsidiaries, or its authorised distributors or with the express permission of Watson-Marlow Limited, its subsidiaries, or its authorised distributors.
- Products which have been abused, misused, or subjected to malicious or accidental damage are excluded.

Warranties purporting to be on behalf of Watson-Marlow Limited made by any person, including representatives of Watson-Marlow Limited, its subsidiaries, 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.

## **Information for returning pumps**

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 to Watson-Marlow or its distributor.

A certificate (a suitable blank form is included at the rear of these operating instructions), or signed statement, must be attached to the outside of the shipping carton.

This certificate is required even if the pump is unused. If the pump has been used, the fluids that have been in contact with the pump and the cleaning procedure must be specified along with a statement that the equipment has been decontaminated.

## **Safety**

In the interests of safety, these pumpheads and the tubing selected should only be used by competent, suitably trained personnel after they have read and understood this manual, and considered any hazard involved.

Any person who is involved in the installation or maintenance of this equipment should be fully competent to carry out the work. In the UK this person should also be familiar with the Health and Safety at Work Act.

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



## **Recommended Procedures**

**DO** keep delivery and suction lines as short as possible.

**DO** use the minimum number of bends in rigid pipe runs. If there must be a bend, use a swept bend and not a tight elbow.

**DO** use suction and delivery pipelines with a bore equal to or larger than the bore of the tube fitted in the pumphead. When pumping **viscous** fluids, the losses caused by increased friction can be overcome by using pipe runs with a cross sectional area several times greater than the pumping element.

**DO** run at a slow speed when pumping viscous fluids. When using the 501RL pumphead, a 4.8 or 6.4mm bore tube with a 1.6mm wall will give best results. Tube smaller than this will generate a high friction pressure loss, so reducing the flow. Tube with a larger bore will not have sufficient strength to resist. Flooded suction will enhance pumping performance in all cases, particularly for materials of a viscous nature. Silicone and Marprene tubing is available with a 2.4mm wall thickness for speeds up to 200rpm. (The rotor will require re-setting to a roller/track gap of 3.8mm.)

**DO** use the largest possible bore tube running at slow speed for the longest tube life.

**DO** fit an extra length of pump tube in the system so that you can move the tube through the pumphead occasionally, without needing to break the pumping circuit. This is particularly useful for extending tube life in long running sterile applications.

**DO** keep the track and rollers clean, and ensure that the rollers are free.

**DO NOT** fit valves in the suction or delivery lines without considering that peristaltic pumps are self priming and will hold their prime up to several metres, so there may be no need for non-return or foot valves, nor for the loading valves required on many other kinds of pumps.

Any valves fitted must cause no restriction. If electrically actuated valves are fitted, they should be interlocked so that the pump will only run when the valves are open. Fit an automatic by-pass if manual valves are installed.

**When using Marprene or Bioprene tubing**, after the first 30 minutes of running, re-tension the tube in the pumphead by releasing the tube clamp on the delivery side a little and pulling the tube tight. This is to counteract the normal stretching that occurs with Marprene and Bioprene, which can go unnoticed and result in reduced tube life.

**Tube selection** The chemical compatibility list published in the Watson-Marlow catalogue is only a guide. If in doubt about the compatibility of a tube material and the duty fluid, request a tube sample card for immersion trials. Remember the sample will be fully immersed, but the fluid when in use will only be in contact with the inside of the tube. If the material swells but does not lose its strength it could be worth considering.

**Viscous dispensing** To overcome the common problems of reduced accuracy and dripping delivery pipes, the suction and delivery lines should be kept as short as possible. Use larger bore transmission tubing than that in the pumphead to keep the friction losses to a minimum. Improvement will be noticed if rigid or semi-rigid pipe is used on the delivery side. The rigid tube is effective in reducing over-run because it does not expand during pumping.

## Part 1: 505Dz Drive

### Siting

To ensure correct lubrication of the gear box it is important to run the pump only while its feet are standing on a horizontal surface.

It should be situated where there is free air to circulate around the pump and where the tubing is allowed to enter the tube clamps without kinking.

The 505Dz can be operated at ambient temperatures from 5C to 40C. Storage temperatures from -40C to 70C are permissible, but allow time for acclimatisation before use.

### Electrical connection

The 505Dz 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. For sites where the local voltage is below this specification and the pumphead loading is high, refer to Part 4: Reduced voltage operation.

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 black, the neutral lead is coloured white, and the earth lead is coloured green.

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 manual mode has been selected. If the pump is under auto control check that there is a signal, the connections are correct and that the pump is correctly set up.

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

### Installation

### Failure to operate



### Accuracy and dose time guidelines

The following gives guidelines to achieve the optimum accuracy with the dose time.

<b>Accuracy required +/-0.5%</b>					
Dose ml	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>250</b>
Tubing i.d. mm	1.6	3.2	3.2	4.8	6.4
Approx dose time. sec	4.8	2.7	5.4	4.9	8.1
<b>Accuracy required +/-1%</b>					
Dose ml	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>250</b>
Tubing i.d. mm	3.2	3.2	4.8	6.4	8.0
Approx dose time. sec	1.1	2.7	2.5	3.2	5.0
<b>Accuracy required +/-2%</b>					
Dose ml	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>250</b>
Tubing i.d. mm	3.2	4.8	6.4	8.0	8.0
Approx dose time. sec	1.1	1.3	1.5	2.0	5.0

For higher accuracy, use smaller bore tubing. However this will also increase filling time.

For faster filling time increase tubing bore size. However this will decrease accuracy.

All tubing will show a gradual drift in the dosed volume, which can be corrected by recalibration. For minimal drift use Silicone tubing (if chemically compatible).

The results seen on page 6 were obtained using Silicone tubing pumping water at zero suction and delivery pressure, with a 501RL pumphead at 300rpm over at least 50 doses. It is intended as a guide only.

It is advised to carry out trials under operating conditions to determine a satisfactory compromise between dose time and accuracy. The important factors are suction and delivery pressures, temperature, and fluid viscosity.

## **Flow rates**

The 505Dz is fitted with the 501RL pumphead. 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 affecting flow rates are delivery pressures, temperature, and fluid viscosity. Tube life will be reduced when pumping against pressure.

<b>501RL flow rates (ml/min)</b>							
Tube #	112	13	14	16	25	17	18
Tube bore	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"
300 rpm	<b>12.5</b>	<b>37</b>	<b>128</b>	<b>560</b>	<b>1210</b>	<b>1900</b>	<b>3000</b>
<b>Note:</b> 501RL pumpheads must not be run at speeds greater than 300rpm							

## **Tubing range**

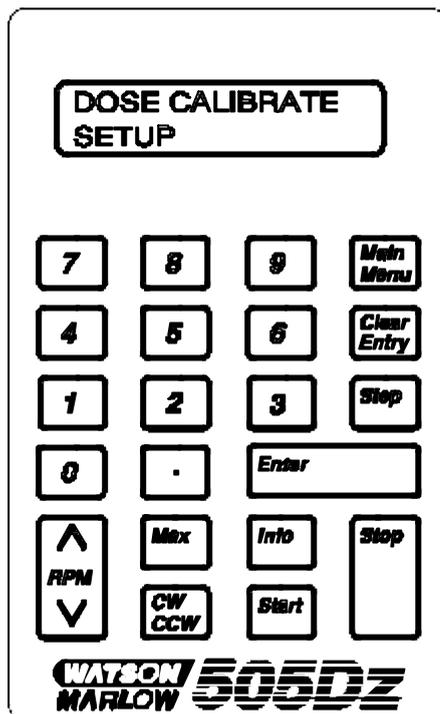
Flow precision depends upon the accuracy and consistency of the tubing. All Watson-Marlow tubing is formulated, manufactured and quality controlled to rigorous specifications. Peristaltic pumping performance and tube life will be affected unless tubing specifically designed for the task is used.

<b>Tubing for 501RL</b>						
Bore mm	"	Tube #	Marprene	Bioprene	Silicone	Neoprene
0.5	1/50	112	<b>902.0005.016</b>	<b>903.0005.016</b>	<b>910.0005.016</b>	
0.8	1/32	13	<b>902.0008.016</b>	<b>903.0008.016</b>	<b>910.0008.016</b>	<b>920.0008.016</b>
1.6	1/16	14	<b>902.0016.016</b>	<b>903.0016.016</b>	<b>910.0016.016</b>	<b>920.0016.016</b>
3.2	1/8	16	<b>902.0032.016</b>	<b>903.0032.016</b>	<b>910.0032.016</b>	<b>920.0032.016</b>
4.8	3/16	25	<b>902.0048.016</b>	<b>903.0048.016</b>	<b>910.0048.016</b>	<b>920.0048.016</b>
6.4	1/4	17	<b>902.0064.016</b>	<b>903.0064.016</b>	<b>910.0064.016</b>	<b>920.0064.016</b>
8.0	5/16	18	<b>902.0080.016</b>	<b>903.0080.016</b>	<b>910.0080.016</b>	<b>920.0080.016</b>
Bore mm	"	Tube #	Butyl	Tygon	Fluorel	
1.6	1/16	14	<b>930.0016.016</b>	<b>950.0016.016</b>	<b>970.0016.016</b>	
3.2	1/8	16	<b>930.0032.016</b>	<b>950.0032.016</b>	<b>970.0032.016</b>	
4.8	3/16	25	<b>930.0048.016</b>	<b>950.0048.016</b>	<b>970.0048.016</b>	
6.4	1/4	17	<b>930.0064.016</b>	<b>950.0064.016</b>	<b>970.0064.016</b>	
8.0	5/16	18	<b>930.0080.016</b>	<b>950.0080.016</b>	<b>970.0080.016</b>	

## **Accessories**

<b>Description</b>	<b>Product code</b>
505AF Footswitch	059.3001.000
505AH Handswitch	059.3011.000
505AS Filling stand	059.5001.000
505AL Dispensing lance	059.5051.000
505AV Proximity switch	059.5071.000
505AFN Filling needle set	059.5101.000
505AN Network kit (includes cables and software)	059.3101.000
505AP Printer	059.3201.000

### Overview



When the pump is switched on, the Main menu will display the options. A flashing cursor can be moved between the Main menu options using the **Step** key. When the cursor is at the required option, press **Enter**.

**DOSE** allows you to set your new required dose in ml. You can also enter the interval time between doses or select the start of a dose by using an external switch.

**CALIBRATE** option is selected to allow the actual tubing to be entered into the microprocessor or if high accuracy is required a calibration dose should be run following the direction given on the display.

**SETUP** controls the user and factory settings required for the correct operation of the system. They include the audible indicator, rotor acceleration, reverse control at the end of a dose run, language and default settings.

---

**Start up**

Turn the power switch (on the rear panel of the drive) **On (I)**.

---

**Main menu**

A cursor will indicate the selection. Press **Step** to move to the required mode then press **Enter**.

---

**Stop**

Press **Stop** key at any time while the pump is running and the pump will stop.

## DOSE

Pressing **Enter** at DOSE while in the Main menu will return the message:

---

**Entering new program**

```
5 . 0 0 M L
      E N T E R   D O S E
```

Enter the required dose using the key pad numbers.

Any dose from 0.001ML to 9999ML can be set. Up to three decimal places are allowed, limited to a maximum of 4 characters.

On **Enter**, display changes to:

```
_   2 . 5   S E C O N D S
      E N T E R   I N T E R V A L
```

Enter the required interval using the key pad numbers.

**Enter** enters time up to 3445 seconds, with up to one decimal place. The minimum time is to be 0.1 seconds.

Set to 0 SECONDS to start a single dose with **Start** or an external switch.

---

**Single dose command**

The number of doses will be requested only if a time interval has been entered:

```
_   2 5 0 0 S E S
      E N T E R   D O S E S
```

Enter the required number of doses using the key pad numbers

**Enter** enters number up to 9999.

On **Enter** the display changes to:

```
2 1 5 R P M
C C W   P R E S S   E N T E R
```

To change the speed enter the required rpm using the numbers on the keypad or press **Λ** or **V**

**Λ / Max** sets maximum RPM.

**V / Max** sets minimum RPM.

CW/CCW can be changed by pressing **CW/CCW**.

Changing the RPM must be confirmed by pressing **Enter**, after which the RPM will be displayed.

Pressing **Enter** calls up confirmation of your selection then requests press **Start**.

```
3 5 M L           1 6 0 0 0 S E
C C W           2 1 5 R P M
```

```
2 . 5   S E C S   I N T E R V A L
      P R E S S   S T A R T
```

---

**Start the dose**

---

**Warning notices**

If the dose set would require less than 100 tachometer pulses, these screens will be displayed:

```
M I N   D O S E       6 . 2 5 M L
P R E S S   M A I N   M E N U
```

If the dose takes less than 5 rotor revolutions, this warning will come up after the volume is entered and will read:

```
U S E   S M A L L E R   T U B E
F O R   B E S T   R E S U L T S
```

If a legal dose has been set and calibrated, **Start**/footswitch starts the sequence. While dosing, the display reads:

```
D O S I N G           3 5 . 0 0 M L
0 1 2 1   D O S E S   T O   G O
```

When a dose has been completed and if an interval time has been set, this screen displays:

```
0 1 2 1 D O S E S       D O N E
0 0 1 6 5 E C   W A I T . . .
```

The interval set counts down to 0 after which the next dose runs.

---

**End of dose run**

When the dosing run is finished, the display changes to:

```
0 1 2 1 D O S E S   D O N E
P R E S S   S T A R T / S T O P
```

When a single dose has been completed, i.e. starting from a dose with **Start** or an external switch, the screen displays:

```
0 1 2 1 D O S E S   D O N E
P R E S S   S T A R T / S T O P
```

Pressing **Start** starts another dosing run or a single shot.

Pressing **Stop** calls the Main menu.

---

**On the fly recalibration**

Pressing **Start** at any time while the pump is dosing (whether pumping or paused), provides an "on-the-fly" recalibration facility by calling:

```
M L   A C H I E V E D
P R E S S   E N T E R
```

Entering exact dose delivered in ml and pressing **Enter** allows drive to be recalibrated for new ml per tacho pulse. Knowing the dose required, a new number of tacho pulses can be calculated to adjust the dose for improved accuracy. This new calibration will take effect on the start of the next dose after **Enter** is pressed.

If a dose below the safe minimum or a dose more than 25 percent higher or lower than the set dose is keyed in, it will be assumed an error has been made and this screen will appear for three seconds:

```
T O O   H I G H   O R   T O O
L O W   -   T R Y   A G A I N
```

Pressing **Stop** to interrupt a dose offers:

```
R E S T A R T   D O S I N G
R E C A L I B R A T E   E X I T
```

---

### **Interrupting a dose**

The MAX key is enabled while this screen is active, and the screen provides a re-prime method.

Pressing **Enter** at RESTART DOSING shows the screen to confirm the program and then requests you press **Start**. The next dose will then resume as if there had been no interruption

If you **Step** to RECALIBRATE then **Enter** you will be asked to enter the value of the previous dose.

Entering exact dose delivered in ML and pressing **ENTER** allows drive to be recalibrated for new ml per tacho pulse. Knowing the dose required, a new number of tacho pulses can be calculated to adjust dose for improved accuracy.

If a dose is below the safe minimum a warning will be given OUT OF RANGE! USE SMALLER TUBE or a dose more than 25 percent higher or lower than the set dose is keyed in, it will be assumed an error has been made and indicate a warning:

```
T O O   H I G H   O R   T O O
L O W   -   I G N O R I N G !
```

Stop is also invoked if a remote footswitch or handswitch is pressed during the dose run (not during the interval between one dose and the next) not less than 1 second after the switch is pressed to demand the dose.

Pressing **Start** restarts the dosing run by confirming the program then requesting you press **Start**.

## CALIBRATE

In the main menu, **Step** to CALIBRATE, then press **Enter**.

Depending upon whether the last calibration was a calibration dose setting in ml/min or by specifying the pumphead and tubing fitted one of the following screens will be shown:

```
S O I R L   8 . 0 M M
R E C A L I B R A T E
```

or

```
S O I R L   9 . 8 M L / R V
R E C A L I B R A T E
```

In both cases press **Enter**, and the screen will request

```
C A L I B R A T I O N   D O S E
T U B E   S I Z E
```

**Step** to the option required then press **Enter**.

### Calibration dose

When running a calibration dose it should be run in the duty configuration and with the duty fluid. The program will run the pump for up to four minutes or you can **Stop** it sooner, however the longer you allow it to run the better. The minimum run time should be 15 seconds or 10 revolutions of the rotor. You can enter the value of the calibration run in ml. On completion of the procedure the screen will confirm the calibration figures and will also confirm the selection as well as displaying the maximum allowable rpm.

```
S O I R L   9 . 9 9 9 M L / R V
M A X I M U M   3 0 0 R P M
```

Calibration is now complete, and the display will return to the main menu.

## SETUP

At the Main menu, **Step** to SETUP, press **Enter** and a choice will be offered. **Step** to the required menu item and press **Enter**.

### Beep

You are able to turn the audible signal off using this menu item. The default condition is on.

### Ramp

Adjusting the ramp value will alter the acceleration/deceleration of the rotor. There is a separate selection for the start of a dose and at the end of a dose. A ramp setting of 2 is the factory default where there is no delay of acceleration, the maximum setting is 5. To select the ramp enter the value on the keypad and press **Enter**. The display will confirm your selection for three seconds.

A gradual start may be useful for applications dispensing sensitive fluids, or to avoid splashing. A gradual stop can often decrease the dripping after the pump has stopped.

### Drip

By adjusting the drip function you can control a reverse rotor direction at the end of a dose. A 0 value has no reverse, the maximum reverse is 5. To select the drip enter the value on the keypad. After the selection has been made and **Entered** the display will confirm your selection.

### Language

This provision is to select the language shown on the display.

### Default

By following the prompts, all settings can be restored to the factory defaults.

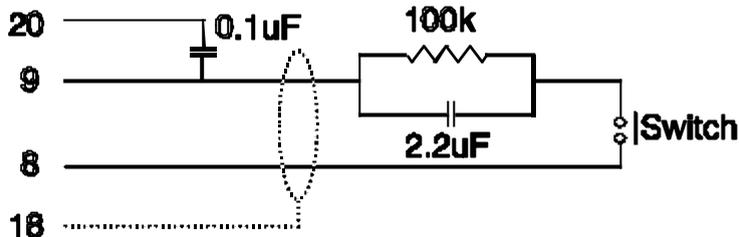
## Remote

Never apply mains voltage across any pins on the 25D socket as permanent damage, not covered by warranty, will result. No voltage should be applied across other pins because permanent damage, not covered by warranty, may result.



If a Watson-Marlow footswitch or handswitch is used connect a switch as shown in the diagram. It has the same function as the **Start** key on the keypad.

**Start dose**



## Error messages

```
PROGS AND SETUP  
LOST - PRESS ENTER
```

Indicates a RAM corruption or change of EPROM.

```
FAULT CONDITION!  
CHECK DRIVE NOW!
```

Indicates that either the motor has stalled or there is a loss of tacho pulses.

## Care and maintenance

The only scheduled maintenance required for the 505Dz/RL is inspection of the motor brushes and their replacement before their length is less than 6mm (1/4"). The life of the brushes will depend on the duty of the pump, but is expected to be at least 10,000 hours at maximum speed.

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 rebuilt you must use the 15ml of the recommended lubricant, which is Rocol MP, which is a SAE 30 mineral oil loaded with molybdenum disulphide to form a soft fluid grease.

## **Part 3: 501RL Pumphead**

### **Description**

The 501RL pumphead has two spring-loaded working rollers, which automatically compensate for minor variations in tubing wall thickness, giving extended tube life.

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.

A major feature of the 501RL pumphead is the ability to run the pumphead clockwise for extended tube life, or anti-clockwise to operate against higher pressures.

The tube clamps of the 501RL are adjustable to four positions to allow varying tube diameters to be securely held without occluding the tube.

### **Installation**

Any one of three tubing input/output positions can be selected on cased drives. Select the required position then fit the track over the drive shaft and locating boss. Tighten the track retaining screw.

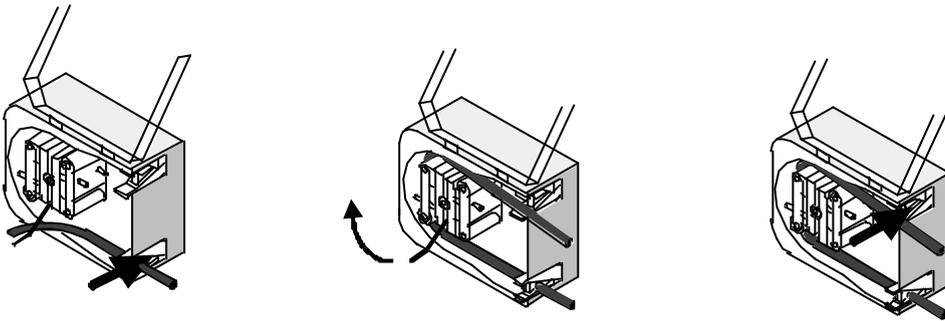
After checking that the shaft is clean and degreased slide the rotor on to it. *Rotate the rotor until its guide rollers are aligned flush to the front edge of the track.* The rotor is attached to the shaft by a split collet, and it is important that the rotor retaining screw is fully tightened to a torque of 3Nm using the largest screw driver that will fit the screw head. This will prevent the collet slipping when the pump is being used.

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. Loosen the track locating screw, and pull the track clear. Rotate the track to its new position and tighten the track locating screw.

## Tube loading

Switch off the drive before loading the tube. Unlock and open the hinged guard and swing out the rotor crank handle until it locks into position.

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).



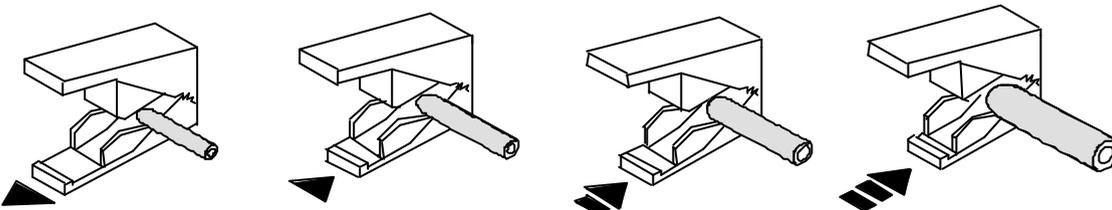
Fit one end of the tubing into one of the spring loaded clamps, and then, whilst rotating the rotor with the crank handle, feed the tubing between the rollers and the track, aligning it within the rotor tube guides. The tubing must lie naturally against the track and must not be twisted or stretched.

Fit the other end of the tubing into the second spring loaded clamp, ensuring that the tubing is not slack in the pumphead, since this can reduce tube life.

Close the crank handle and shut and lock the guard.

After the pump has been started, open the downstream clamp for a short time, so that the tube can find its natural length.

The 501RL pumphead is fitted with four-position tube clamps, to accommodate various tube diameters, 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 the clamps so that the minimum necessary pressure is applied to the tubing.



## Roller adjustment

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 required. 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.

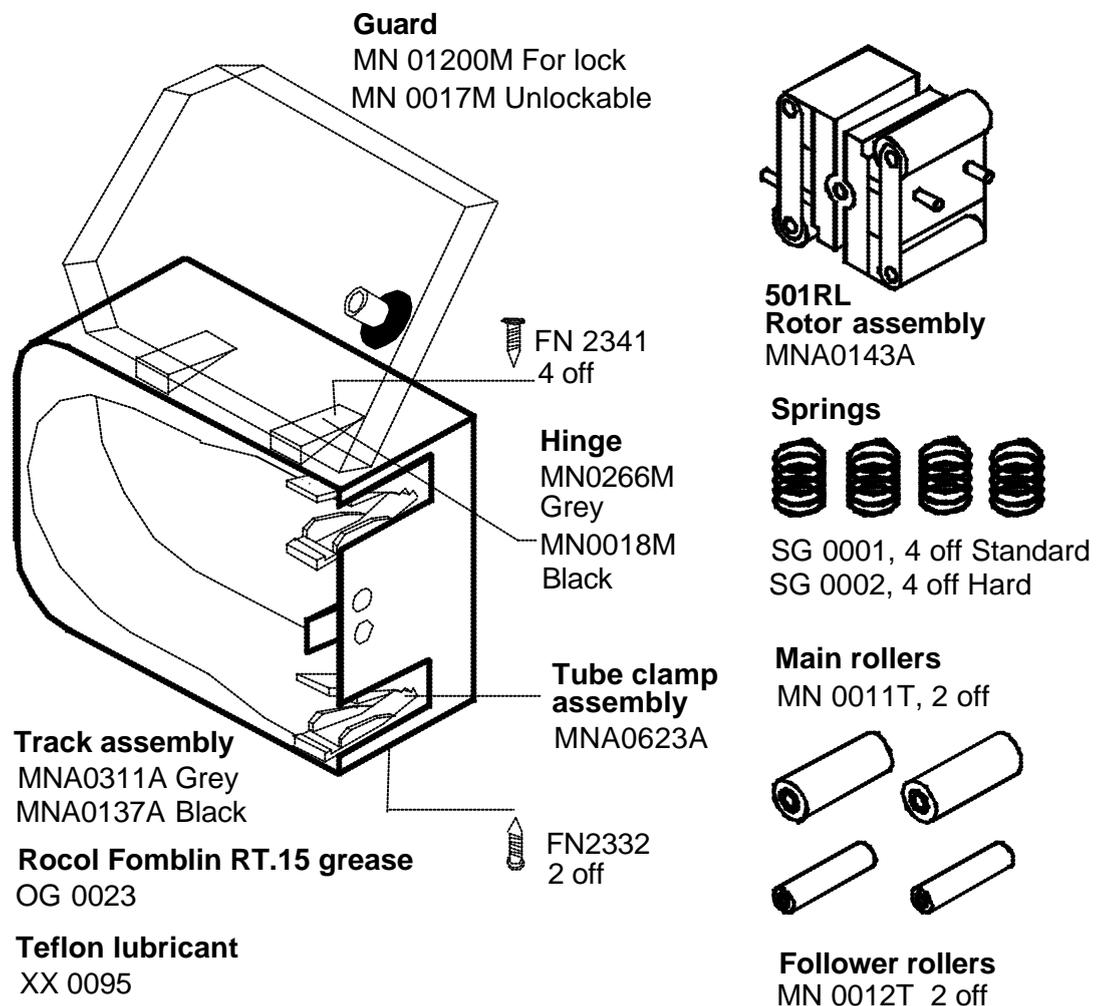
To restore the original settings of 2.6mm, turn the adjusting screws until both rollers are just touching the track, then tighten each screw by three and a quarter turns.

## Care and maintenance

If aggressive liquids are spilled on to the pumphead, the head should be removed and cleaned using a mild solution of detergent and water. 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 Teflon lubricating oil. To effectively lubricate the roller spindle, remove from the pumphead and clean thoroughly prior to applying Rocol Fomblin grease.

## Spares



If in doubt when considering spares for order, do not hesitate to contact Watson-Marlow Technical Support for further information.

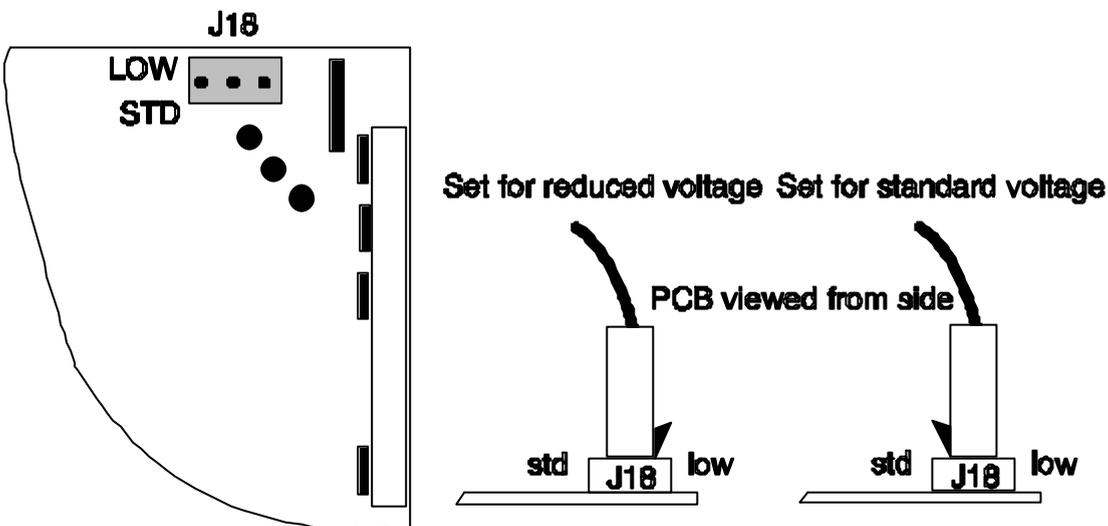
## Part 4: Appendices

### Reduced voltage operation

If the local voltage is below that specified on page 6, and there is a high pumphead loading, provision has been made in the design of the drive for a simple modification to be carried out. This will make the drive suitable for use with voltages as low as 180 volts when the 220-240V setting is selected, and as low as 90V when the 100-120V setting is selected.

Please note that the work should be carried out only by qualified personnel and that there are components at mains voltage inside the drive. If the drive is found to be damaged after this modification is incorporated and the damage is considered to have been caused by connecting it to a "normal " voltage, the warranty will be considered to have been voided.

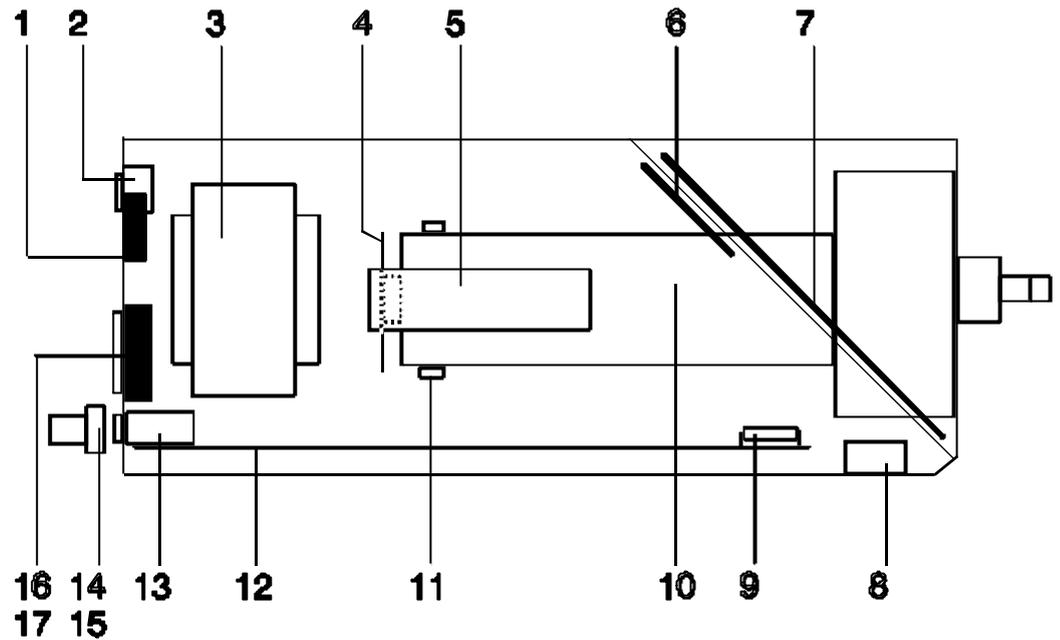
The modification requires the connector J18 on the control PCB to be reversed. To locate the terminal, isolate the mains supply then remove the pump cover which is secured by 4 screws located on the underside of the pump. Lift the cover to one side



### Specification

Supply	100-120/220-240V~50/60Hz
(For 80/180V operation see Part 4: Reduced voltage operation)	
Nominal maximum rotor speeds	300rpm
Power consumption	100VA
Shaft torque	2.2Nm
Operating temperature range	5C to 40C
Storage temperature range	-40C to 70C
Weight (including 501RL pumphead)	7.7kg (17lbs)
Noise	<70dBA at 1m
Standards	IEC 335-1, EN60529 (IP31)
Machinery directive	98/37/EC EN60204-1
Low voltage directive	73/23/EEC EN61010-1
EMC Directive	89/336/EEC EN50081-1/EN50082-1

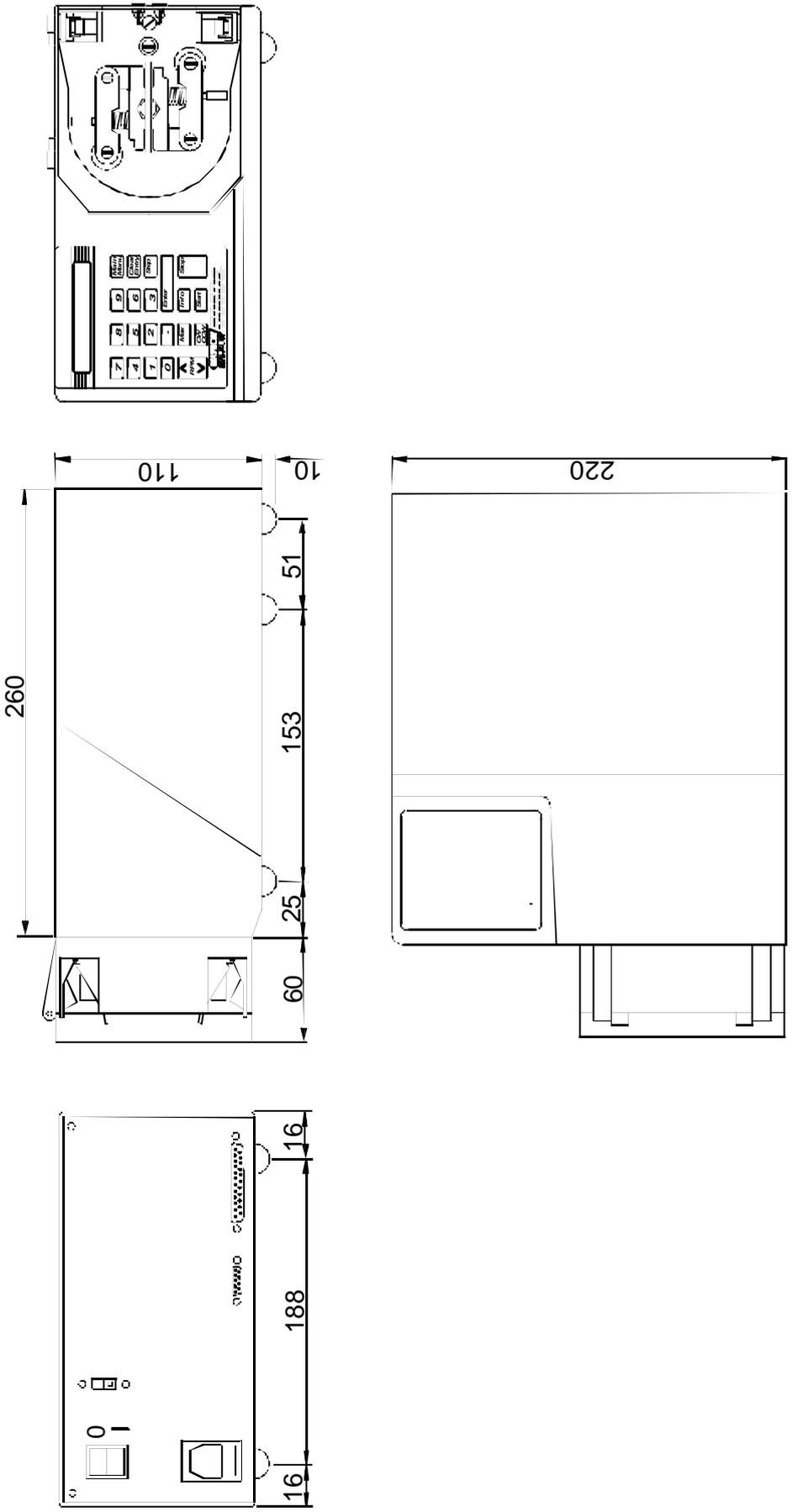
## Spares



Item #	Code	Title	Number / pump
1	SW 0147	Switch - On/Off	1
2	SW 0086	Switch - Voltage selector	1
3	TF 0031	Transformer 135VA	1
4	MN 0787M	Tacho disc	1
5	MNA0424A	Tacho PCB	1
6	MNA0476A	Display and harness	1
7	MN 0549B	Membrane switch panel	1
8	MNA0322A	Audible alarm	1
9	MNA0490A	I.C. ROM programmed	1
10	MNA0473A	Motor/gearbox 300rpm	1
11	BM 0014	Motor brush	2
12	MNA0488A	Control PCB	1
13	UP 0056	Plug - 25 WAY bucket	1
14	UP 0057	Plug - 25 WAY shell	1
15	FS 0003	Fuse 1.0A T type	1
16	US 0045	3 pin chassis plug	2
	MN 0763S	Case gasket -vertical	2
	MN 0764S	Case gasket - horizontal	4
	FS 0047	PCB fuse 2.0A T type	1
	<b>056.4661.000</b>	<b>Complete drive (No pumphead)</b>	<b>1</b>

If in doubt when considering spares for order, do not hesitate to contact Watson-Marlow Technical Support for further information.

**Outline drawing**



# Decontamination certificate

## Watson-Marlow Limited Health and Safety Declaration

1.0 This procedure is a legal requirement in the UK and **must** be used when returning pumps and equipment for service at Watson-Marlow (or its distributor).

3.0 Either fax this form or send by first class post to Watson-Marlow (or its distributor) to **ensure** that we have the information **before** receipt of the equipment.

2.0 **Pumps returned for service must be cleaned. You are responsible for their decontamination.**

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

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

4.0 Company .....  
 Address .....  
 Telephone .....  
 Post Code.....  
 Fax number.....

5.0 Please complete **all** the following sections

5.4 If substances are not hazardous nor toxic, please complete section 5.4.1. If substances are hazardous or toxic, please complete section 5.4.2.

5.1 Pump Type.....

5.2 Serial number.....

5.4.1 I hereby confirm that the equipment specified has not pumped nor come into contact with any toxic or hazardous substances.

5.3 Details of substances pumped

Signed.....  
 Name.....  
 Position.....  
 Date.....

5.3.1 Chemical names:

- (a) .....
- (b) .....
- (c) .....
- (d) .....

5.4.2 I hereby confirm that the only toxic or hazardous substance(s) 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 if the consignment is of a hazardous nature.

5.3.2 Precautions to be taken in handling these substances:

- (a) .....
- (b) .....
- (c) .....
- (d) .....

Signed.....  
 Name.....  
 Position.....  
 Date.....

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

- (a) .....
- (b) .....
- (c) .....
- (d) .....

5.5 Carrier to be used

.....  
 Delivery date  
 .....

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

- (a) .....
- (b) .....
- (c) .....
- (d) .....

5.6 Fault description or any other information

.....  
 .....  
 .....

**IMPORTANT**

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

Watson-Marlow Limited, Falmouth, Cornwall TR11 4RU, England. Tel 01326 370370, Fax 01326 376009