

302SM/R

Fixed speed pump

I Quick start-up guide

- 1 Ensure mains electricity supply matches that marked on rear panel.
- 2 Load silicone tubing only into pumphead.
- 3 Switch pump on.

II Two year 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 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, rollers and tubing are excluded.
- 2 Products must be returned by pre-arrangement carriage paid to Watson-Marlow or its authorised distributor.
- 3 All repairs or modifications must have been made by Watson-Marlow or its authorised distributor 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.

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.

III Introduction

Thank you for choosing a Watson-Marlow peristaltic pump. This manual is for use with either the 302SM fixed speed drive, or the 302SM/R drive fitted with the 501R twin sprung roller pumphead.

The 302SM is a fixed speed version of Watson-Marlow's best selling 502S variable speed drive and is fitted with a shaded pole motor. The 302SM is not reversible and runs in a clockwise direction. It can be fitted with any of five different pumpheads giving flow rates from 3 µl/min to 1190 ml/min through from one to thirty two channels. When fitted with the 501R pumphead or 303 pumphead, the 302SM can only be used with silicone tubing of 1.6mm wall thickness.

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Part 1: 302SM drive

1 Installation

Ensure that the supply voltage and frequency correspond with those marked on the rear panel. The mains supply cable 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 302SM 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. The pump should be positioned to allow a free flow of air around it. When pumps are stacked, the foot mountings will provide the necessary ventilation space between units.

If the pump does not operate correctly, check that mains electricity is available at the unit, that the fuses are intact, that the pump is not stalled by incorrect fitting of tubing, that only 1.6mm wall thickness tubing has been fitted if the 303 pumphead or 501R pumphead is used, and that the pumphead is properly located and securely attached to the drive.

WARNING There are dangerous voltages (at mains potential) inside the 302SM. If access is required, isolate the mains before removing the cover.

2 Pumpheads

The 302SM can be fitted with any of five different pumpheads. The permissible combinations and the maximum number of channels we advise are given in the table below. For more information about the 501R see Part 2 of this manual. For details of other pumpheads, please refer to the relevant operating instructions. When fitted with the 303 pumphead or the 501R pumphead, the 302SM can only be used with 1.6mm wall thickness silicone tubing.

Permissible combinations of drives and pumpheads

Drive	rpm		Pumphead and maximum channels advised				
	50Hz	60Hz	501R	303D/A	502AA	501M	501D
302SM	7	8	2*	see below	32	30	30
	55	55	2*	see below	20	20	20
	110		2*	see below	10	10	

* Two channel use restricted to tubes of 4.8 mm bore or smaller in single head

Maximum number of 303 pumpheads

The number of 303 pumpheads which may be fitted depends on the drive module and size of silicone tubing used. Do not exceed the maximum numbers advised below.

Drive	rpm		Silicone tubing internal diameter (mm)						
	50Hz	60Hz	0.5	0.8	1.6	3.2	4.8	6.4	8.0
302SM	7	8	6	6	6	5	4	3	3
	55	66	6	6	4	3	2	2	2
	110	90	4	4	2	2	1	1	1

3 Flow rates

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.

501R flow rates (ml/min)		Silicone tubing internal diameter (mm)						
Frequency	rpm	0.5	0.8	1.6	3.2	4.8	6.4	8.0
50Hz	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
60Hz	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

303 flow rates (ml/min)		Silicone tubing internal diameter (mm)						
Frequency	rpm	0.5	0.8	1.6	3.2	4.8	6.4	8.0
50Hz	7	0.2	0.5	1.9	7	15	25	35
	55	1.7	3.9	15	55	121	198	275
	110	3.3	7.7	30	110	242	396	550
60Hz	8	0.2	0.6	2.2	8	18	29	40
	66	2.0	4.6	18	66	145	237	330
	90	2.7	6.3	24	90	198	324	450

502AA flow rates (ml/min)		Tubing internal diameter (mm)							Chan- nels
Frequency	rpm	0.13	0.19	0.25	0.38	0.50	0.63	0.76	
50Hz	7	0.003	0.01	0.02	0.03	0.06	0.08	0.11	32
	55	0.026	0.07	0.16	0.27	0.43	0.63	0.85	20
	110	0.053	0.14	0.31	0.53	0.86	1.25	1.69	12
60Hz		0.004	0.01	0.02	0.04	0.07	0.10	0.13	
		0.031	0.08	0.19	0.32	0.52	0.76	1.02	
		0.043	0.11	0.25	0.43	0.70	1.09	1.38	

		Tubing internal diameter (mm)							Chan- nels
Frequency	rpm	0.88	1.02	1.14	1.29	1.42	1.47	1.52	
	7	0.15	0.20	0.26	0.32	0.41	0.44	0.48	32
	55	1.20	1.58	2.04	2.48	3.18	3.48	3.76	20
	110	2.40	3.17	4.07	4.95	6.36	6.95	7.52	10
60Hz		0.24	0.31	0.38	0.49	0.53	0.58		
		1.90	2.45	2.98	3.82	4.18	4.51		
		2.59	3.33	4.05	5.20	5.69	6.15		

Frequency	rpm	Tubing internal diameter (mm)						Channels
		1.65	1.85	2.05	2.38	2.54	2.79	
50Hz	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
60Hz	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

501M flow rates (ml/min)

Frequency	rpm	Tubing internal diameter (mm)						Channels
		1.0	1.5	2.0	2.5	3.0	4.0	
50Hz	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
60Hz	8	0.5	1.0	1.6	2.6	4.1	6.6	30
	66	3.5	7.7	12	20	31	52	20
	90	4.7	11	17	28	43	71	10

501D flow rates (ml/min)

Frequency	rpm	Tubing internal diameter (mm)						Channels
		1.0	1.5	2.0	2.5	3.0	4.0	
50Hz	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
60Hz	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

4 Tubing range

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

1.6mm wall thickness silicone tubing for 501R and 303 pumpheads

Bore	Product code	Bore	Product code	Bore	Product code
0.5mm	915-0005-016	3.2mm	915-0032-016	6.4mm	915-0064-016
0.8mm	915-0008-016	4.8mm	915-0048-016	8.0mm	915-0080-016
1.6mm	915-0016-016				

Thin wall tubing for 501D and 501M

Bore	Product code	Bore	Product code	Bore	Product code
1.0mm	995-0010-003	2.0mm	995-0020-005	3.0mm	995-0030-005
1.5mm	995-0015-005	2.5mm	995-0025-005	4.0mm	995-0040-007

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

5 Specification

Motor type	Alternating current shaded pole
Nominal rotor speeds	7, 55, 110rpm/50Hz 8, 66, 90rpm/60Hz
Voltage/frequency	230-250V 50/60Hz 200-220V 50/60Hz 100-120V 50/60Hz
Operating temperature range	0C to 37C
Storage temperature range	-40C to 70C
Standards	CEE10, IP31
Dimensions	H125 x W185 x L230mm 4 3/4" x 7 1/16" x 9 1/16"
Weight	3.9kg 8 1/2lb

6 Care and maintenance

Scheduled maintenance of the 302SM is not required. When the pump needs cleaning, use a cloth dampened with water and mild detergent. Do not use strong solvents. If the gearbox is dismantled, it should be refilled with a good quality grease such as Andersol 761.

7 Spares

CX 044	Cable clamp
FB 001	Foot rubber
FH 007	Fuseholder
FS 025	Fuse, type F, 0.63A (for 200-250V units)
FS 042	Fuse, type F, 1.25A (for 100-120V units)
MC 020	Fan for shaded pole motor
MN 197	Mains cable
MN 708	Cover
MN 709	Case
MN 718	Wiring harness
MN 722	Motor support bracket
MNA115	Motor/gearbox, 7/8rpm, 220-240V 50Hz
MNA116A	Motor/gearbox, 55/66rpm, 220-240V 50/60Hz
MNA117	Motor/gearbox, 110rpm, 220-240V 50/60Hz
MNA118	Motor/gearbox, 7/8rpm, 110-115V 50/60Hz
MNA119	Motor/gearbox, 55/66rpm, 110-115V 50/60Hz
MNA120	Motor/gearbox, 110rpm, 110-115V 50Hz
MNA164	Motor/gearbox, 75/90rpm, 110-115V 50/60Hz
SW 023	Power switch, rocker, illuminated, 200-250V
SW 040	Power switch, rocker, illuminated, 100-130V
TM 014	Terminal block

Part 2: 501R pumphead

8 Description

The 501R 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. Only silicone tubing may be used when the 501R is fitted to the 302SM drive.

9 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; first remove the rotor assembly, remove the track locating screw, rotate the track to the new position and replace the screw.

10 Tube loading

WARNING Switch off the drive before loading the tube.

- 1 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 the guard.
- 6 After the pump has been started, open the downstream clamp 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.

11 Adjustment of the gap between the rollers and track

The 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. 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 quarter turn changes the gap by 0.7mm.

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

12 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.

13 Spares

