

# OEM

If you use pumps, we can improve your products and save you money



## Peristaltic Pumps for Engineers

**WATSON**  
**MARLOW**  
Bredel

PUMPS

# PUMP SUCCESS INTO YOUR PRODUCTS

Where others saw a novelty, we saw the perfect pump. Forty-five years ago, peristaltic pumping was just a curiosity. Squeeze a rubber tube filled with fluid between your fingers; slide them along; the fluid moves.

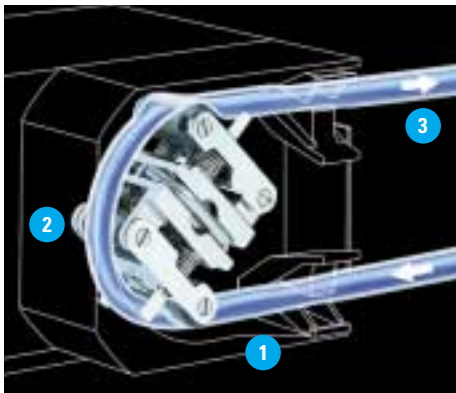
But the people who founded Watson-Marlow Breidel could also see that the peristaltic was the perfect pump. Nothing but the tube touched the fluid, eliminating the risk of contaminating either the fluid or the pump. From that simple idea was founded a company that has developed products that can pump from microlitres per minute up to hundreds of gallons per minute. Watson-Marlow Breidel is the world's peristaltic pump specialist, exporting two-thirds of production to over fifty countries.

And if you ask Watson-Marlow Breidel what has turned an unlikely pump into an international success, the answer will be engineering. The company designs and makes its product extremely well. They are always seeking to improve products and expand performance capabilities.

Watson-Marlow Breidel specialises in supplying the right pump for the job, where other vendors try to force-fit a standard solution. Sales Engineers will help you apply and integrate one of the hundreds of standard choices, or help you make custom modifications. Watson-Marlow Breidel will evolve with your own product design. Start with a standard product for the early prototypes, and add custom options as the project moves towards production. If this is not enough, a completely new pump can be designed from scratch to meet a specification. There are no limits to providing the best solution for OEM customers.

**WATSON  
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PUMPS



## What is peristaltic pumping

The drawing shows a pumphead loaded with tubing.

- 1 The advancing roller occludes the tube.
- 2 It recovers to its normal size and draws in fluid, which is then trapped by the next roller.
- 3 The fluid is then finally expelled from the pump.

This is the peristaltic flow-inducing action, and the full occlusion of the tube provides positive displacement. Together, the flow-inducer and tube make the pump, and both are equally important. The Watson-Marlow Breidel range of pumps and tubes provides flow rates from 15 microlitres to over 80m<sup>3</sup>/hr, pressures of up to 16 bar (230 psi).

## The benefits of peristaltic pumping

Compared to lobe pumps, diaphragm pumps, gear pumps and piston pumps, and every other type of pump, the advantages of Watson-Marlow Breidel pumps include:

- No contamination of the fluid
- No contamination of the pump
- Ideal for shear-sensitive and aggressive fluids
- Self-priming, dry-running
- No valves, seals or glands
- Automatic check valve action prevents backflow
- Reversible



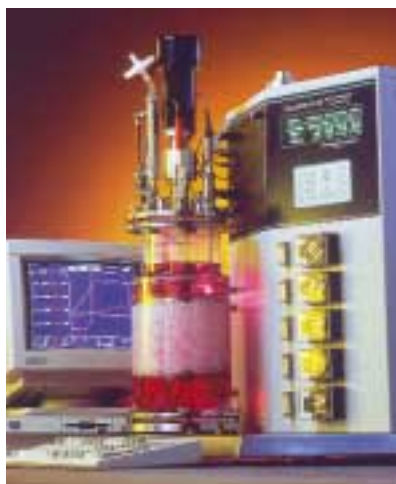
*B. Braun Biotech the world's leading supplier of fermenters, typically uses no less than three pumps and or pumpheads in all their standard products. The pumps and pumpheads individually meter nutrients, acids, bases, and surfactants.*



*M&O Perry Industries Inc installs 505Di/L dispensing units on their automated filling and capping equipment. The pumps were selected for their validated sterility, and rapid changeover of batches.*



*Margar Industries uses 313D pumpheads on their patented concrete mixing systems. The pumps are used to meter the various additives that improve strength and drying time. The unique system mounts directly to the trucks, allowing for small batches of concrete to be produced. The pump was selected for its ability to precisely meter the chemicals, and their ability to withstand the harsh environment.*



New Brunswick Scientific, producers of a wide range of bioprocessing and fermentation equipment, uses single channel pumpheads to precisely meter acids, bases, and surfactants on computer controlled fermenters. Pumpheads are also used for nutrient feed in continuous culture applications.



Packard Instruments, a leading manufacturer of life science research equipment chose the 501RL pumphead for their MultiProbe™ system used for high throughput screening for drug discovery. They required a long lasting pump capable of high flow rates. The spring-loaded pumphead offers optimal tube life and minimal maintenance.

## Where are peristaltic pumps used?

There are thousands of processes where confining the fluid to a tube, and nothing else, is ideal. Instead of stripping and cleaning the pump, just fit a new pump tube - which takes only minutes, or even seconds. A sterile tube creates a sterile pump. Think of peristaltic pumps especially for pharmaceuticals, fermentation, cell culture, filtration, automated laboratory test equipment, separation, sampling, spray coating, pollution control, food processing, beverage dispensing, inks, pigments and photographic solutions, as well as abrasive and aggressive fluids. If a fluid will pass through a tube, then a peristaltic pump can speed its flow, control its flow rate, or dispense it in precise volumes.

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# 100 SERIES OEM SYSTEMS

The 100 series of OEM systems offers a choice of pumps in a range of speeds, based on the 102R low-flow pumphead, and uses either synchronous or DC motors. The 102R pumphead is also available on its own, for use with users' own drives. Recently introduced into the range is the 100 series CIRA 1990! OEM speed control board providing direction and speed control for the 12V DC OEM pumps.

## 102R low flow pumphead



The 102R low-flow OEM pumphead accepts, without adjustment, all Watson-Marlow Bredel tubing from 0.5mm (1/50") to 4.8mm (3/16") internal diameter with 1.6mm (1/16") wall thickness. It has a spring-loaded, two-roller rotor and is suitable for continuous use up to 65 rpm, providing flow rates up to 106 ml/min (intermittent use up to 130rpm giving flow rates up to 212 ml/min).

The 102R may be driven in either direction: clockwise rotation will give a longer tube life, but anti-clockwise rotation can be used for working against greater pressures. It is available with a choice of track material and rotor springs and is suitable for either a 6mm or 8mm drive shaft if mounted on users' own drive. All 102R pumpheads have a choice of mounting points and a shatterproof clear polycarbonate guard which is hinged to allow easy access for tube changing.

For certain applications, the 102R can be supplied with snap-in connectors (as shown in the photograph bottom left) in place of the sprung tube clamps.

### Ordering information

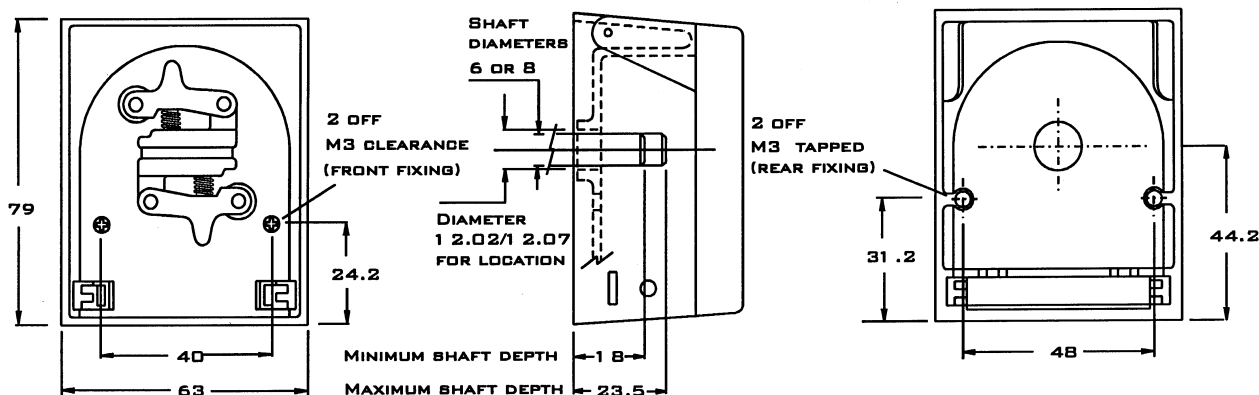
For 6mm drive shaft	Suitable for
Kematal track with standard springs	Platinum cured Silicone/Neoprene 013.2001.000
Kematal track with hard springs	Marprene/PVC/Fluorel 013.2011.000
PVDF track with standard springs	Platinum cured Silicone/Neoprene 013.3001.000
PVDF track with hard springs	Marprene/PVC/Fluorel 013.3011.000
For 8mm drive shaft	Suitable for
Kematal track with standard springs	Platinum cured Silicone/Neoprene 013.2101.000
Kematal track with hard springs	Marprene/PVC/Fluorel 013.2111.000
PVDF track with standard springs	Platinum cured Silicone/Neoprene 013.3101.000
PVDF track with hard springs	Marprene/PVC/Fluorel 013.3111.000

### Materials of construction

IXEF (Polyarylamide)	Rotor
MOS2 filled Nylon 6 (Nylatron)	Rollers
Acetal copolymer (Kematal) or PVDF	Track
Acetal copolymer (Kematal)	Tube clamps
Polycarbonate	Guard
Stainless steel	Spindles, Guide pins



ALL DIMENSIONS IN MILLIMETRES





### Flow rates

	<b>1.6mm (1/16") wall tubing</b>				
Bore mm	0.5mm	0.8mm	1.6mm	3.2mm	4.8mm
Bore "	1/50"	1/32"	1/16"	1/8"	3/16"
<i>Flow rate: ml/revolution</i>	0.02	0.05	0.22	0.81	1.66
<i>Maximum continuous flow rate (65rpm): ml/min</i>	1.38	3.22	14.0	52.0	106
<i>Maximum intermittent flow rate (130rpm): ml/min</i>	2.76	6.44	28.0	104	212

For tube selections, see Table A on page 47.

### Specifications

	<b>1.6mm (1/16") wall tubing</b>				
Bore mm	0.5mm	0.8mm	1.6mm	3.2mm	4.8mm
Bore "	1/50"	1/32"	1/16"	1/8"	3/16"
<i>Maximum continuous speed: rpm</i>	65	65	65	65	65
<i>Maximum intermittent speed: rpm</i>	130	130	130	130	130
<b>With silicone tubing (standard springs, clockwise rotation)</b>					
Required torque up to 0.5 bar: kg cm	1.1	1.1	1.2	1.5	1.8
Required torque up to 1 bar: kg cm	1.2	1.2	1.25	1.8	2.1
<i>Maximum pressure: bar</i>	3.0	3.0	3.0	1.0	1.0
<b>With Marprene tubing (hard springs, clockwise rotation)</b>					
Required torque up to 0.5 bar: kg cm	3.5	3.5	3.6	4.2	4.6
<i>Maximum pressure: bar</i>	1.6	1.6	1.6	1.6	1.6

For counter-clockwise rotation, increase required torque figures by 80%.

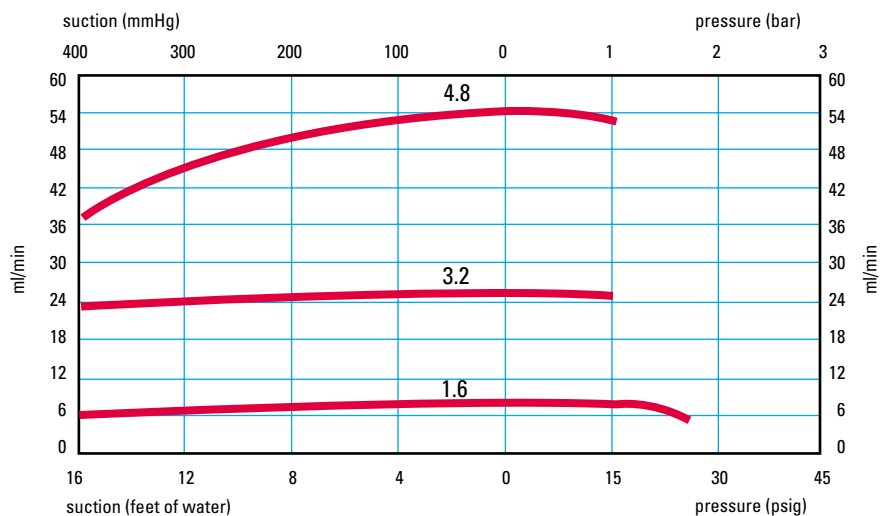
### Performance against pressure

#### Conditions:

- Suction curves obtained with zero output pressure.
- Pressure curves obtained with zero lift.
- Pumphead speed 32 rpm

#### Conversion Factors:

Suction pressure in bar x 760 = mm Hg  
 Suction pressure in bar x 33.5 = Ft H<sub>2</sub>O  
 Back pressure in bar x 14.5 = psi





## 102FS/R fixed speed AC pump



The 102FS/R comprises a 102R pumphead plus synchronous motor and mounting plate.

It will accept 1.6mm wall thickness silicone tubing from 0.5 to 4.8mm internal diameter, and provides a choice of speeds giving flow rates up to 32.6 at 50Hz ml/min. No tube connectors are required and a continuous length of tubing can be run from source to delivery point. Long tube life and precise flow rates are assured by the sprung roller design.

### Ordering information

#### 100-120V AC

0.67/0.8rpm 50/60Hz	<a href="#">010.2102.000</a>
4.0/4.8rpm 50/60Hz	<a href="#">010.2202.000</a>
6.0/7.2rpm 50/60Hz	<a href="#">010.2302.000</a>
12rpm 50Hz	<a href="#">010.2402.000</a>
14.4rpm 60Hz	<a href="#">010.2412.000</a>
20/24rpm 50/60Hz	<a href="#">010.2502.000</a>

#### 200-250V AC

0.67rpm 50Hz	<a href="#">010.2112.000</a>
4.0rpm 50Hz	<a href="#">010.2212.000</a>
6.0rpm 50Hz	<a href="#">010.2312.000</a>
12rpm 50Hz	<a href="#">010.2422.000</a>
20rpm 50Hz 200-220V	<a href="#">010.2512.000</a>
20rpm 50Hz 230-250V	<a href="#">010.2522.000</a>

### Specifications

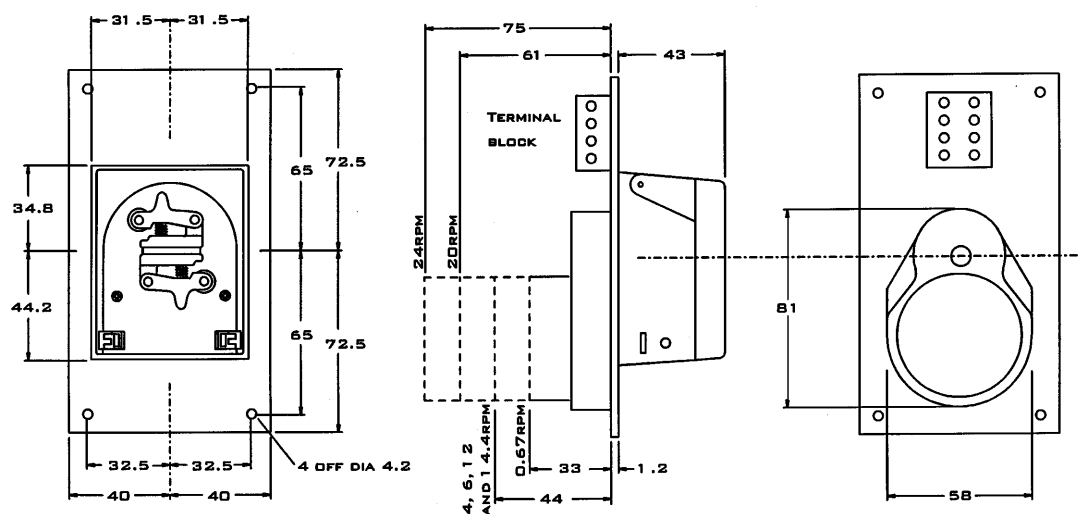
Motor type	<i>Synchronous</i>
Motor torque output	<i>2.5kg cm</i>
Power consumption	<i>25VA</i>
Weight	<i>600g</i>

### Flow rates (ml/min)

		1.6mm (1/16") wall silicone tubing				
		0.5mm 1/50"	0.8mm 1/32"	1.6mm 1/16"	3.2mm 1/8"	4.8mm 3/16"
50	0.67	0.014	0.03	0.15	0.54	1.08
	4.0	0.087	0.20	0.87	3.17	6.35
	6.0	0.130	0.30	1.30	4.75	9.53
	12	0.250	0.60	2.55	9.44	19.0
	20	0.420	0.98	4.36	16.0	32.6
60	0.8	0.017	0.04	0.18	0.65	1.32
	4.8	0.104	0.24	1.05	3.80	7.62
	7.2	0.150	0.36	1.53	5.67	11.4
	14.4	0.300	0.72	3.06	11.3	22.9
	24	0.500	1.18	5.23	19.2	39.1

For tube selections, see Table A on page 47.

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## 102FD/R fixed/variable speed DC pump



The 102FD/R comprises a 102R pumphead plus a 12V DC motor and mounting plate. It will accept 1.6 mm wall thickness silicone tubing from 0.5 to 4.8mm internal diameter, and provides a choice of speeds giving flow rates up to 106 ml/min. It may be used with the 100 series speed control board to provide a variable speed pumping system, giving a speed control ratio of 10:1, direction control and stop/start facilities.

### Ordering information

#### 12V DC

4rpm	010.1002.000
65rpm	010.1042.000

### Specifications

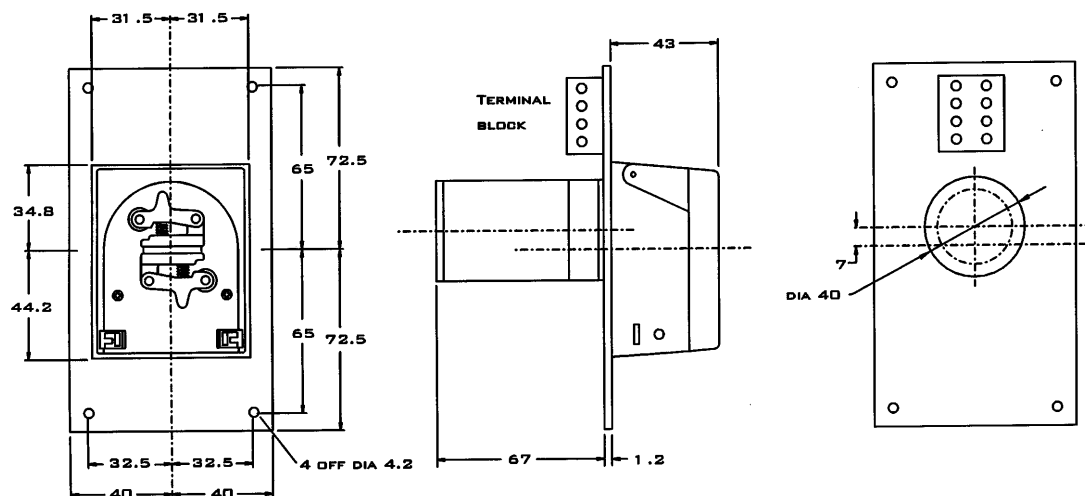
Motor type	Standard 12V DC
Motor torque output	2.5kg cm
Power consumption	25VA
Weight	500g
Brush life	3000 hours

### Flow rates (ml/min)

rpm	1.6mm (1/16") wall silicone tubing				
	0.5mm 1/50"	0.8mm 1/32"	1.6mm 1/16"	3.2mm 1/8"	4.8mm 3/16"
4	0.09	0.20	0.87	3.17	6.40
65	1.38	3.22	14.0	52.0	106

Note: Minimum flows are 10% of rates given when using the 100 series OEM speed control board.  
For tube selections, see Table A on page 47.

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## OEM speed control board



The OEM speed control board is designed to give speed control and remote stop facilities for the 102FD/R and 313FD/D 12-24V DC OEM pumps, and is capable of accepting a remote speed control signal input from users' own equipment.

With the addition of extra components to the standard board, options of direction reverse, power on LED, AC supply input, board mounted speed control potentiometer and instant prime are available.

Two different boards are available, both in 'Eurocard' format with a 32 way edge connector. The 100 series OEM speed control board for the 102FD/R incorporates an on-board power transistor, whereas the power transistor for the 300 series board has to be mounted on an external heat sink with a 1,000 sq cm surface area and is rated for higher loads.

### Ordering information

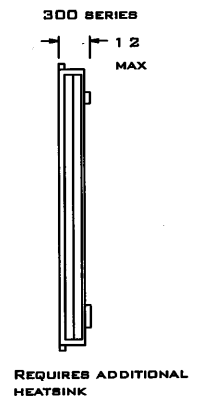
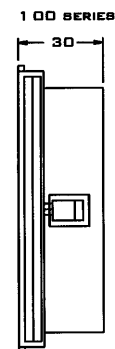
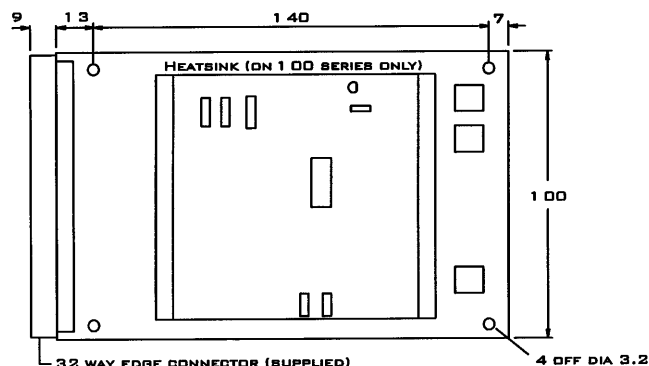
For 102FD/R	019.2021.000
For 313FD/D	039.2021.000

### Specifications

Power supply input	20-30V DC, (AC/Mains voltage optional)
Power supply rating	100 series: 0.5A, 300 series: 2.0A
Output	12V DC (variable)
Circuit board format	Eurocard (pillar mounting points as alternative)
Connections	32 way edge
Speed control input	Remote potentiometer or 0 to 5V DC input (board mounted potentiometer optional)
Speed control ratio	10:1
Weight	100 series 150g, 300 series 100g plus external heat sink

### Board features

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>■ Speed control by potentiometer (not supplied) or 0 to 5V DC control signal</li> <li>■ Motor stop/start control by remote switch, TTL or CMOS</li> <li>■ Motor may be connected for either clockwise or anti-clockwise rotation</li> <li>■ Full connection and calibration instructions</li> </ul> | <p>Optional features requiring additional components</p> <ul style="list-style-type: none"> <li>■ Instant direction change</li> <li>■ Power on LED indication</li> <li>■ AC or DC power supply</li> <li>■ Prime maximum speed switch</li> <li>■ Board-mounted potentiometer for speed control</li> <li>■ 100 or 300 series OEM system</li> <li>■ 32 way edge connector (supplied)</li> </ul> |
|--|--|







## Custom-Tailored Designs

### Features

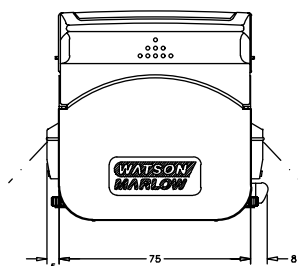
Simple, ingenious tube loading - slide open the track to expose the rotor, load the tubing, slide the track down and the tubing is clamped and stretched as the track clicks shut. It takes longer to describe than to do!

Designed around the 313D flip-top pumphead, these OEM pumps provide high quality, single channel pumps, with a choice of AC, DC or brushless DC drive units, and controls. The pumps provide flow rates up to 2 litres per minute (3 litres per minute for intermittent use).

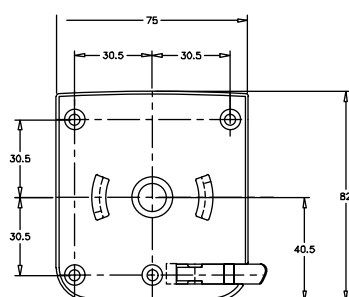
### Standard features/options of 313D and 314D pumpheads

- 313 has 3 rollers for maximum flows. 314 has 4 rollers for minimum pulsation. Both accept 1.6mm wall thickness tubing from 0.5mm to 8mm bore.
- 313 and 314 pumpheads can also be ordered with dedicated tube clamps for 0.5 - 1.6mm, 3.2mm, 4.8mm and 6.4 - 8.0mm bore tubing.
- 313D and 314D with bayonet mounting plate and adjustable clamps. Fits Watson-Marlow Bredel OEM drives.
- 313D/A and 314D/A with bayonet mounting plate, bayonet adapter and adjustable clamps. Fits 500 series cased drives.
- 313X and 314X extension pumpheads.
- 313B and 314B bare-shaft versions with bayonet plate and adjustable clamps.
- For higher pressure applications order 2.4mm wall tubing versions by adding "2" suffix e.g. 313D2 or 313X2.
- AC, DC and brushless DC motor drives are available.

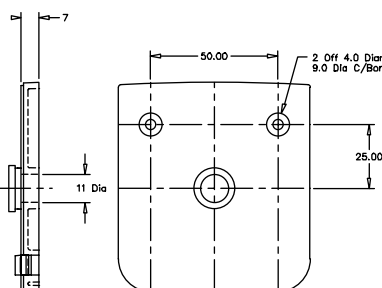
The 313 pump range has hundreds of standard options to choose from. We can also do custom colours, tube sizes and drives. We can also create new products custom-tailored to your unique requirements, such as the tube element version shown at top left. Contact one of our sales engineers for more information on custom products.



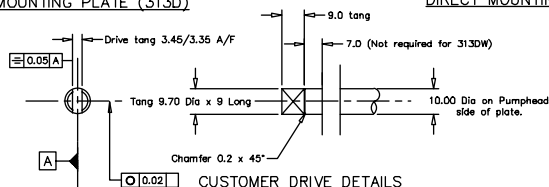
ALL DIMENSIONS IN MILLIMETRES



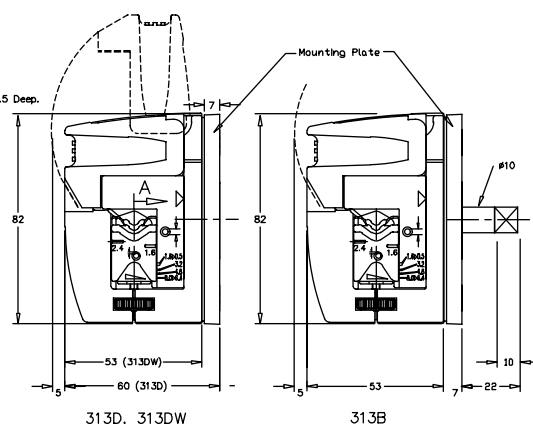
MOUNTING PLATE (313D)



DIRECT MOUNTING (313DW)



CUSTOMER DRIVE DETAILS



## 313 rapid load pumpheads, three rollers



These pumpheads are fast loading, handle tube sizes with 1.6mm wall thickness from 0.5mm to 8.0mm bore, and extension pumpheads can be snapped on up to the power limit of the drive. 313 pumpheads have three Nylatron rollers and are suitable for continuous use up to a speed of 400 rpm, giving flow rates up to 2000 ml/min, or intermittently up to 600 rpm, giving flow rates up to 3000 ml/min.

The 313 range of pumpheads includes the 313D pumphead for mounting on either Watson-Marlow 300 series OEM drives or users' own drive shaft arrangement, the 313B bare shaft pumphead for drives with a flexible coupling, and the 313X extension pumphead for use with the 313D.

The 313D pumpheads accept up to five extension pumpheads for multi-channel installations, depending on the power limit of the drive. A mounting plate, which must be incorporated into the installation, is supplied with 313B and 313D pumpheads. Extension pumpheads snap fit directly behind 313D pumpheads.

A pumphead is available that will accept 2.4mm wall tube, for applications that will benefit from using a thicker wall tube. To order a 313 pumphead for 2.4mm wall thickness tubing, add suffix "2" - 313D2.

The ordering information below shows the full range of 313 pumpheads as detailed on page 7.

### Ordering information

#### Three roller 1.6 mm wall thickness tubing

Clamp setting	313D	313X	313B	313XB	313DW	313BW
Variable	033.3411.000	033.3431.000	033.3421.000	033.3441.000	033.3451.000	033.3461.000
0.5 - 1.6	033.3411.00c	033.3431.00c	033.3421.00c	033.3441.00c	033.3451.00c	033.3461.00c
3.2	033.3411.00f	033.3431.00f	033.3421.00f	033.3441.00f	033.3451.00f	033.3461.00f
4.8	033.3411.00k	033.3431.00k	033.3421.00k	033.3441.00k	033.3451.00k	033.3461.00k
6.4 - 8.0	033.3411.00n	033.3431.00n	033.3421.00n	033.3441.00n	033.3451.00n	033.3461.00n

#### Three roller 2.4 mm wall thickness tubing

Clamp setting	313D2	313X2	313B2	313XB2	313DW2	313BW2
Variable	033.3511.000	033.3531.000	033.3521.000	033.3541.000	033.3551.000	033.3561.000
0.5 - 1.6	033.3511.00c	033.3531.00c	033.3521.00c	033.3541.00c	033.3551.00c	033.3561.00c
3.2	033.3511.00f	033.3531.00f	033.3521.00f	033.3541.00f	033.3551.00f	033.3561.00f
4.8	033.3511.00k	033.3531.00k	033.3521.00k	033.3541.00k	033.3551.00k	033.3561.00k
6.4	033.3511.00n	033.3531.00n	033.3521.00n	033.3541.00n	033.3551.00n	033.3561.00n

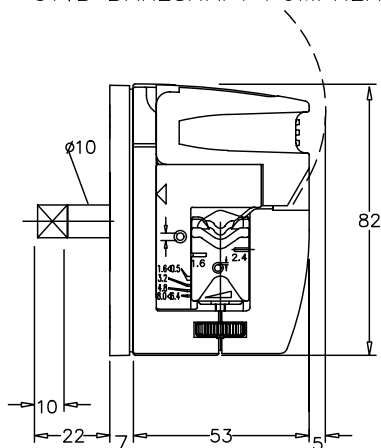
### Flow rates

	1.6mm (1/16") wall tubing						
Bore mm	0.5	0.8	1.6	3.2	4.8	6.4	8.0
Bore "	1/50	1/32	1/16	1/8	1/16	1/4	5/16
Flow rate: ml/revolution	0.03	0.06	0.26	1.0	2.2	3.6	5.0
Maximum continuous flow: ml/min	12	24	104	400	880	1400	2000
Maximum intermittent flow: ml/min	18	36	156	600	1320	2160	3000

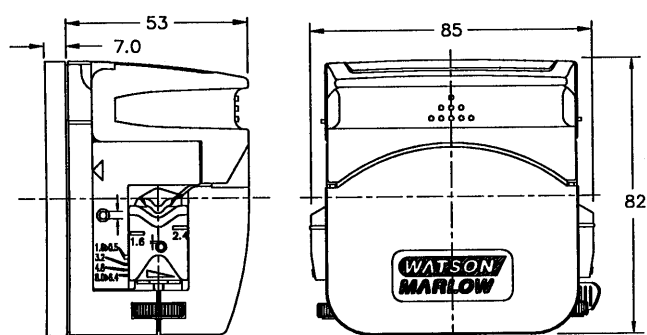
For tube selections, see Table A and B on page 47.

ALL DIMENSIONS IN MILLIMETRES

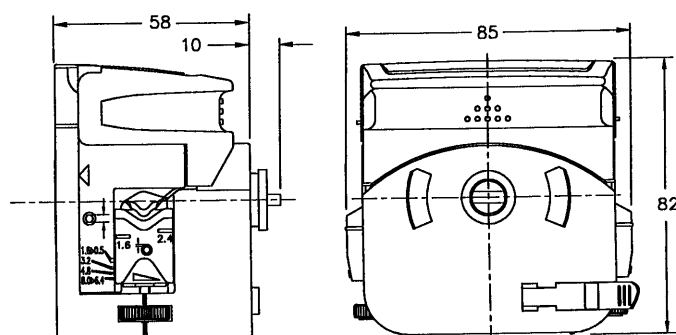
314B BARESHAFT PUMPHEAD



313D PUMPHEAD



313X EXTENSION PUMPHEAD





## Materials of construction

Body rear	Glass filled polypropylene
Body front, body front extension, mounting plate, track and lever	IXEF
Rotor, tube clamps and mounting plate locking tab	Glass filled Nylon
Rollers	MoS2 filled Nylon 6 (Nylatron)
Spindles	Electroless nickel plated, hardened steel
Screws	Stainless steel
Sealed bearings	Bronze Bush

## Specifications

	1.6mm (1/16") wall tubing						
Bore mm	0.5	0.8	1.6	3.2	4.8	6.4	8.0
Bore "	1/50	1/32	1/16	1/8	3/16	1/4	5/16
Maximum continuous speed: rpm	400	400	400	400	400	400	400
Maximum intermittent speed: rpm	600	600	600	600	600	600	600
<b>With Marprene tubing</b>							
Required torque up to 0.5 bar: kgcm	1.4	1.4	2.0	2.8	4.2	4.8	6.3
Required torque up to 2.0 bar: kgcm	1.5	1.5	2.1	4.0	6.1	6.8	7.8
Maximum continuous pressure: bar	2	2	2	2	1.3	1.3	1.3
Maximum intermittent pressure: bar	3	3	3	2.5	2	2	1.7
<b>With Silicone tubing</b>							
Required torque up to 0.5 bar: kgcm	1.1	1.1	1.7	2.3	2.9	3.5	4.0
Required torque up to 2.0 bar: kgcm	1.5	1.5	2.1	3.2	4.3	5.2	6.7
Maximum continuous pressure: bar	2	2	1.5	1.5	1	1	1
Maximum intermittent pressure: bar	2.5	2.5	2	2	1.3	1.3	1.3

## Performance against pressure

### Conditions:

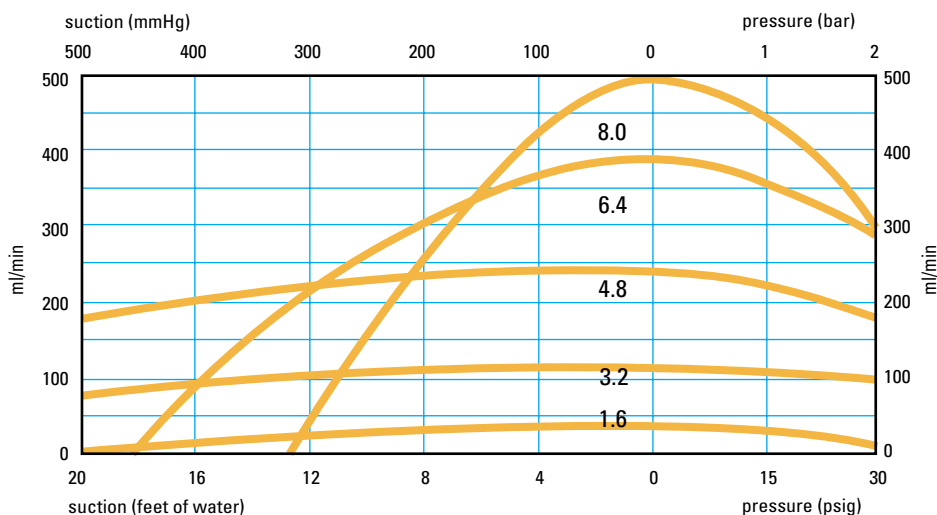
- Suction curves obtained with zero output pressure.
- Pressure curves obtained with zero lift.
- Pumphead speed 100 rpm.

### Conversion Factors:

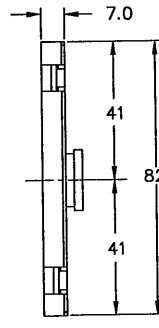
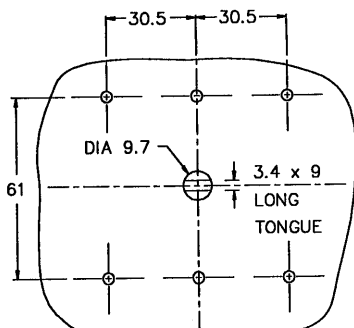
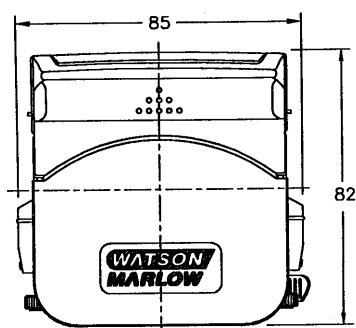
Suction pressure in bar x 760 = mm Hg

Suction pressure in bar x 33.5 = Ft H<sub>2</sub>O

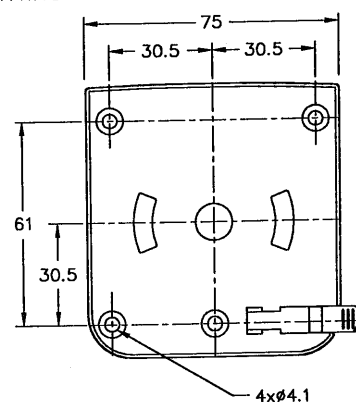
Back pressure in bar x 14.5 = psi



## CUSTOMER DRIVE DETAILS



## MOUNTING PLATE



## 314 rapid load pumpheads, four rollers



With the same bayonet mounting system, 314 pumpheads may be interchanged with the 313 pumpheads or specified as an alternative head when ordering 300 series OEM pumps. Their four roller design gives higher precision and less pulsation and is suitable for continuous use up to 300 rpm giving flow rates up to 1200 ml/min (intermittent use up to 600 rpm giving flow rates up to 2400 ml/min).

The 314 range of pumpheads includes the 314D pumphead for mounting on either Watson-Marlow 300 series OEM drives or users' own drives having the same drive shaft arrangement, the 314B bare shaft pumphead for drives with a flexible coupling and the 314X extension pumphead for use with the 314D.

The 314D and 314B pumpheads accept up to five extension pumpheads for multi-channel installations depending on the power limit of the drive. A mounting plate, which must be incorporated into the installation, is supplied with 314B and 314D pumpheads. Extension pumpheads snap fit directly behind 314D pumpheads. To use 2.4mm wall thickness tubing, please add the suffix "2" - 314D2

The ordering information below shows the full range of 314 pumpheads as detailed on page 7.

### Ordering information

#### Four roller 1.6 mm wall thickness tubing

Clamp setting	314D	314X	314B	314XB	314DW	314BW
Variable	033.4411.000	033.4431.000	033.4421.000	033.4441.000	033.4451.000	033.4461.000
0.5 - 1.6	033.4411.00c	033.4431.00c	033.4421.00c	033.4441.00c	033.4451.00c	033.4461.00c
3.2	033.4411.00f	033.4431.00f	033.4421.00f	033.4441.00f	033.4451.00f	033.4461.00f
4.8	033.4411.00k	033.4431.00k	033.4421.00k	033.4441.00k	033.4451.00k	033.4461.00k
6.4 - 8.0	033.4411.00n	033.4431.00n	033.4421.00n	033.4441.00n	033.4451.00n	033.4461.00n

#### Four roller 2.4 mm wall thickness tubing

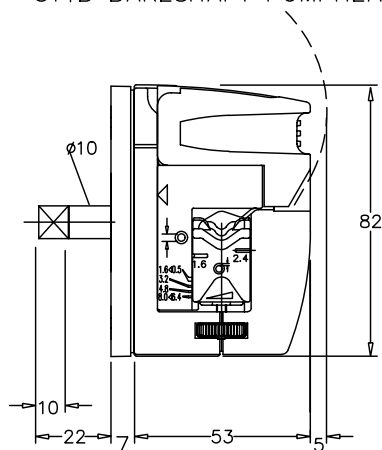
Clamp setting	314D2	314X2	314B2	314XB2	314DW2	314BW2
Variable	033.4511.000	033.4531.000	033.4521.000	033.4541.000	033.4551.000	033.4561.000
0.5 - 1.6	033.4511.00c	033.4531.00c	033.4521.00c	033.4541.00c	033.4551.00c	033.4561.00c
3.2	033.4511.00f	033.4531.00f	033.4521.00f	033.4541.00f	033.4551.00f	033.4561.00f
4.8	033.4511.00k	033.4531.00k	033.4521.00k	033.4541.00k	033.4551.00k	033.4561.00k
6.4	033.4511.00n	033.4531.00n	033.4521.00n	033.4541.00n	033.4551.00n	033.4561.00n

### Flow rates

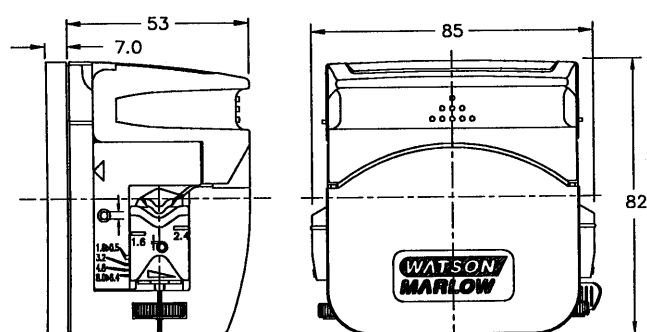
	1.6mm (1/16") wall tubing						
Bore mm	0.5	0.8	1.6	3.2	4.8	6.4	8.0
Bore "	1/50	1/32	1/16	1/8	3/16	1/4	5/16
Flow rate: ml/revolution	0.03	0.06	0.25	0.85	1.9	3.0	4.0
Maximum continuous flow: ml/min	9	18	75	255	570	900	1200
Maximum intermittent flow: ml/min	18	36	150	510	1140	1800	2400

For tube selections, see Tables A and B on page 47.

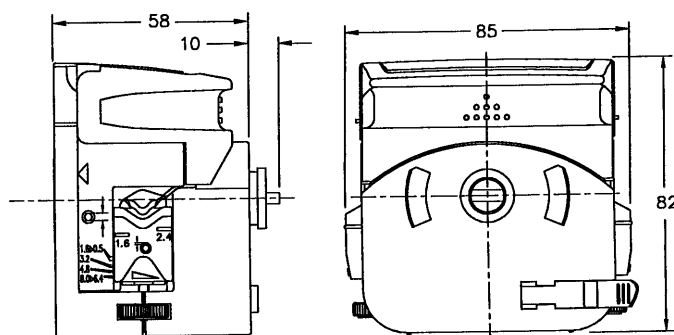
314B BARESHAFT PUMPHEAD



313D PUMPHEAD



313X EXTENSION PUMPHEAD





## Materials of construction

Body rear	Glass filled polypropylene
Body front, body front extension, mounting plate, track and lever	IXEF
Rotor, tube clamps and mounting plate locking tab	Glass filled Nylon
Rollers	MoS2 filled Nylon 6 (Nylatron)
Spindles	Electroless nickel plated, hardened steel
Screws	Stainless steel
Bearings	Bronze Bush

## Specifications

	1.6mm (1/16") wall thickness tubing						
Bore mm	0.5	0.8	1.6	3.2	4.8	6.4	8.0
Bore "	1/50	1/32	1/16	1/8	3/16	1/4	5/16
Maximum continuous speed: rpm	400	400	400	400	400	400	400
Maximum intermittent speed: rpm	600	600	600	600	600	600	600
<b>With Marprene tubing</b>							
Required torque up to 0.5 bar: kgcm	1.4	1.4	2.0	2.8	4.2	4.8	6.3
Required torque up to 2.0 bar: kgcm	1.5	1.5	2.1	4.0	6.1	6.8	7.8
Maximum continuous pressure: bar	2	2	2	2	1.3	1.3	1.3
Maximum intermittent pressure: bar	3	3	3	2.5	2	2	1.7
<b>With Silicone tubing</b>							
Required torque up to 0.5 bar: kgcm	1.1	1.1	1.7	2.3	2.9	3.5	4.0
Required torque up to 2.0 bar: kgcm	1.5	1.5	2.1	3.2	4.3	5.2	6.7
Maximum continuous pressure: bar	2	2	1.5	1.5	1	1	1
Maximum intermittent pressure: bar	2.5	2.5	2	2	1.3	1.3	1.3

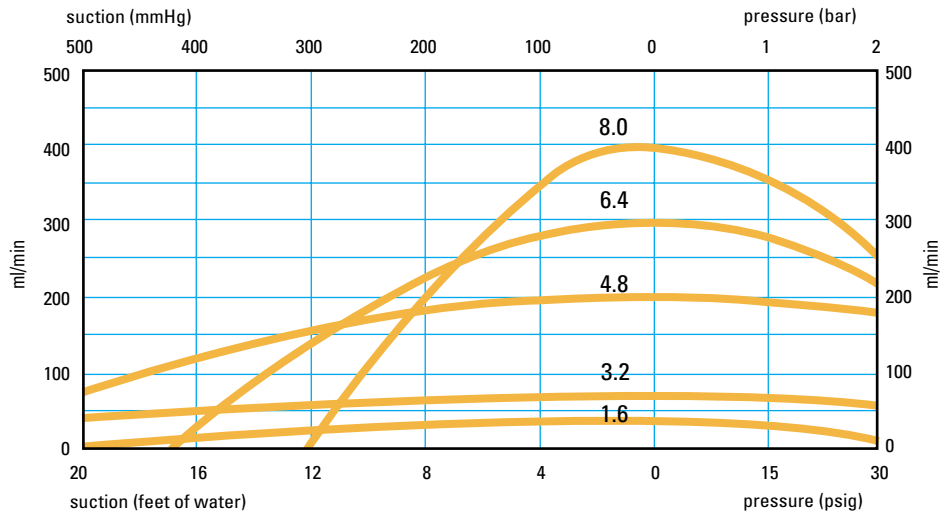
## Performance against pressure

### Conditions:

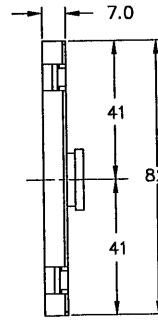
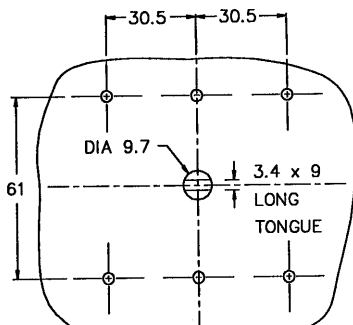
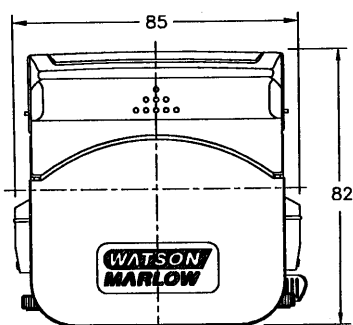
- Suction curves obtained with zero output pressure
- Pressure curves obtained with zero lift
- Pumphead speed 100 rpm

### Conversion Factors:

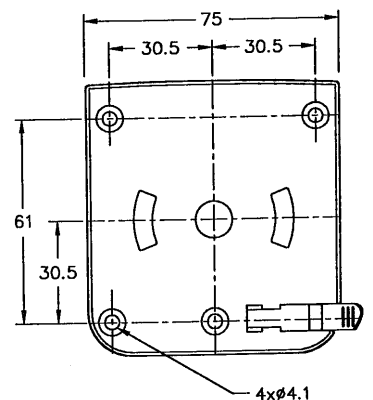
- Suction pressure in bar x 760 = mm Hg
- Suction pressure in bar x 33.5 = Ft H<sub>2</sub>O
- Back pressure in bar x 14.5 = psi



## CUSTOMER DRIVE DETAILS



## MOUNTING PLATE



## 313FDP/D fixed/variable speed DC pump, precision motors



The 313FDP/D uses our highest quality DC motor, offering precise speed adjustment, low electrical and audible noise, and a long operating life.

The 313FDP/D OEM pump is made up of a single channel 313D pumphead and a powerful 12 or 24 volt DC motor-gearbox, mounted on an aluminum faceplate. The coreless DC motors provide high torque output, and speed in a small case size. When fitted with 8.0mm x 1.6mm tubing, these pumps provide flow rates of up to 1250 ml/min. Snap on the 313X extension pumpheads to enable multi-channel pumping, depending on the torque limit of the drive (see page 18 for details on pumphead torque figures). When used with the 400 series OEM speed control board, the 313FDP/D provides a variable speed pumping system with a speed control ratio of 20:1, as well as stop/start and direction facilities, and analog control of speed. See page 37 for speed controls.

### Ordering information

12V DC		24V DC		Power Consumption
50rpm	<i>040.MK10.3D0</i>	50rpm	<i>040.LK10.3D0</i>	5 VA
100rpm	<i>040.MP10.3D0</i>	100rpm	<i>040.LP10.3D0</i>	30 VA
250rpm	<i>040.MT10.3D0</i>	250rpm	<i>040.LT10.3D0</i>	30 VA

### Specifications

Motor type	12 or 24V DC
Motor torque output	50rpm 11kg cm 100rpm 14kg cm 250rpm 6kg cm
Weight	2kg (4.4lbs)

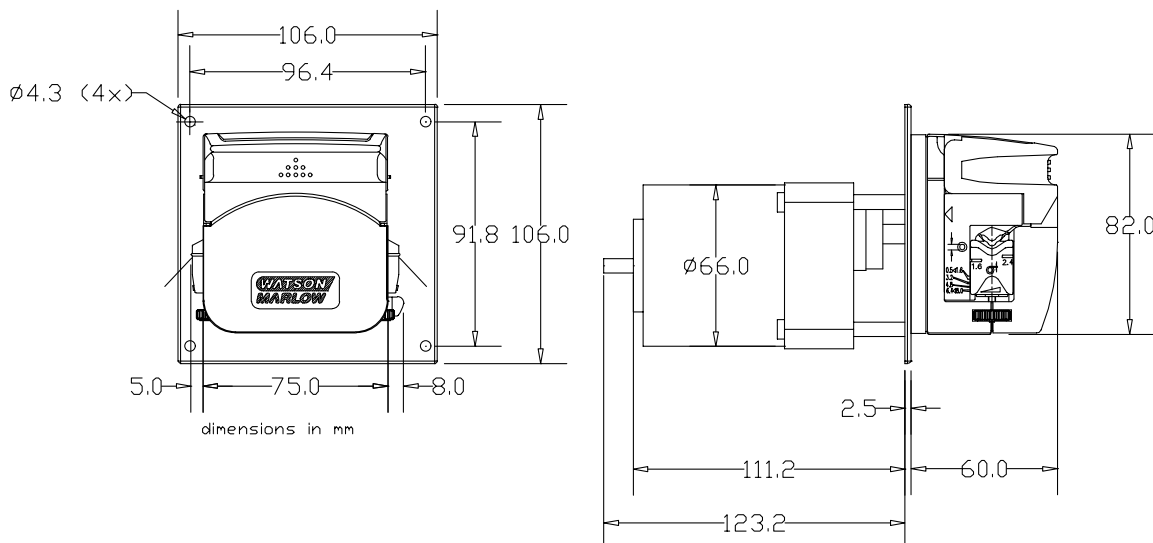
### Flow rates

rpm	1.6mm (1/16") wall thickness tubing						
	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"
50	1.50	3.00	13.0	50.0	110	180	250
100	3.00	6.00	26.0	100	220	360	500
250	7.50	15.0	65.0	250	550	900	1250

Minimum flows are 5% of rates given with OEM speed control board

For tube selections, see Tables A and B on page 47.

ALL DIMENSIONS IN MILLIMETRES





## 313VDL/D variable speed pumps with brushless DC motor



The 313VDL/D uses a high quality brushless DC motor that provides precise speed adjustment, and low electrical and audible noise. Brushless DC motors have an extremely long service life because they have no internal wearing components. The 313VDL/D OEM pump is made up of a single channel 313D pumphead and a powerful 24V brushless DC gearmotor with built in controller, mounted on an aluminum faceplate. When fitted with 8.0mm x 1.6mm tubing, these pumps provide flow rates of up to 1750 ml/min. Snap on the 313X extension pumpheads to enable multi-channel pumping, depending on the torque limit of the drive (see page 18 for details on pumphead torque figures). The built-in controller allows control of speed, stop/start, direction, and a frequency tacho output.

### Ordering information

#### 24V DC Brushless

100rpm	040.NP10.3D0
350rpm	040.NU10.3D0

For tube selections, see Tables A and B on inside back cover.

### Specification Motor

Motor type	24 Volt Brushless DC with built in controller
Motor torque output	100rpm, 21.0kg cm 350rpm, 7.3kg cm
Power consumption	35VA
Weight	1.0kg (2.2 lbs)

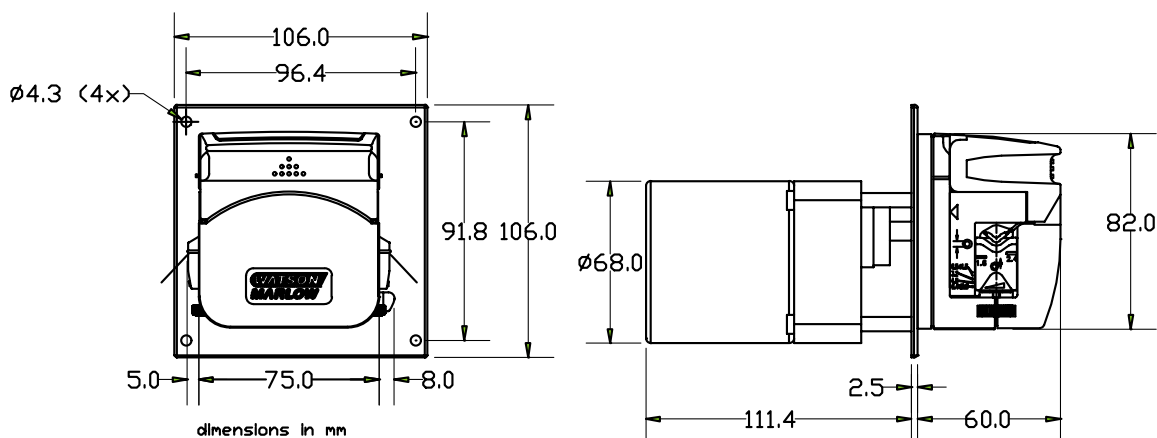
### Motor/Controller Connections

Lead no.	Lead Color	Function	Descriptions
1	brown	FW/RV	Direction control input: 'High' CW, 'Low' CC (shaft side)
2	white	Vin	Input voltage (set-point) for speed loop. Resulting speed approx. 1000 rpm/V Vin < 4V: motor at full speed, speed loop off (open loop)
3	green	FG	Frequency generator output, 36 ppr; R out = 4kOhm (approx.)
4	black	GND	Motor return, ground (0v)
5	red	Vp	Motor supply voltage +24V (min 14V – Max 30V)
6	bare	shield	Shield for cable and connection to motor housing

### Flow rates (ml/min)

rpm	1.6mm (1/16") wall tubing						
	0.5mm 1/50"	0.8mm 1/32"	1.6mm 1/16"	3.2mm 1/32"	4.8mm 3/16"	6.4mm 1/16"	8.0mm 5/16"
100	3.00	6.00	26.0	100	220	360	500
350	10.5	21.0	91.0	350	770	1260	1750

For tube selections, see Tables A and B on page 47.



## 313FD/D fixed/variable speed DC pump



Made up of one 313D pumphead, a 12 or 24V DC motor, a gearbox, and a faceplate, these pumps provide flow rates up to 500 ml/min from 8.0mm bore tubing. Additionally, snap on the 313X extension pumpheads to enable multi-channel pumping, depending on the torque limit of the drive (see page 18 for details of pumphead torque figures). The six drives available give a choice of speeds and voltages.

When used with the 300 series OEM speed control board 039.2021.000 (see page 6), the 12V 313FD/D provides a variable speed pumping system with a speed control ratio of 10:1 and other facilities.

### Ordering information

#### 12V DC

10rpm	030.7002.000
50rpm	030.7022.000
100rpm	030.7062.000

#### 24V DC

10rpm	030.7502.000
50rpm	030.7522.000
100rpm	030.7562.000

### Specifications

Motor type	12 or 24V DC
Motor torque output	10rpm 24kg cm; 50rpm 11kg cm; 100rpm 6kg cm
Power consumption	17VA
Weight	2kg
Brush life	2500 hours

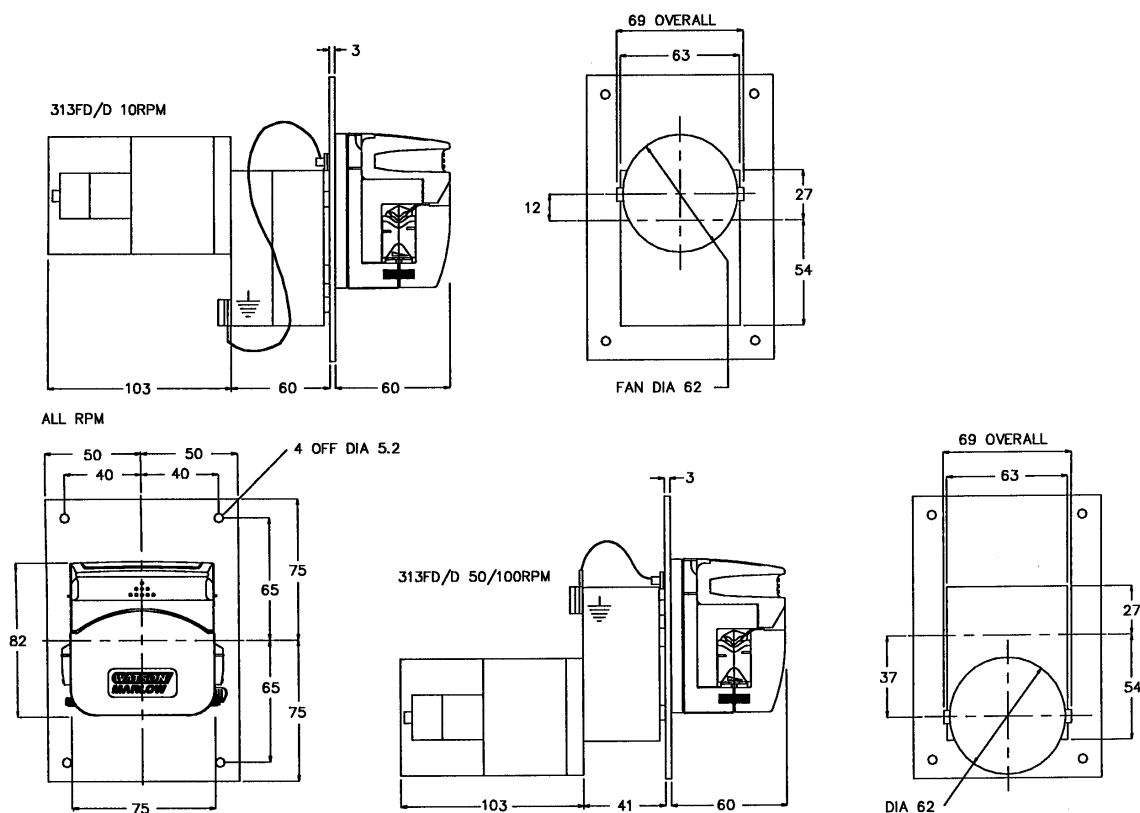
### Flow rates

rpm	1.6mm (1/16") wall thickness tubing						
	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"
10	0.30	0.70	2.60	10.0	22.0	36.0	50.0
50	1.50	3.00	13.0	50.0	110	180	250
100	3.00	6.00	26.0	100	220	360	500

Minimum flows are 10% of rates given with OEM speed control board

For tube selections, see Tables A and B on page 47.

ALL DIMENSIONS IN MILLIMETRES



## 313FDC/D fixed speed 12V DC pump



The 313FDC/D OEM pump is made up of one 313D pumphead, a 12V DC motor, the Watson-Marlow gearbox, and a faceplate. These pumps are available for applications that require more torque than is available from the 313FD/D, providing flow rates up to 1100 ml/min for continuous use from 8.0mm bore tubing.

Additionally, snap on 313X extension pumpheads for multi-channel pumping, depending on the torque limit of the drive (see pumphead torque figures on page 18).

### Ordering information

12V DC 220rpm *030.8932.000*

### Specifications

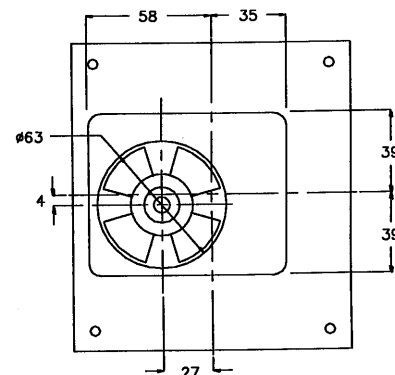
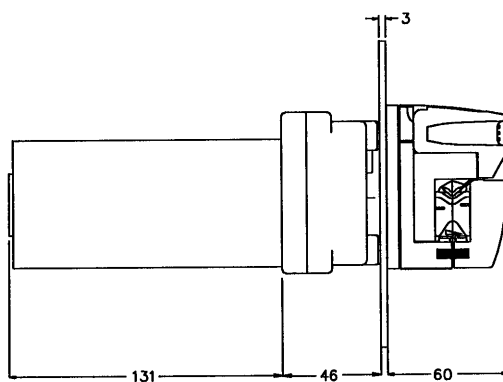
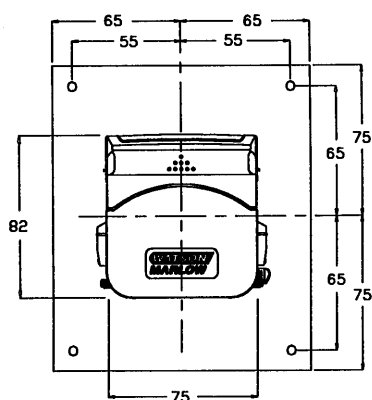
Motor type	12V DC
Motor torque output	14kg cm
Motor consumption	35VA
Weight	2.2kg
Brush life	2500 hours

### Flow rates

rpm	1.6mm (1/16") wall thickness tubing						
	0.5mm 1/50"	0.8mm 1/32"	1.6mm 1/16"	3.2mm 1/8"	4.8mm 3/16"	6.4mm 1/16"	8.0mm 5/16"
220	6.60	13.2	57.2	220	484	792	1100

For tube selections, see Tables A and B on page 47.

ALL DIMENSIONS IN MILLIMETRES



## 313FAC/D fixed speed AC pump



The 313FAC/D is made up of one 313D pumphead, an induction motor, Watson-Marlow's purpose-designed gearbox, and a faceplate. It is available in three standard voltages with a choice of four speeds, providing flow rates up to 1620 ml/min from 8.0 mm bore tubing (1350 ml/min if used on 50 Hz supplies).

Snap on up to five 313X extension pumpheads for multi-channel pumping depending on the torque limit of the drive (see pumphead torque figures on page 18).

### Ordering information

	100-120V AC	220V AC	240V AC
33/40rpm 50/60Hz	030.8802.000	030.8803.000	030.8812.000
67/80rpm 50/60Hz	030.8822.000	030.8823.000	030.8832.000
135/162rpm 50/60Hz	030.8842.000	030.8843.000	030.8852.000
270/324rpm 50/60Hz	030.8862.000	030.8863.000	030.8872.000

### Specification

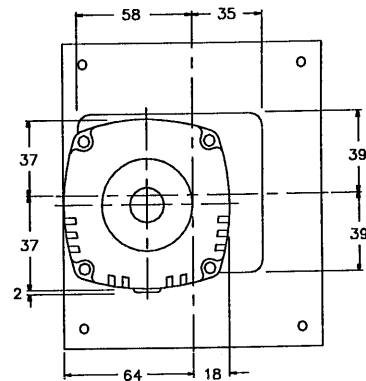
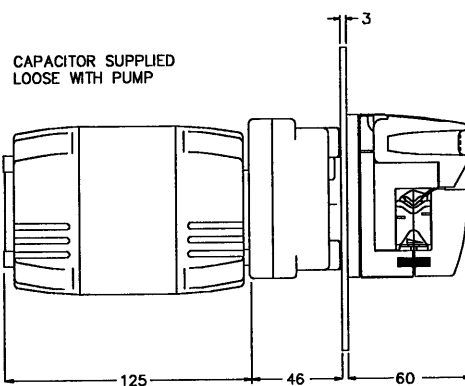
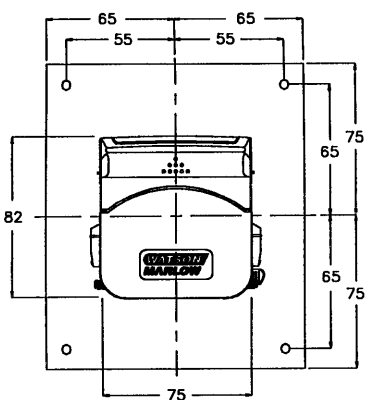
Motor type	Induction
Motor torque output	33/67rpm 20kg cm 40/80rpm 16kg cm 135/270rpm 10kg cm 162/324rpm 8kg cm
Power consumption	50VA
Weight	2.5kg

### Flow rates

		1.6mm (1/16") wall thickness tubing						
		0.5mm	0.8mm	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm
Hz	rpm	1/50"	1/32"	1/16"	1/8"	3/16"	1/4"	5/16"
50	33	1.00	2.00	8.6	33.0	72.6	119	165
	67	2.00	4.00	17.4	67.0	147	241	335
	135	4.00	8.10	35.1	135	297	486	675
	270	8.10	16.2	70.2	270	594	972	1350
60	40	1.20	2.40	10.4	40.0	88.0	144	200
	80	2.40	4.90	20.8	80.0	176	288	400
	162	4.80	9.70	42.1	162	356	583	810
	324	9.70	19.4	84.2	324	713	1166	1620

For tube selections, see Tables A and B on page 47.

ALL DIMENSIONS IN MILLIMETRES



## 313FC/D fixed speed AC Pump



Made up of one 313D pumphead, a shaded pole motor, a gearbox and a faceplate, these pumps provide flow rates up to 500 ml/min from 8.0mm bore tubing. The motor is rated for continuous duty, making this pump ideal for both dosing and transfer duties. Extension pumpheads may be snapped on for multi-channel pumping, depending on the torque limit of the drive (see pumphead torque figures on page 18). With a choice of speeds and voltages, the 313FC/D provides a low cost OEM pumping system. The 313FC/D is supplied with a motor cooling fan. U.L. listed motors are available upon request.

### Ordering information

	220-240V AC	100-120V AC
10rpm 50Hz	030.6032.000	030.6002.000
50rpm 50Hz	030.6232.000	030.6202.000
100rpm 50Hz	030.6632.000	030.6602.000

### Specifications

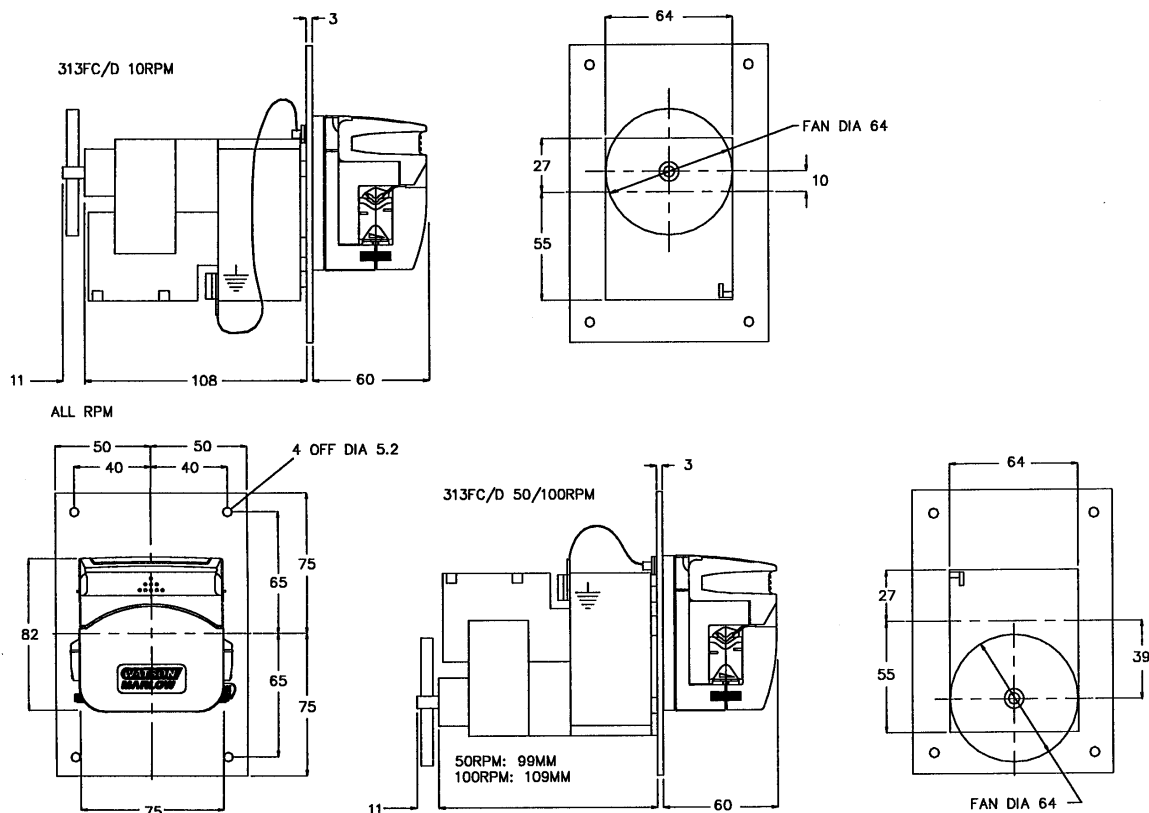
Motor type	Shaded pole induction
Motor torque output	10rpm 19.5kg cm; 50rpm 7.5kg cm; 100rpm 6.5kg cm
Power consumption	10rpm 21VA; 50, 100rpm 40VA
Weight	2.2kg

### Flow rates

		1.6mm (1/16") wall thickness tubing						
		0.5mm 1/50"	0.8mm 1/32"	1.6mm 1/16"	3.2mm 1/8"	4.8mm 3/16"	6.4mm 1/16"	8.0mm 5/16"
50	10	0.30	0.60	2.60	10.0	22.0	36.0	50.0
	50	1.50	3.00	13.0	50.0	110	180	250
	100	3.00	6.00	26.0	100	220	360	500
60	12	0.40	0.70	3.10	12.0	26.4	43.2	60.0
	60	1.80	3.60	15.6	60.0	132	216	300
	115	3.45	6.90	30.0	115	253	414	575

For tube selections, see Tables A and B on page 47.

ALL DIMENSIONS IN MILLIMETRES



## 313/314 maximum number of pumpheads permissible

### Permissible pumpheads

Maximum number of gangable 313/314 pumpheads using Marprene tubing

Pressure limits		Up to 0.5 bar							Up to 2 bar						
Tube	mm	0.5	0.8	1.6	3.2	4.8	6.4	8.0	0.5	0.8	1.6	3.2	4.8	6.4	8.0
bore	"	1/50	1/32	1/16	1/8	3/16	1/4	5/16	1/50	1/32	1/16	1/8	3/16	1/4	5/16
313FAC	33/40rpm	6	6	6	6	4	4	3	6	6	6	5	3	2	2
	67/80rpm	6	6	6	5	3	3	2	6	6	6	4	2	2	2
	135/162rpm	6	6	5	3	2	2	1	6	6	4	2	1	1	1
	270/324rpm	5	5	4	2	1	1	1	5	5	3	2	1	1	1
313FDC	220rpm	6	6	6	5	3	2	2	6	6	6	3	2	2	1
313FC	10rpm	6	6	6	6	4	4	3	6	6	6	4	3	2	2
	50rpm	5	3	2	1	1	1	5	5	3	1	1	1	0	0
	100rpm	4	3	2	1	1	1	4	4	3	1	1	0	0	0
313FD	10rpm	6	6	6	6	5	5	3	6	6	6	6	3	3	3
	50rpm	6	5	3	2	2	1	6	6	5	2	1	1	1	1
	100rpm	4	3	2	1	1	0	4	4	2	1	0	0	0	0
313FDP	50rpm	6	6	4	3	2	1	1	6	6	4	2	1	1	1
	100rpm	6	6	3	2	2	2	6	6	5	2	1	1	1	1
	250rpm	3	2	1	1	1	1	3	3	2	1	0	0	0	0
313FBD	100rpm	6	6	6	6	5	4	3	6	6	6	5	3	3	2
	350rpm	4	4	4	2	1	1	1	4	4	3	1	1	1	0

Maximum number of gangable 313/314 pumpheads using Silicone tubing

Pressure limits		Up to 0.5 bar							Up to 2 bar						
Tube	mm	0.5	0.8	1.6	3.2	4.8	6.4	8.0	0.5	0.8	1.6	3.2	4.8	6.4	8.0
bore	"	1/50	1/32	1/16	1/8	3/16	1/4	5/16	1/50	1/32	1/16	1/8	3/16	1/4	5/16
313FAC	33/40rpm	6	6	6	6	6	5	4	6	6	6	6	4	3	2
	40/80rpm	6	6	6	6	5	4	4	6	6	6	5	3	3	2
	135/160rpm	6	6	5	4	3	2	2	6	6	5	3	2	1	1
	270/324rpm	6	6	4	3	2	2	2	5	5	3	2	1	1	1
313FDC	220rpm	6	6	6	6	5	4	3	6	6	6	4	4	2	2
313FC	10rpm	6	6	6	6	6	5	4	6	6	6	6	4	3	2
	50rpm	6	4	3	2	2	1	5	5	3	2	1	1	1	1
	100rpm	5	3	2	2	1	1	4	4	3	2	1	1	1	1
313FD	10rpm	6	6	6	6	6	6	6	6	6	6	6	5	4	3
	50rpm	6	6	4	3	3	2	6	6	5	3	2	2	1	1
	100rpm	5	3	2	2	1	1	4	4	2	1	1	1	0	0
313FDP	50rpm	6	6	6	3	3	2	2	6	6	4	2	2	1	1
	100rpm	6	6	5	3	3	2	6	6	5	3	2	2	1	1
	250rpm	4	2	1	1	1	1	2	2	1	1	1	1	0	0
313FBD	100rpm	6	6	6	6	5	5	3	6	6	6	6	5	4	3
	350rpm	5	5	3	2	2	1	1	3	3	2	1	1	1	1





## Microcassette pumpheads



The 300 series of interchangeable OEM pumpheads also includes the 304MC and 308MC microcassette pumpheads, with a choice of four rollers for higher flow or eight rollers for higher precision. Microcassette pumpheads are available with three or five pumping channels.

Designed to give affordable precision for multi-channel applications, each pumphead contains removable cassettes which may be preloaded with tubing elements. Up to two MCX or three MCX3 extension pumpheads may be added to a maximum twelve or fifteen channels, depending on the drive selected.

Cassettes may be removed and tubing changed at any time without stopping the drive or disturbing neighboring channels, and each cassette will accept any of the twenty tube sizes available.

Double segment manifold tubing elements are available in Marprene, PVC and Platinum-cured Silicone and feature two pumping segments to give double tube life. Adjacent cassettes may contain tubing of a different type or size.

Microcassette pumpheads are compatible with all 300 Series motors and controllers.

### Ordering information

304MC four roller five channel pumphead	033.6450.000
308MC eight roller five channel pumphead	033.6850.000
304MCX four roller five channel extension pumphead	033.6451.000
308MCX eight roller five channel extension pumphead	033.6851.000
304MC3 four roller three channel pumphead	033.6460.000
308MC3 eight roller three channel pumphead	033.6860.000
304MCX3 four roller three channel extension pumphead	033.6462.000
308MCX3 eight roller three channel extension pumphead	033.6862.000

### Materials of construction

Bayonet mounting plate	IXEF
Spindles, shaft, screws	Stainless steel
Cassette	Kematal
Sealed bearings	Carbon steel
Rollers, locking rods	MOS2 filled Nylon 6 (Nylatron)
Body, rotor	Aluminium

### 304MC Flow rates

	Double segment manifold tubing						
	0.13mm	0.19mm	0.25mm	0.38mm	0.50mm	0.63mm	0.76mm
Bore mm	0.13mm	0.19mm	0.25mm	0.38mm	0.50mm	0.63mm	0.76mm
Bore "	0.005"	0.007"	0.01"	0.015"	0.02"	0.025"	0.03"
Flow rate: ml/revolution	0.001	0.003	0.005	0.008	0.015	0.028	0.042
Maximum continuous flow: ml/min	0.1	0.3	0.52	0.92	1.7	3.1	4.6
Bore mm	0.88mm	1.02mm	1.14mm	1.29mm	1.42mm	1.47mm	1.52mm
Bore "	0.035"	0.04"	0.045"	0.05"	0.055"	0.058"	0.06"
Flow rate: ml/revolution	0.058	0.074	0.09	0.12	0.15	0.16	0.17
Maximum continuous flow: ml/min	6.40	8.10	9.90	13.0	17.0	18.0	19.0
Bore mm	1.65mm	1.85mm	2.05mm	2.29mm	2.54mm	2.79mm	
Bore "	0.065"	0.07"	0.08"	0.09"	0.1"	0.11"	
Flow rate: ml/revolution	0.2	0.25	0.3	0.36	0.43	0.48	
Maximum continuous flow: ml/min	22.0	28.0	33.0	40.0	47.0	53.0	

For tube selections, see Table F on page 47.

## 304MC Specifications

Bore mm	0.5mm	1.02mm	1.52mm	2.05mm	2.54mm	2.79mm
Bore "	0.02"	0.04"	0.06"	0.08"	0.1"	0.11"
Maximum continuous speed: rpm	110	110	110	110	110	110

**With Marprene tubing** (Cam lever vertical, all cassettes full)

Required torque: kg cm	1.8	2.9	3.6	3.6	3.6	3.6
Maximum pressure: bar	2	2	2	1.3	1.3	1
Maximum vacuum: mmHg	400	400	300	300	200	200
Maximum vacuum: feet of water	16	16	12	12	8	8

**With Silicone tubing** (Cam lever vertical, all cassettes full)

Required torque: kg cm	1.6	2.6	3.2	3.2	3.2	3.2
Maximum pressure: bar	2	2	1.3	1.3	1	1
Maximum vacuum: mmHg	400	400	300	300	200	200
Maximum vacuum: feet of water	16	16	12	12	8	8

## 308MC Flow rates

	Double segment manifold tubing						
	0.13mm	0.19mm	0.25mm	0.38mm	0.5mm	0.63mm	0.76mm
Bore mm	0.005"	0.007"	0.01"	0.015"	0.02"	0.025"	0.03"
Flow rate: ml/revolution	0.001	0.003	0.004	0.008	0.013	0.024	0.035
Maximum continuous flow: ml/min	0.1	0.30	0.47	0.83	1.40	2.60	3.90
Bore mm	0.88mm	1.02mm	1.14mm	1.29mm	1.42mm	1.47mm	1.52mm
Bore"	0.035"	0.04"	0.045"	0.05"	0.055"	0.058"	0.06"
Flow rate: ml/revolution	0.048	0.06	0.08	0.95	0.11	0.12	0.13
Maximum continuous flow: ml/min	5.30	6.60	8.80	10.0	12.0	13.0	14.0
Bore mm	1.65mm	1.85mm	2.05mm	2.38mm	2.54mm	2.79mm	
Bore"	0.065"	0.07"	0.08"	0.09"	0.1"	0.11"	
Flow rate: ml/revolution	0.15	0.18	0.22	0.26	0.30	0.33	
Maximum continuous flow: ml/min	17.0	20.0	24.0	29.0	33.0	36.0	

For tube selections, see Table F on page 47.

## 308MC Specifications

Bore mm	0.5mm	1.02mm	1.52mm	2.05mm	2.54mm	2.79mm
Bore "	0.02"	0.04"	0.06"	0.08"	0.1"	0.11"
Maximum continuous speed: rpm	110	110	110	110	110	110

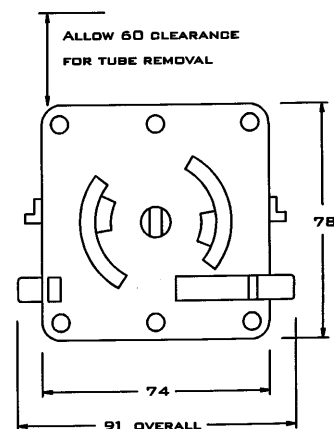
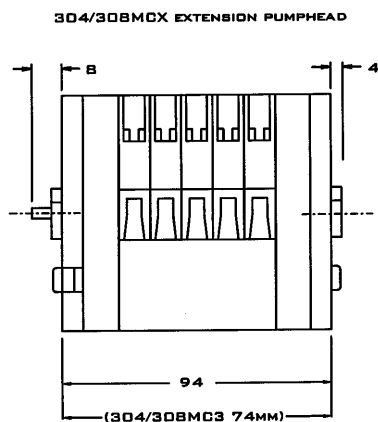
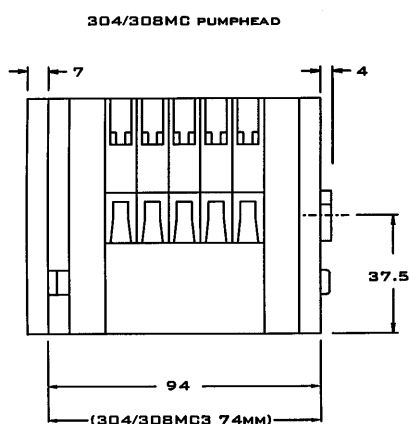
**With Marprene tubing** (Cam lever vertical, all cassettes full)

Required torque: kg cm	4.1	4.5	5.5	5.8	6.0	6.0
Maximum pressure: bar	2	2	2	1.3	1.3	1
Maximum vacuum: mmHg	400	400	300	300	200	200
Maximum vacuum: feet of water	16	16	12	12	8	8

**With Silicone tubing** (Cam lever vertical, all cassettes full)

Required torque: kg cm	2.6	2.8	3.5	3.7	3.8	3.8
Maximum pressure: bar	2	2	1.3	1.3	1	1
Maximum vacuum: mmHg	400	400	300	300	200	200
Maximum vacuum: feet of water	16	16	12	12	8	8

**Note:** To work against higher pressures, the cam lever may be moved beyond the vertical position. Torque requirement will be approximately 2 to 3 times that listed, and tube life could be shortened.



The 400 Series is a complete range of pumps for low and medium flow applications. These pumps are designed in a modular way, giving them a large number of standard versions, and the ability to customise. If you don't see exactly what you are looking for, our sales engineers can help you make changes ranging from simple modifications, to a completely new pump design.

The 400 Series is organized in a 3 tiered system. Tier I is our standard product offering as shown in the catalogue. Each one can be ordered using the part numbers listed. A Tier II product is a customized version of the standard.

The modifications tend to be simple things, such as an alternate gear ratio, or tube holder. Table A lists some of the more common options available to Tier II products. A Tier III product is also a custom product, but there are no limits on what can be done. Tier III can take any form, such as a stepper drive with a custom mounting plate, or an entirely new pump designed and built from scratch. Three examples of Tier III products are pictured below. This system allows the pump design to evolve with your product design. Start with a standard product for your early prototypes, and add custom options as your design moves towards production.

Table A Tier II Pump Options for 400 Series pumps

Option	Pumphead		D3	DM2-3	M1	N	VM	G	R1	L2
	B1	D2								
Multiple channel versions	2	2			2,3,4	4,6,8	2,3,4	2,3,4	1,2	2
Tube WT	1.6,1.0				1.6,1.0					
Pumphead-only version					X	X				
# of rollers	4	4	4	4	4	4	10	4,8	4,8	4
PVDF track & rotor	X	X	X	X	X	X			X	
Low pulsation dual offset pumpheads	X									X
Continuous tubing	X								X	X
Tube elements with barb/luer connectors		X	X		X	X			X	X
Manifold tubing				X			X	X		
High speed intermittent duty pumps	X	X	X	X	X	X	X	X	X	X
Alternate gear ratios	X	X	X	X	X	X	X	X	X	X
Speed controls	X	X	X	X	X	X	X	X	X	X

## Tier III Products



The precise flow of the B1 pumphead was required for this 8 channel variant.



This customer needed a completely new closed pump for a medical application.



This was required for an extremely small application; the pump is only 50mm long by 75mm wide.

## 400F/B1 series one channel peristaltic pumps



400F/B1

The 400F/B1 is our standard instrument-quality peristaltic pump for low flow rates. The 400F/B1 has a spring-loaded track, which gives superior tube life and flow-accuracy. The tubing occlusion can be adjusted to produce higher pressures. The pump is available with four gearmotors options. Each one is extremely small in size and has low power requirements. The pump accepts continuous tubing with a 1.6mm wall. The tubing is available in six bore sizes, allowing the user to precisely match the pump to the required flow. See page 21 for additional options.

### Flow capacity

	1.6mm (1/16") wall thickness continuous tubing					
	0.5mm 1/50"	0.8mm 1/32"	1.6mm 1/16"	2.4mm 3/32"	3.2mm 3/16"	4.0mm 5/32"
Flow rate ml/revolution	0.01	0.03	0.11	0.24	0.41	0.59
Max continuous flow ml/min 200 rpm	2.0	6.0	22	44	81	117
Max intermittent flow ml/min 400 rpm	4.4	12	46	96	164	236

### Materials of construction

Rotor, rollers, track, tube holder	Black Acetal (POM)
Mounting plate	Black anodized aluminium
Screws, springs, shafts	Acid resistant stainless steel

### Specifications

Maximum continuous speed	200 rpm
Maximum intermittent speed	400 rpm
Weight of complete pump	240-420 g
Tube type	Tube elements with fittings

### Performance against pressure

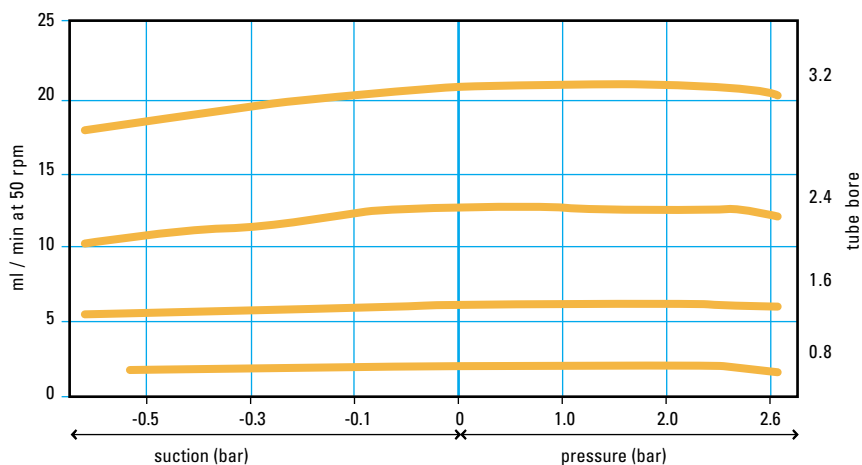
The spring-loaded tension arm makes it possible to adjust the pump to operate at higher back pressures/suction heights without overloading the tubing. In the diagram shown below, the arm is set for optimal performance at back pressures up to approx. 2.5 bar. The pump is capable of operating against pressures up to 3 bar.

### Conversion Factors:

Suction pressure in bar x 760 = mm Hg

Suction pressure in bar x 33.5 = Ft H<sub>2</sub>O

Back pressure in bar x 14.5 = psi



## Ordering information

Standard DC	12rpm	40rpm	100rpm	200rpm
400FDC/B1 12V	040.D81B.01C	040.DH1B.01C	040.DP1B.01C	040.DS1B.01C
400FDC/B1 24V	040.E81B.01C	040.EH1B.01C	040.EP1B.01C	040.ES1B.01C
Economy DC	25rpm	75rpm	200rpm	350rpm
400FD/B1 12V	040.AC1B.01C	040.AN1B.01C	040.AS1B.01C	040.AU1B.01C
400FD/B1 24V	040.BC1B.01C	040.BN1B.01C	040.BS1B.01C	040.BU1B.01C
Brushless DC	15rpm	50rpm	130rpm	250rpm
400FDL/B1 24V	040.F91B.01C	040.FK1B.01C	040.FQ1B.01C	040.FT1B.01C
Synchronous AC 115V	5rpm	12rpm	25rpm	
400FS/B1 115VAC 60Hz	040.H41B.01C	040.H81B.01C	040.HC1B.01C	
Synchronous AC 220V	4rpm	10rpm	20rpm	
400FS/B1 230 V 500Hz	040.J31B.01C	040.J71B.01C	040.JA1B.01C	

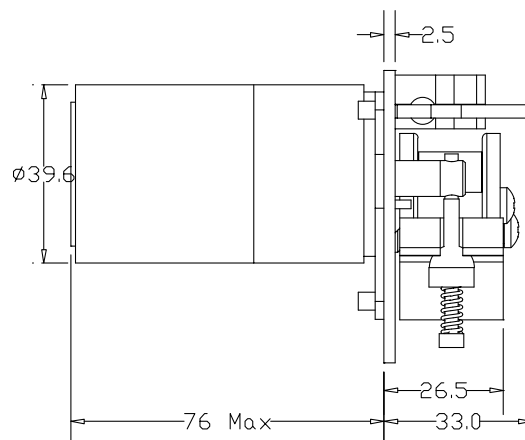
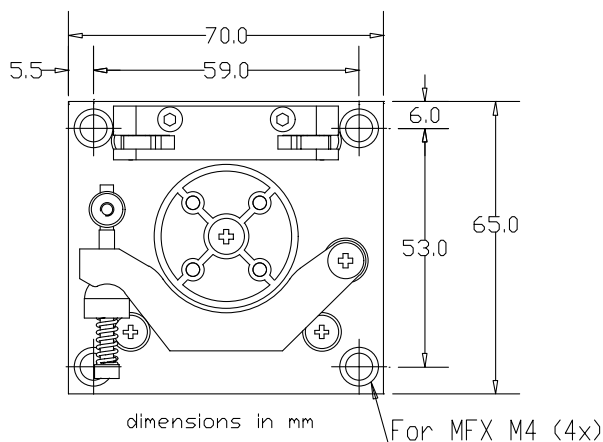
See motor descriptions on page 45.

## Flow rates

Bore mm Bore "	Single Channel 1.6mm (1/16") wall thickness tubing					
	0.5mm 1/50"	0.8mm 1/32"	1.6mm 1/16"	2.4mm 3/32"	3.2mm 3/16"	4.0mm 5/32"
Standard DC 12rpm	0.120	0.360	1.32	2.88	4.92	7.08
Standard DC 40rpm	0.400	1.20	4.40	9.60	16.4	23.6
Standard DC 100rpm	1.00	3.00	11.0	24.0	41.0	59.0
Standard DC 200rpm	2.00	6.00	22.0	48.0	82.0	118
Economy DC 25rpm	0.250	0.750	2.75	6.00	10.25	14.8
Economy DC 75rpm	0.750	2.25	8.25	18.0	30.8	44.3
Economy DC 200rpm	2.00	6.00	22.0	48.0	82.0	118
Economy DC 350rpm	3.50	10.5	38.5	84.0	144	207
Brushless DC 15rpm	0.150	0.450	1.65	3.60	6.15	8.85
Brushless DC 50rpm	0.500	1.50	5.50	12.0	20.5	29.5
Brushless DC 130rpm	1.30	3.90	14.3	31.2	53.3	76.7
Brushless DC 250rpm	2.50	7.50	27.5	60.0	103	148
Synchronous AC 60Hz 5rpm	0.050	0.150	0.55	1.20	2.1	3.0
Synchronous AC 60Hz 12rpm	0.120	0.360	1.32	2.88	4.92	7.08
Synchronous AC 60Hz 25rpm	0.250	0.750	2.75	6.00	10.25	14.8
Synchronous AC 50Hz 4rpm	0.040	0.120	0.44	0.96	1.6	2.4
Synchronous AC 50Hz 10rpm	0.100	0.300	1.10	2.40	4.10	5.90
Synchronous AC 50Hz 20rpm	0.200	0.600	2.20	4.80	8.20	11.8

See motor descriptions on page 45.

For tube selections, see Table A on page 47.



## 400F/D2-D3 two or three channel peristaltic pumps



400F/D2

The 400F/D is our standard instrument-quality peristaltic pump for low flow rates. The pumps have a spring-loaded track, which gives superior tube life and flow-accuracy. The tubing occlusion can be adjusted to produce higher pressures. The pump is available with four standard gearmotors. Each one is extremely small in size and has low power requirements. The pump accepts tube elements with a 1.0mm wall thickness. The tubing is available in four bore sizes, allowing the user to precisely match the pump to the required flow. See page 21 for additional options.

### Flow capacity

Bore mm	1.0mm wall thickness tubing elements			
	0.5mm	1.0mm	2.0mm	3.0mm <sup>1</sup>
Flow rate ml/revolution	0.013	0.05	0.18	0.33
Max continuous flow ml/min	2.6	10	36	66
Max intermittent flow ml/min	5.2	20	72	132

<sup>1</sup> rated for silicone tubing only

### Materials of construction

Rotor, rollers, track, tube holder	Black Acetal (POM)
Mounting plate	Black anodized aluminium
Screws, springs, shafts	Acid resistant stainless steel

### Specifications

Maximum continuous speed	200 rpm
Maximum intermittent speed	400 rpm
Weight of complete pump	240-420 g
Tube type	Tube elements with fittings

### Performance against pressure

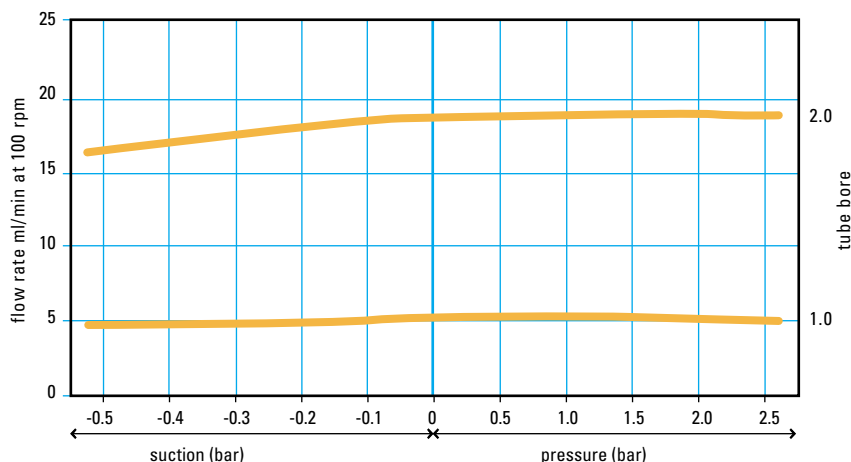
The spring-loaded tension arm makes it possible to adjust the pump to operate at higher back pressures/suction heights without overloading the tubing. In the diagram shown below, the arm is set for optimal performance at back pressures up to approx. 2.5 bar. The pump is capable of operating against pressures up to 2.5 bar.

### Conversion Factors:

Suction pressure in bar x 760 = mm Hg

Suction pressure in bar x 33.5 = Ft H<sub>2</sub>O

Back pressure in bar x 14.5 = psi







400F/D3

## Ordering information

Standard DC	12rpm	40rpm	100rpm	200rpm
400FDC/D2 12V Two channel	040.D81D.N2C	040.DH1D.N2C	040.DP1D.N2C	040.DS1D.N2C
400FDC/D2 24V Two channel	040.E81D.N2C	040.EH1D.N2C	040.EP1D.N2C	040.ES1D.N2C
400FDC/D3 12V Three channel	040.D81D.N3C	040.DH1D.N3C	040.DP1D.N3C	
400FDC/D3 24V Three channel	040.E81D.N3C	040.EH1D.N3C	040.EP1D.N3C	
Economy DC	25rpm	75rpm	200rpm	
400FD/D2 12V Two channel	040.AC1D.N2C	040.AN1D.N2C	040.AS1D.N2C	
400FD/D2 24V Two channel	040.BC1D.N2C	040.BN1D.N2C	040.BS1D.N2C	
400FD/D3 12V Three channel	040.AC1D.N3C	040.AN1D.N3C		
400FD/D3 24V Three channel	040.BC1D.N3C	040.BN1D.N3C		
Brushless DC	15rpm	50rpm	130rpm	250rpm
400FDL/D2 24V Two channel	040.F91D.N2C	040.FK1D.N2C	040.FQ1D.N2C	040.FT1D.N2C
400FDL/D3 24V Three channel	040.F91D.N3C	040.FK1D.N3C	040.FQ1D.N3C	
Synchronous AC 110V	5rpm	12rpm	25rpm	
400FS/D2 110VAC 60Hz Two channel	040.H41D.N2C	040.H81D.N2C	040.HC1D.N2C	
Synchronous AC 220V	4rpm	10rpm	20rpm	
400FS/D2 220VAC 50Hz Two channel	040.J31D.N2C	040.J71D.N2C	040.JA1D.N2C	

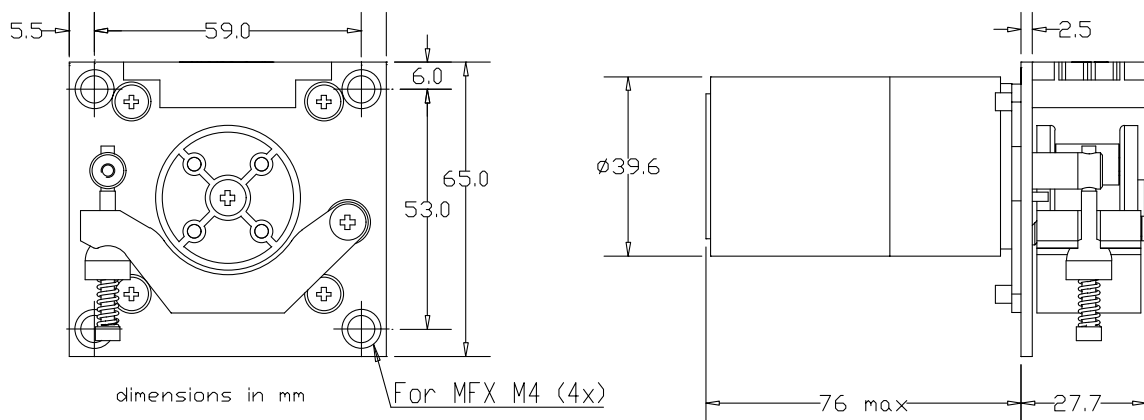
See motor descriptions on page 45.

## Flow rates

Bore mm	Per channel 1.0mm wall thickness			
	0.5mm	1.0mm	2.0mm	3.0mm <sup>1</sup>
Standard DC 12rpm	0.16	0.6	2.2	4.0
Standard DC 40rpm	0.52	2.0	7.2	13.2
Standard DC 100rpm	1.3	5.0	18.0	33.0
Standard DC 200rpm	2.6	10.0	36.0	66.0
Economy DC 25rpm	0.33	1.3	4.5	8.3
Economy DC 75rpm	1.0	3.8	13.5	24.8
Economy DC 200rpm	2.6	10.0	36.0	66.0
Brushless DC 15rpm	0.20	0.75	2.7	5.0
Brushless DC 50rpm	0.65	2.5	9.0	16.5
Brushless DC 130rpm	1.7	6.5	23.4	42.9
Brushless DC 250rpm	3.3	12.5	45.0	82.5
Synchronous AC 60Hz 5rpm	0.07	0.25	0.90	1.7
Synchronous AC 60Hz 12rpm	0.16	0.6	2.2	4.0
Synchronous AC 60Hz 25rpm	0.33	1.3	4.5	8.3
Synchronous AC 50Hz 4rpm	0.05	0.20	0.72	1.3
Synchronous AC 50Hz 10rpm	0.13	0.5	1.8	3.3
Synchronous AC 50Hz 20rpm	0.26	1.0	3.6	6.6

<sup>1</sup> rated for silicone tubing only

For tube selection, see inside back cover.



## 400F/DM2-DM3 two or three channel peristaltic pumps for manifold tubing



400F/DM2

The 400F/DM is our standard instrument-quality peristaltic pump for low flow rates. The pumps have a spring-loaded track, which gives superior life and flow-accuracy. The tubing occlusion can be adjusted to produce higher pressures. The pump is available with four standard gearmotors option. Each one is extremely small in size and has low power requirements. The pump accepts standard manifold tube elements, with three colour-coded stops. The tubing is available in twenty bore sizes, allowing the user to precisely match the pump to the required flow. See page 21 for additional options.

### Ordering information

Standard DC	12rpm	40rpm	100rpm
400FDC/DM2 12V Two channel	<a href="#">040.D81D.M2M</a>	<a href="#">040.DH1D.M2M</a>	<a href="#">040.DP1D.M2M</a>
400FDC/DM2 24V Two channel	<a href="#">040.E81D.M2M</a>	<a href="#">040.EH1D.M2M</a>	<a href="#">040.EP1D.M2M</a>
400FDC/DM3 12V Three channel	<a href="#">040.D81D.M3M</a>	<a href="#">040.DH1D.M3M</a>	<a href="#">040.DP1D.M3M</a>
400FDC/DM3 24V Three channel	<a href="#">040.E81D.M3M</a>	<a href="#">040.EH1D.M3M</a>	<a href="#">040.EP1D.M3M</a>
Economy DC	25rpm	75rpm	
400FD/DM2 12V Two channel	<a href="#">040.AC1D.M2M</a>	<a href="#">040.AN1D.M2M</a>	
400FD/DM2 24V Two channel	<a href="#">040.BC1D.M2M</a>	<a href="#">040.BN1D.M2M</a>	
400FD/DM3 12V Three channel	<a href="#">040.AC1D.M3M</a>	<a href="#">040.AN1D.M3M</a>	
400FD/DM3 24V Three channel	<a href="#">040.BC1D.M3M</a>	<a href="#">040.BN1D.M3M</a>	
Brushless DC	15rpm	50rpm	
400FDL/DM2 24V Two channel	<a href="#">040.FK1D.M2M</a>	<a href="#">040.F91D.M2M</a>	
400FDL/DM3 24V Three channel	<a href="#">040.FK1D.M3M</a>	<a href="#">040.F91D.M3M</a>	
Synchronous AC 110V	5rpm	12rpm	25rpm
400FS/DM2 110VAC 60Hz Two channel	<a href="#">040.H41D.M2M</a>	<a href="#">040.H81D.M2M</a>	<a href="#">040.HC1D.M2M</a>
Synchronous AC 220V	4rpm	10rpm	20rpm
400FS/DM2 220VAC 50Hz Two channel	<a href="#">040.J31D.M2M</a>	<a href="#">040.J71D.M2M</a>	<a href="#">040.JA1D.M2M</a>

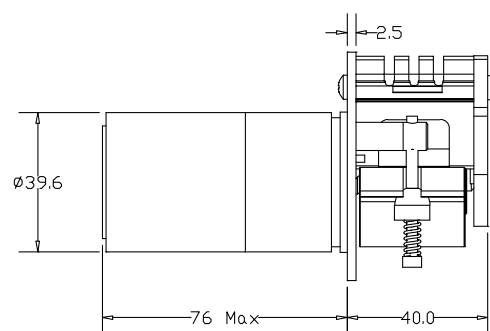
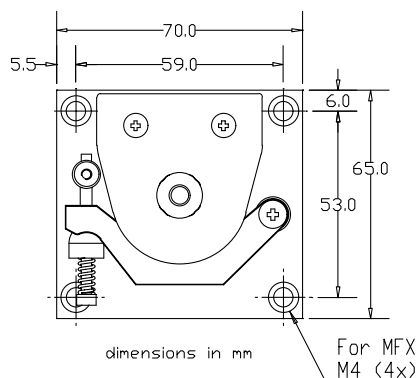
See motor descriptions on page 45.

### Materials of construction

Rotor track	<i>Black Acetal (POM)</i>
Rollers	<i>Black Acetal (POM),</i>
Mounting plate, tube holder,	<i>Anodized aluminium</i>
Screws, springs, shafts	<i>Acid-resistant stainless steel</i>

### Specifications

Maximum continuous speed	<i>100 rpm</i>
Maximum intermittent speed	<i>200 rpm</i>
Weight of complete pump	<i>240-420 g</i>
Tube type	<i>Three-stop manifold tube elements</i>





400F/DM3

## Flow rates

Colour Bore	Orange/Black 0.13mm	Orange/Red 0.19mm	Orange/Blue 0.25mm	Orange/Green 0.38mm	Orange/Yellow 0.50mm
Flow ml/revolution	0.001	0.002	0.004	0.008	0.014
4	0.004	0.008	0.016	0.03	0.06
5	0.005	0.010	0.020	0.04	0.07
10	0.010	0.020	0.040	0.08	0.14
12	0.012	0.024	0.048	0.096	0.168
15	0.015	0.032	0.056	0.12	0.21
20	0.020	0.040	0.080	0.16	0.28
25	0.025	0.050	0.100	0.20	0.35
40	0.040	0.080	0.160	0.32	0.56
50	0.050	0.100	0.200	0.40	0.70
75	0.075	0.150	0.300	0.60	1.105
100	0.100	0.200	0.400	0.80	1.4
Colour Bore	Orange/White 0.63mm	Black/Black 0.76mm	Orange/Orange 0.88mm	White/White 1.02mm	Red/Red 1.14mm
Flow ml/revolution	0.022	0.031	0.043	0.055	0.070
4	0.09	0.12	0.17	0.22	0.28
5	0.11	0.16	0.22	0.28	0.35
10	0.22	0.31	0.43	0.55	0.70
12	0.26	0.37	0.52	0.66	0.84
15	0.33	0.47	0.65	0.83	1.05
20	0.44	0.62	0.86	1.10	1.40
25	0.55	0.78	1.1	1.4	1.8
40	0.88	1.2	1.7	2.2	2.8
50	1.1	1.6	2.2	2.8	3.5
75	1.7	2.3	3.2	4.1	5.3
100	2.2	3.1	4.3	5.5	7.0
Colour Bore	Grey/Grey 1.29mm	Yellow/Yellow 1.42mm	Yellow/Blue 1.52mm	Blue/Blue 1.65mm	Green/Green 1.85mm
Flow ml/revolution	0.089	0.11	0.12	0.14	0.18
4	0.36	0.44	0.48	0.56	0.72
5	0.45	0.55	0.60	0.70	0.90
10	0.89	1.1	1.2	1.4	1.8
12	1.1	1.3	1.4	1.7	2.2
15	1.3	1.7	1.8	2.1	2.7
20	1.8	2.2	2.4	2.8	3.6
25	2.2	2.8	3.0	3.5	4.5
40	3.6	4.4	4.8	5.6	7.2
50	4.5	5.5	6.0	7.0	9.0
75	6.7	8.3	9.0	10.5	13.5
100	8.9	11.0	12.0	14.0	18.0
Colour Bore		Purple/Purple 2.05mm	Purple/Black 2.29mm	Purple/Orange 2.54mm	Purple/White 2.79mm
Flow ml/revolution		0.21	0.26	0.31	0.36
4		0.84	1.04	1.24	1.44
5		1.1	1.3	1.6	1.8
10		2.1	2.6	3.1	3.6
12		2.5	3.1	3.7	4.3
15		3.2	3.9	4.7	5.4
20		4.2	5.2	6.2	7.2
25		5.3	6.5	7.8	9.0
40		8.4	10.4	12.4	14.4
50		10.5	13.0	15.5	18.0
75		15.8	19.5	23.3	27.0
100		21.0	26.0	31.0	36.0

For tube selections, see Table F on page 47.

## 400F/M economy peristaltic pump



The 400F/M pump has premium features in an economical price. The pump shaft is supported by ball bearings which insure a long gearmotor life. The pump uses tube elements for simple tube loading, and luer fittings for easy connection to transfer tubes. The tubes are completely enclosed in the pumping chamber. The pump is available with four standard gearmotors. Each one is extremely small in size and has low power requirements. The pump accepts tube elements with a 1.6mm wall thickness. The tubing is available in six bore sizes, allowing the user to precisely match the pump to the required flow. See page 21 for additional options.

### Flow capacity

	1.6mm (1/16") wall thickness continuous tubing					
	0.5mm 1/50"	0.8mm 1/32"	1.6mm 1/16"	2.4mm 3/32"	3.2mm 1/8"	4.0mm 5/32"
Flow rate ml/revolution	0.01	0.03	0.11	0.24	0.41	0.59
Max continuous flow ml/min 200 rpm	2.0	6	22	48	82	118
Max intermittent flow ml/min 400 rpm	4.0	12	44	96	164	236

### Materials of construction

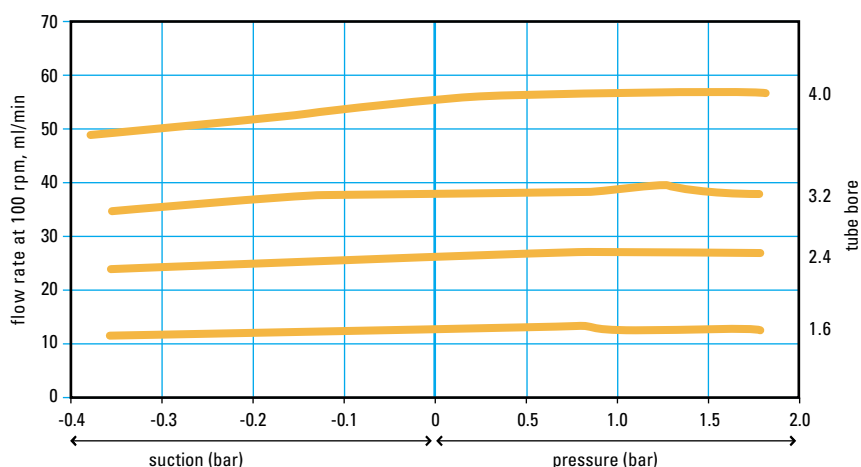
Housing, rotor, rollers, track, tube holder	Acetal (POM)
Mounting plate	Anodized aluminium
Screws, shafts	Acid resistant stainless steel
Bearing	Carbon Steel

### Specifications

Maximum continuous speed	200 rpm
Maximum intermittent speed	400 rpm
Weight of complete pump	0.25 - 0.43kg
Tube type	Tube elements with luer fittings

### Performance against pressure

The M1-pumphead is designed to perform at its best against back pressures up to 2 Bar. The diagram below shows performance at 100 rpm.



### Conversion Factors:

Suction pressure in bar x 760 = mm Hg

Suction pressure in bar x 33.5 = Ft H<sub>2</sub>O

Back pressure in bar x 14.5 = psi

## Ordering information

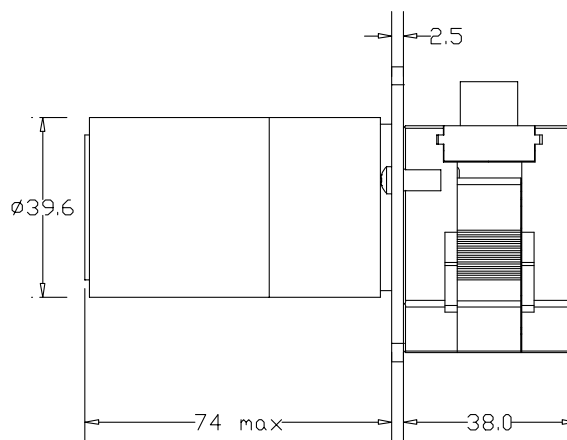
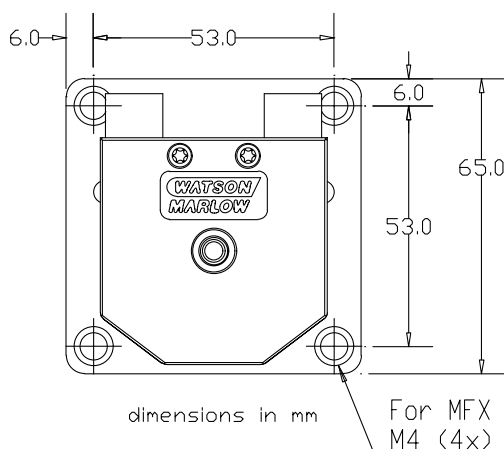
Standard DC	12rpm	40rpm	100rpm	200rpm
400FDC/M1 12V	<i>040.D81M.E1C</i>	<i>040.DH1M.E1C</i>	<i>040.D1PM.E1C</i>	<i>040.DS1M.E1C</i>
400FDC/M1 24V	<i>040.E81M.E1C</i>	<i>040.EH1M.E1C</i>	<i>040.EP1M.E1C</i>	<i>040.ES1M.E1C</i>
Economy DC	25rpm	75rpm	200rpm	350rpm
400FD/M1 12V	<i>040.AC1M.E1C</i>	<i>040.AN1M.E1C</i>	<i>040.AS1M.E1C</i>	<i>040.AU1M.E1C</i>
400FD/M1 24V	<i>040.BC1M.E1C</i>	<i>040.BN1M.E1C</i>	<i>040.BS1M.E1C</i>	<i>040.BU1M.E1C</i>
Brushless DC	15rpm	50rpm	130rpm	250rpm
400FDL/M1 24V	<i>040.F91M.E1C</i>	<i>040.FK1M.E1C</i>	<i>040.FQ1M.E1C</i>	<i>040.FT1M.E1C</i>
Synchronous AC 110V	5rpm	12rpm	25rpm	
400FS/M1 110V 60Hz	<i>040.H41M.E1C</i>	<i>040.H81M.E1C</i>	<i>040.HC1M.E1C</i>	
Synchronous AC 220V	4rpm	10rpm	20rpm	
400FS/M1 220VAC 50Hz	<i>040.J31M.E1C</i>	<i>040.J71M.E1C</i>	<i>040.JA1M.E1C</i>	

See motor descriptions on page 45.

## Flow rates

Bore mm Bore "	Single Channel 1.6mm (1/16") wall thickness tubing					
	0.5mm 1/50"	0.8mm 1/32"	1.6mm 1/16"	2.4mm 3/32"	3.2mm 1/8"	4.0mm 5/32"
Standard DC 12rpm	0.120	0.360	1.32	2.88	4.92	7.08
Standard DC 40rpm	0.400	1.20	4.40	9.60	16.4	23.6
Standard DC 100rpm	1.00	3.00	11.0	24.0	41.0	59.0
Standard DC 200rpm	2.00	6.00	22.0	48.0	82.0	118
Economy DC 25rpm	0.250	0.750	2.75	6.00	10.25	14.8
Economy DC 75rpm	0.750	2.25	8.25	18.0	30.8	44.3
Economy DC 200rpm	2.00	6.00	22.0	48.0	82.0	118
Economy DC 350rpm	3.50	10.5	38.5	84.0	144	207
Brushless DC 15rpm	0.150	0.450	1.65	3.60	6.15	8.85
Brushless DC 50rpm	0.500	1.50	5.50	12.0	20.5	29.5
Brushless DC 130rpm	1.30	3.90	14.3	31.2	53.3	76.7
Brushless DC 250rpm	2.50	7.50	27.5	60.0	103	148
Synchronous AC 5rpm	0.050	0.150	0.55	1.20	2.05	2.95
Synchronous AC 12rpm	0.120	0.360	1.32	2.88	4.92	7.08
Synchronous AC 25rpm	0.250	0.750	2.75	6.00	10.25	14.8
Synchronous AC 4rpm	0.040	0.120	0.44	0.96	1.64	2.36
Synchronous AC 10rpm	0.100	0.300	1.10	2.40	4.10	5.90
Synchronous AC 20rpm	0.200	0.600	2.20	4.80	8.20	11.8

For tube selections, see page 48.



## 400F/N economy two channel peristaltic pump



The 400F/N pump has premium features in an economical price. The pump shaft is supported by ball bearings which insure a long gearmotor life. The pump uses tube elements with barbed fittings for easy tube loading, and connection to transfer tubes. The tube is completely enclosed in the pumping chamber. The pump is available with four standard gearmotors. Each one is extremely small in size and has low power requirements. The pump accepts tube elements with a 1.0mm wall thickness. The tubing is available in four bore sizes, allowing the user to precisely match the pump to the required flow. See page 21 for additional options.

### Flow capacity

Bore mm	1.0mm wall thickness tubing elements			
	0.5mm	1.0mm	2.0mm	3.0mm <sup>1</sup>
Flow rate ml/revolution	0.013	0.05	0.18	0.33
Max continuous flow ml/min	2.6	10	36	66
Max intermittent flow ml/min	5.2	20	72	132

<sup>1</sup> rated for silicone tubing only

### Materials of construction

Rotor, rollers, track, tube holder	Acetal (POM)
Mounting plate	Anodized aluminium
Screws, shafts	Acid resistant stainless steel

### Specifications

Maximum continuous speed	200 rpm
Maximum intermittent speed	400 rpm
Weight of complete pump	0.25 - 0.43kg
Tube type	Tube elements with fittings

### Performance against pressure

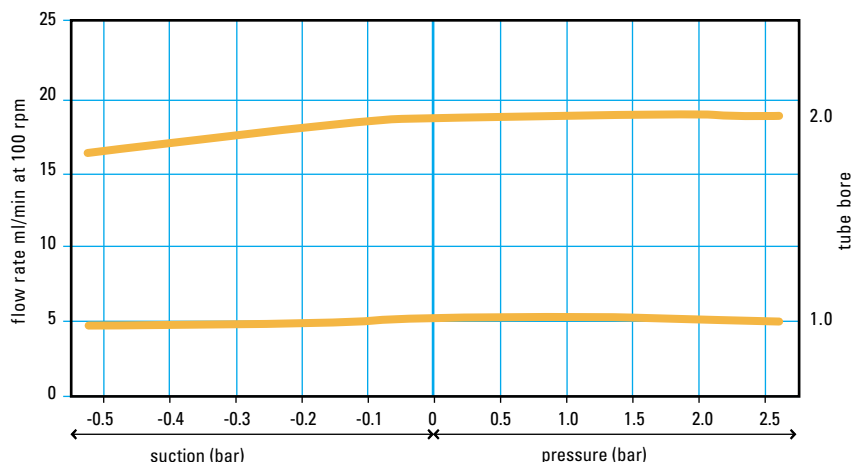
The N pumphead is designed to perform best against back pressures up to 2 bar. The diagram shows pumphead performance up to 2 bar.

### Conversion Factors:

Suction pressure in bar x 760 = mm Hg

Suction pressure in bar x 33.5 = Ft H<sub>2</sub>O

Back pressure in bar x 14.5 = psi





## Ordering information

Standard DC	12rpm	40rpm	100rpm	200rpm
400FDC/N 12V	<i>040.D81N.N2C</i>	<i>040.DH1N.N2C</i>	<i>040.DP1N.N2C</i>	<i>040.DS1N.N2C</i>
400FDC/N 24V	<i>040.E81N.N2C</i>	<i>040.EH1N.N2C</i>	<i>040.EP1N.N2C</i>	<i>040.ES1N.N2C</i>
Economy DC	25rpm	75rpm		200rpm
400FD/N 12V	<i>040.AC1N.N2C</i>	<i>040.AN1N.N2C</i>		<i>040.AS1N.N2C</i>
400FD/N 24V	<i>040.BC1N.N2C</i>	<i>040.BN1N.N2C</i>		<i>040.BS1N.N2C</i>
Brushless DC	15rpm	50rpm	130rpm	250rpm
400FDL/N 24V	<i>040.F91N.N2C</i>	<i>040.FK1N.N2C</i>	<i>040.FQ1N.N2C</i>	<i>040.FT1N.N2C</i>
Synchronous AC		5rpm	12rpm	25rpm
400FS/N 110 VAC 60Hz		<i>040.H41N.N2C</i>	<i>040.H81N.N2C</i>	<i>040.HC1N.N2C</i>
Synchronous AC		4rpm	10rpm	20rpm
400FS/N 220 VAC 50Hz		<i>040.J31N.N2C</i>	<i>040.J71N.N2C</i>	<i>040.JA1N.N2C</i>

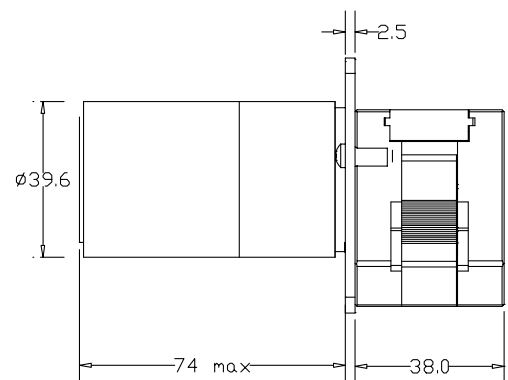
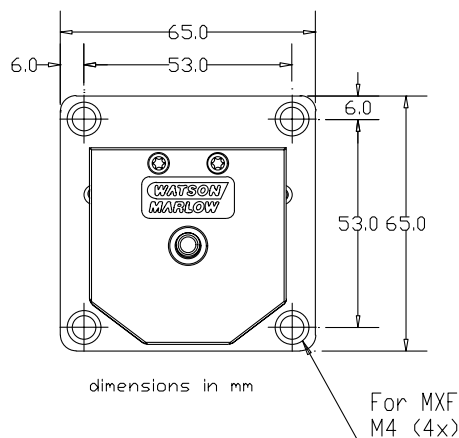
See motor descriptions on page 45.

## Flow rates

Bore mm	Per channel 1.05mm WT Tubing			
	0.5mm	1.0mm	2.0mm	3.0mm <sup>1</sup>
Standard DC 12rpm	0.16	0.6	2.2	4.0
Standard DC 40rpm	0.52	2.0	7.2	13.2
Standard DC 100rpm	1.3	5.0	18.0	33.0
Standard DC 200rpm	2.6	10.0	36.0	66.0
Economy DC 25rpm	0.33	1.3	4.5	8.3
Economy DC 75rpm	1.0	3.8	13.5	24.8
Economy DC 200rpm	2.6	10.0	36.0	66.0
Brushless DC 15rpm	0.20	0.75	2.7	5.0
Brushless DC 50rpm	0.65	2.5	9.0	16.5
Brushless DC 130rpm	1.7	6.5	23.4	42.9
Brushless DC 250rpm	3.3	12.5	45.0	82.5
Synchronous AC 5rpm	0.07	0.25	0.90	1.7
Synchronous AC 12rpm	0.16	0.6	2.2	4.0
Synchronous AC 25rpm	0.33	1.3	4.5	8.3
Synchronous AC 4rpm	0.05	0.20	0.72	1.3
Synchronous AC 10rpm	0.13	0.5	1.8	3.3
Synchronous AC 20rpm	0.26	1.0	3.6	6.6

<sup>1</sup> rated for silicone tube only

For tube selections, see page 48.



## 400F/VM precision low pulsation manifold tubing pump



400F/VM2

The 400F/VM is our highest precision, instrument-quality peristaltic pump for low flow rates. The pump is designed with ten rollers and other special design features to provide fluid flow with very low pulsation. Each channel has individual occlusion adjustment to allow fine-tuning of flow and pressure performance. The pumps have a spring-loaded track, which gives superior life and flow accuracy. The tracks are machined to precision tolerances, and the rollers are stainless steel with ball bearings. The pump accepts standard manifold tube elements, with two colour-coded stops. The tubing is available in 20 bore sizes in five materials, allowing the user to precisely match the pump to the required flow. See page 21 for additional options.

### Materials of construction

Rotor, track	Anodized aluminium
Rollers, screws, springs, shafts	Acid resistant stainless steel
Tube holder	Black acetal (POM)
Mounting plate	Black anodized aluminium
Bearings	Carbon steel

### Specifications

Maximum speed	100 rpm
Weight of complete pump	1.3 – 2.1 kg (depending on gearmotor and number of channels)
Tube type	Two stop manifold tubing elements

### Performance against pressure

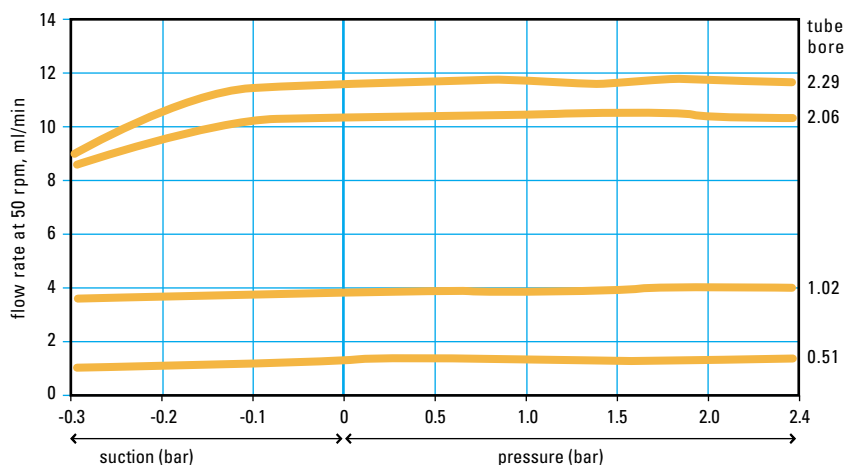
The spring-loaded tension arm makes it possible to adjust the pump to operate at higher back pressures/suction heights without overloading the tubing. In the diagram shown below, the arm is set for optimal performance at back pressures up to approx. 2.4 bar. The pump is capable of operating against pressures up to 3 bar.

### Conversion Factors:

Suction pressure in bar x 760 = mm Hg

Suction pressure in bar x 33.5 = Ft H<sub>2</sub>O

Back pressure in bar x 14.5 = psi



# OEM



400F/VM4

## Ordering information

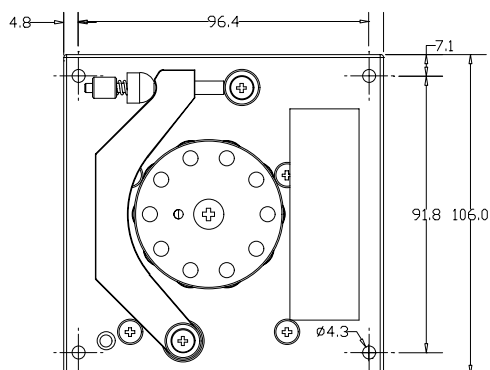
Standard 5 VA or *30 VA motor	12rpm	25rpm	60rpm	*100 rpm
400FDC/VM2 12V Two channel	<a href="#">040.C81V.M2S</a>	<a href="#">040.CC1V.M2S</a>	<a href="#">040.CM1V.M2S</a>	<a href="#">040.MP1V.M2S</a>
400FDC/VM2 24V Two channel	<a href="#">040.E81V.M2S</a>	<a href="#">040.EC1V.M2S</a>	<a href="#">040.EM1V.M2S</a>	<a href="#">040.LP1V.M2S</a>
400FDC/VM3 12V Three channel	<a href="#">040.C81V.M3S</a>	<a href="#">040.CC1V.M3S</a>	<a href="#">040.CM1V.M3S</a>	
400FDC/VM3 24V Three channel	<a href="#">040.E81V.M3S</a>	<a href="#">040.EC1V.M3S</a>	<a href="#">040.EM1V.M3S</a>	
400FDC/VM4 12V Four channel	<a href="#">040.C81V.M4S</a>	<a href="#">040.CC1V.M4S</a>	<a href="#">040.CM1V.M4S</a>	
400FDC/VM4 24V Four channel	<a href="#">040.E81V.M4S</a>	<a href="#">040.EC1V.M4S</a>	<a href="#">040.EM1V.M4S</a>	
Brushless DC 35 VA	30rpm		100rpm	
400VDL/VM2 24V Two channel			<a href="#">040.NE1V.M2S</a>	<a href="#">040.NP1V.M2S</a>
400VDL/VM3 24V Three channel			<a href="#">040.NE1V.M3S</a>	
400VDL/VM4 24V Four channel			<a href="#">040.NE1V.M4S</a>	

See motor descriptions on page 45.

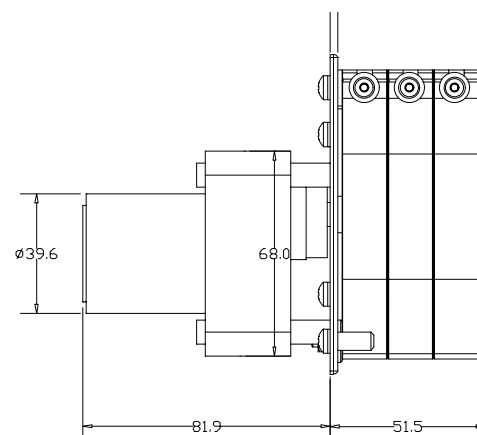
## Flow rates

Colour	Orange/Black	Orange/Red	Orange/Blue	Orange/Green	Orange/Yellow
Bore	0.13mm	0.19mm	0.25mm	0.38mm	0.50mm
Flow ml/revolution	0.001	0.003	0.004	0.010	0.018
12 rpm	0.012	0.036	0.048	0.12	0.22
25 rpm	0.025	0.075	0.10	0.25	0.45
30 rpm	0.030	0.090	0.12	0.30	0.54
60 rpm	0.060	0.180	0.24	0.60	1.08
100 rpm	0.10	0.30	0.40	1.00	1.80
Colour	Orange/White	Black/Black	Orange/Orange	White/White	Red/Red
Bore	0.63mm	0.76mm	0.88mm	1.02mm	1.14mm
Flow ml/revolution	0.028	0.039	0.053	0.068	0.085
12 rpm	0.34	0.47	0.64	0.82	1.02
25 rpm	0.70	0.98	1.33	1.70	2.13
30 rpm	0.84	1.17	1.59	2.04	2.55
60 rpm	1.68	2.34	3.18	4.08	5.10
100 rpm	2.80	3.90	5.30	6.80	8.50
Colour	Grey/Grey	Yellow/Yellow	Yellow/Blue	Blue/Blue	Green/Green
Bore	1.29mm	1.42mm	1.52mm	1.65mm	1.85mm
Flow ml/revolution	0.11	0.13	0.14	0.17	0.20
12 rpm	1.30	1.54	1.73	1.98	2.40
25 rpm	2.70	3.20	3.60	4.13	5.00
30 rpm	3.24	3.84	4.32	4.95	6.00
60 rpm	6.48	7.68	8.64	9.90	12.0
100 rpm	10.8	12.8	14.4	16.5	20.0
Colour	Purple/Purple	Purple/Black	Purple/Orange	Purple/White	
Bore	2.05mm	2.29mm	2.54mm	2.79mm	
Flow ml/revolution	0.24	0.27	0.31	0.34	
12 rpm	2.82	3.29	3.74	4.10	
25 rpm	5.88	6.85	7.80	8.55	
30 rpm	7.05	8.22	9.36	10.3	
60 rpm	14.1	16.4	18.7	20.5	
100 rpm	23.5	27.4	31.2	34.2	

For tube selections, see page 48.



dimensions in mm



## 400F/GM precision high flow manifold tubing pump



400F/GM4

The 400F/GM is a precision, instrument-quality peristaltic pump. The 400F/GM pump offers a higher flow than the 400F/VM series, but has fewer rollers (four), and channels cannot be individually adjusted. The pumps have a spring-loaded track, which gives superior tube life and flow accuracy. The tracks are machined to precision tolerances, and rollers are stainless steel with ball bearings. The pump accepts standard manifold tube elements, with two colour-coded stops. The tubing is available in 20 bore sizes, in five materials allowing the user to precisely match the pump to the required flow. See page 21 for additional options.

### Ordering information

Standard 5 VA or *30 VA motor	12rpm	25rpm	60rpm	*100 rpm
400FDC/GM4 12V Four channel	<a href="#">040.C81G.M4S</a>	<a href="#">040.CC1G.M4S</a>	<a href="#">040.CM1G.M4S</a>	<a href="#">040.MP1G.M4S</a>
400FDC/GM4 24V Four channel	<a href="#">040.E81G.M4S</a>	<a href="#">040.EC1G.M4S</a>	<a href="#">040.EM1G.M4S</a>	<a href="#">040.LP1G.M4S</a>
Brushless DC 35 VA			30rpm	100rpm
400FVDL/GM4 24V Four channel			<a href="#">040.NE1G.M4S</a>	<a href="#">040.NP1G.M4S</a>

See motor descriptions on page 45.

### Flow rates

Color Bore	Orange/Black 0.13mm	Orange/Red 0.19mm	Orange/Blue 0.25mm	Orange/Green 0.38mm	Orange/Yellow 0.50mm
Flow ml/revolution	0.001	0.003	0.005	0.012	0.022
12 rpm	0.012	0.036	0.060	0.14	0.26
25 rpm	0.025	0.075	0.13	0.30	0.55
30 rpm	0.030	0.090	0.15	0.36	0.66
60 rpm	0.060	0.180	0.30	0.72	1.32
100 rpm	0.10	0.30	0.50	1.20	2.20
Color Bore	Orange/White 0.63mm	Black/Black 0.76mm	Orange/Orange 0.88mm	White/White 1.02mm	Red/Red 1.14mm
Flow ml/revolution	0.034	0.049	0.066	0.086	0.11
12 rpm	0.41	0.59	0.79	1.03	1.32
25 rpm	0.85	1.23	1.65	2.15	2.75
30 rpm	1.02	1.47	1.98	2.58	3.30
60 rpm	2.04	2.94	3.96	5.16	6.60
100 rpm	3.40	4.90	6.60	8.60	11.00
Color Bore	Grey/Grey 1.29mm	Yellow/Yellow 1.42mm	Yellow/Blue 1.52mm	Blue/Blue 1.65mm	Green/Green 1.85mm
Flow ml/revolution	0.14	0.17	0.19	0.22	0.28
12 rpm	1.68	2.04	2.28	2.64	3.36
25 rpm	3.50	4.25	4.75	5.50	7.00
30 rpm	4.20	5.10	5.70	6.60	8.40
60 rpm	8.40	10.2	11.4	13.2	16.8
100 rpm	14.0	17.0	19.0	22.0	28.0
Color Bore	Purple/Purple 2.05mm	Purple/Black 2.29mm	Purple/Orange 2.54mm	Purple/White 2.79mm	
Flow ml/revolution	0.34	0.41	0.50	0.59	
12 rpm	4.08	4.92	6.00	7.08	
25 rpm	8.50	10.3	12.5	14.8	
30 rpm	10.2	12.3	15.0	17.7	
60 rpm	20.4	24.6	30.0	35.4	
100 rpm	34.0	41.0	50.0	59.0	

For tube selection, see page 48.

## 400F/R1 precision one channel and 400F/L2 two channel pumps



400F/R1

These models are our highest precision, instrument-quality peristaltic pumps for medium flow rates. Both models have a spring-loaded track, which gives superior tube life and flow accuracy. The tubing occlusion can be adjusted to produce higher pressures. The tracks are machined to precision tolerances, and the rollers are stainless steel with ball bearings. The pump is available with three standard gearmotors. The pump accepts continuous tubing with a 1.6mm wall thickness, in seven bore sizes, allowing the user to precisely match the pump to the required flow. The R1 is a single tube pumphead and the L2 has two individual flow channels, each with a separate rotor. The L2 can also be used with a tube element that combines flows of the two tubes to create a single, low pulsation flow. These two channel models will use a maximum bore accept size of 4.8mm. These models offer our widest range of options, allowing you to customise a pump for your application. See page 21 for additional options.

### Flow capacity

Bore mm Bore "	1.6mm (1/16") wall thickness continuous tubing						
	0.8mm 1/32"	1.6mm 1/16"	2.4mm 3/32"	3.2mm 1/8"	4.0mm 5/32"	4.8mm 3/16"	6.4mm 1/4"
Flow rate ml/revolution	0.06	0.2	0.50	0.86	1.3	1.8	3.0
Max continuous flow ml/min 200 rpm	11	44	98	170	262	367	606
Max intermittent flow ml/min 400 rpm	22	88	196	340	524	734	1212

### Materials of construction

Tube holder	Black acetal (POM)
Rotor, track, mounting plate	Anodized aluminium
Ball bearings	Carbon steel
Rollers, screws, springs, shafts	Acid resistant stainless steel

### Specifications

Maximum continuous speed	200 rpm
Maximum intermittent speed	400 rpm
Weight of complete pump	1.0 - 1.5kg

### Performance against pressure

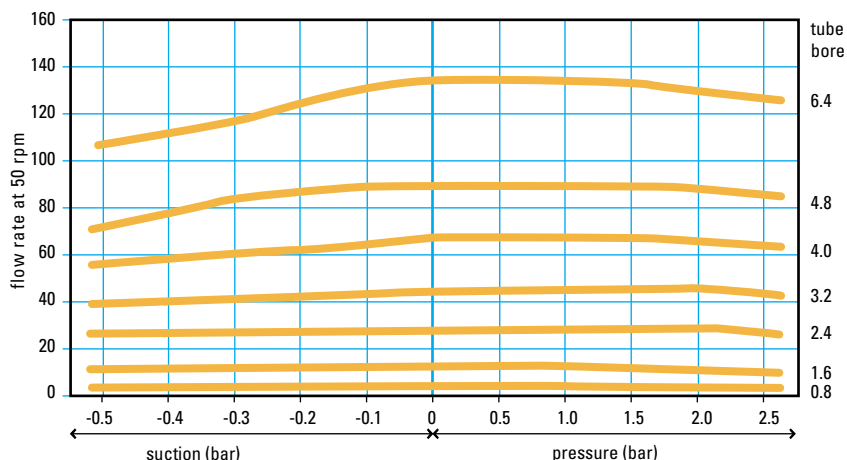
The spring-loaded tension arm makes it possible to adjust the pump to operate at higher back pressures/suction heights without overloading the tubing. In the diagram shown below, the arm is set for optimal performance at back pressures up to approx. 2.3 bar. The pump is capable of operating against pressures up to 3 bar.

### Conversion Factors:

Suction pressure in bar x 760 = mm Hg

Suction pressure in bar x 33.5 = Ft H<sub>2</sub>O

Back pressure in bar x 14.5 = psi





400F/L2

## Ordering information

5W DC	12rpm	25rpm	60rpm
400FDC/R1 12V One channel	<i>040.C81R.01S</i>	<i>040.CC1R.01S</i>	<i>040.CM1R.01S</i>
400FDC/R1 24V One channel	<i>040.E81R.01S</i>	<i>040.EC1R.01S</i>	<i>040.EM1R.01S</i>
400FDC/L2 12V Two channel	<i>040.C81L.E2S</i>	<i>040.CC1L.E2S</i>	<i>040.CM1L.E2S</i>
400FDC/L2 24V Two channel	<i>040.E81L.E2S</i>	<i>040.EC1L.E2S</i>	<i>040.EM1L.E2S</i>
30W DC	100rpm	200rpm	
400FDC/R1 12V One channel	<i>040.MP1R.01S</i>	<i>040.MS1R.01S</i>	
400FDC/R1 24V One channel	<i>040.LP1R.01S</i>	<i>040.LS1R.01S</i>	
400FDC/L2 12V Two channel	<i>040.MP1L.E2S</i>	<i>040.MS1L.E2S</i>	
400FDC/L2 24V Two channel	<i>040.LP1L.E2S</i>	<i>040.LS1L.E2S</i>	
Brushless DC 35 Watt	30rpm	100rpm	350rpm
400VDL/R1 24V One channel	<i>040.NE1R.01S</i>	<i>040.NP1R.01S</i>	<i>040.NP1R.01S</i>
400VDL/L2 12V Two channel	<i>040.NE1L.E2S</i>	<i>040.NP1L.E2S</i>	<i>040.NP1L.E2S</i>

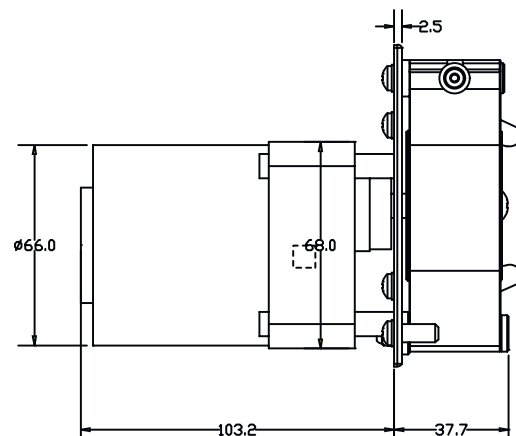
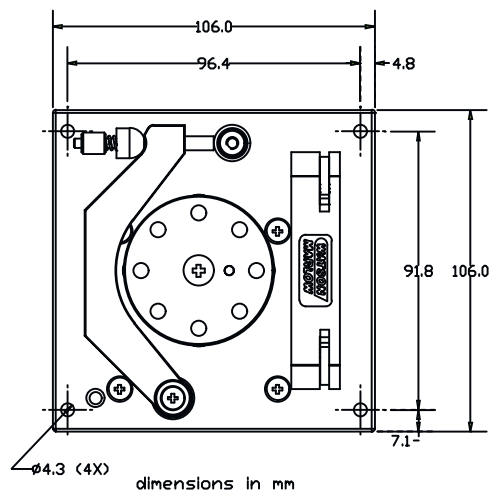
See motor descriptions on page 45.

## Flow rates

	Single Channel 1.6mm (1/16") wall thickness tubing							
Bore mm	0.5mm	0.8mm	1.6mm	2.4mm	3.2mm	4.0mm	4.8mm	6.4mm
Bore "	1/50"	1/32"	1/16"	3/32"	1/8"	5/32"	3/16"	1/4"
5W DC 12rpm	0.24	0.72	2.40	6.00	10.3	15.6	21.6	36.0
5W DC 25rpm	0.50	1.50	5.00	12.5	21.5	32.5	45.0	75.0
5W DC 60rpm	1.20	3.60	12.0	30.0	51.6	78.0	108	180
30W DC 100rpm	2.00	6.00	20.0	50.0	86.0	130	180	300
30W DC 200rpm	4.00	12.0	40.0	100.0	172.0	260	360	600
Brushless DC 30rpm	0.60	1.80	6.00	15.0	25.8	39.0	54.0	90.0
Brushless DC 100rpm	2.00	6.00	20.0	50.0	86.0	130	180	300
Brushless DC 350rpm	7.00	21.00	70.0	175	301	455	630	1050

For tube selections for 400F/R1, see Table A on page 47.

For tube elements for 400F/L2, see inside rear cover.



# OEM

## 400 SCB speed controls for 400 Series, 313FDP/D, and 501FDP/RL DC pumps

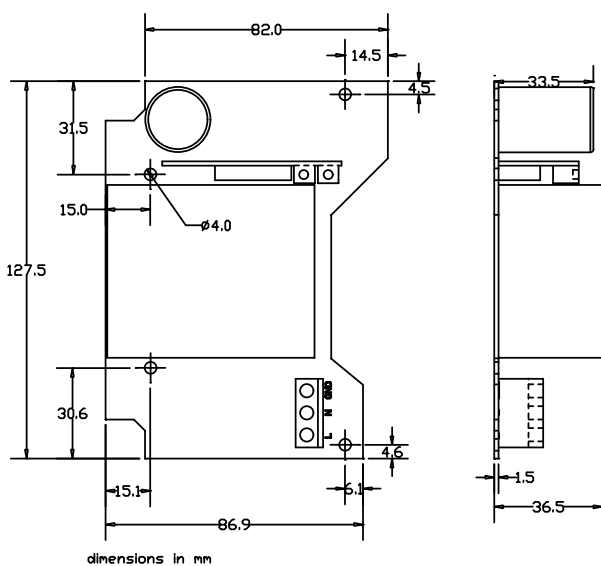
These OEM motor speed controls are designed for operating permanent magnetic DC motors up to 30 VA. They are linear type controllers that provide smooth acceleration and deceleration under load, and a turndown of 20:1. The low voltage unit will accept AC or DC inputs. The high voltage will work directly off the main supply.

### Ordering information

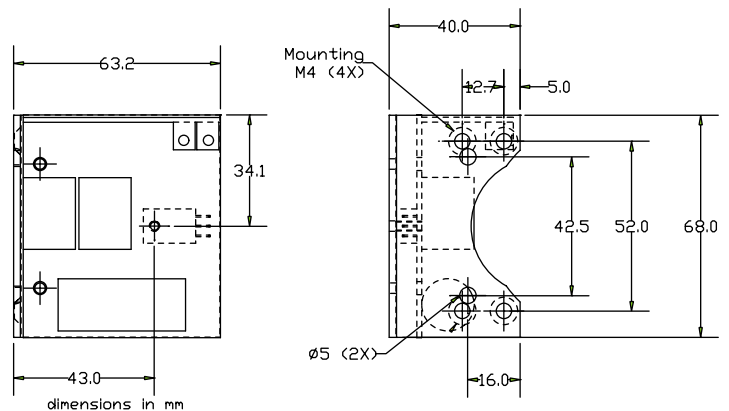
Model	Supply Voltage	Output Voltage	Motor	
400SCB/534	15-30VDC or 12-22VAC 50/60 Hz	0-12V DC or 0-24V DC	5/30 VA	<a href="#">049.C534.000</a>
400SCB/424	110 VAC 50/60 Hz	0-12V DC	5 VA	<a href="#">049.C424.05A</a>
400SCB/424	110 VAC 50/60 Hz	0-21V DC	30 VA	<a href="#">049.C424.30A</a>
400SCB/424	220 VAC 50/60 Hz	0-12V DC	5 VA	<a href="#">049.C424.05E</a>
400SCB/424	220 VAC 50/60 Hz	0-21V DC	30 VA	<a href="#">049.C424.30E</a>

### Specifications

Speed control ratio	20:1 (stable, speed independent of load)
Remote speed options	0-20 mA or 4-20 mA, 0-1V or 0-10V; remote potentiometer (10K ohm)
Stop/Start	Remote switch, or 5V logic (on 534 models only)
Direction	Remote switch, or 5V logic (on 534 models only)
User adjustments	Max speed and signal selection
Temperature range	-30°C to 40°C
Cooling	10W (4°C/W)



High Voltage 049.C424,\*\*\*



Low Voltage 049.C534.000



# 500 SERIES OEM SYSTEMS

Designed around the 501RL twin roller, spring-loaded pumphead, the 500 series OEM pumps provide high quality single channel pumps, with a choice of both AC, DC, and brushless DC drive units, and flow rates up to 3 litres per minute (5 litres per minute for intermittent use). In addition, the 501F/RL faceplate-mounted pumpheads are available, with an integral bearing for use with users' own drive systems. The pumps are also available in a close-coupled version directly mounted to a gearmotor.

## 501RL spring-loaded 2-roller pumpheads



The 501RL pumphead features adjustable tube clamps and a rotor crank handle for easy tube loading. They are suitable for continuous use at speeds up to 300 rpm, giving flow rates of up to 3 litres/min (intermittent use up to 500 rpm, flow rates up to 5 litres/min). The 501RL may be driven in either direction: clockwise rotation will give a longer tube life but anti-clockwise rotation can be used for working against greater pressures. The 501RL accepts standard 1.6mm wall tubing, and the 501RL2 accepts 2.4mm thick-walled tubing.

The faceplate adapter allows ease of connection to "third party" drives. This eliminates the need for a specific drive shaft/nose arrangement when using the standard 501RL.

### Ordering information

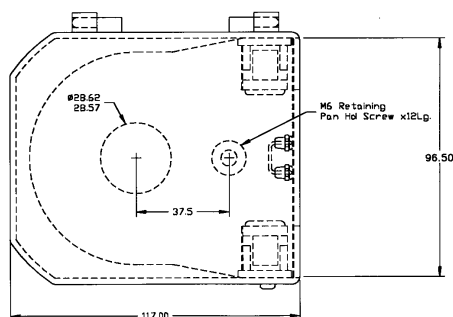
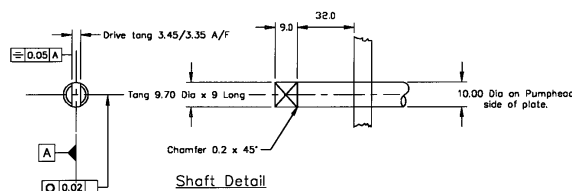
501RL pumphead for 1.6mm wall thickness tubing	056.0001.L00
502RL2 pumphead for 2.4mm wall thickness tubing	056.0001.L20
501F faceplate adapter (no pumphead)	056.8001.000

### Materials of construction

Track	Mazak, aklyd melamine enamel
Rotor	Mazak, copper/nickel/chrome plated
Main rollers	MOS2 filled Nylon 6 (Nylatron)
Tube clamps, hinges, guide rollers	Acetal copolymer (Kematal)
Guard	Polycarbonate
Springs, spindles, fixings	Stainless steel
Faceplate	Aluminium

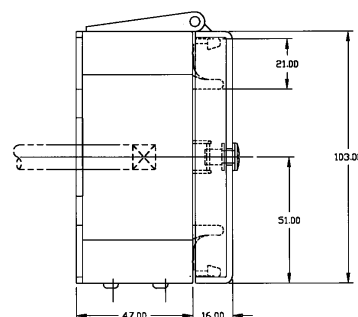
### Specifications

	1.6mm (1/16") wall tubing						
	0.5mm	0.8mm	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm
Bore mm	1/5"	1/32"	1/16"	1/8"	3/16"	1/4"	5/16"
Bore °							
Maximum continuous speed: rpm	300	300	300	300	300	300	300
Maximum intermittent speed: rpm	500	500	500	500	500	500	500
Marpene tubing (standard springs, clockwise rotation)							
Required torque up to 0.5bar: kg cm	3.2	3.2	3.8	4.8	5.0	6.6	6.6
Required torque up to 1 Bar: kg cm	4.0	4.0	4.3	5.0	6.5	9.2	9.2
Maximum pressure: Bar	2	2	2	2	2	1	1
501F/RL and 501F/RL2 weight	1.15kg and 2.3kg						



dimensions in mm

501RL & 501RL2 Pumphead



## Flow rates

Bore mm Bore *	1.6mm (1/16") wall thickness tubing						
	0.5mm 1/5"	0.8mm 1/32"	1.6mm 1/16"	3.2mm 1/8"	4.8mm 3/16"	6.4mm 1/4"	8.0mm 5/16"
Flow rate: ml/revolution	0.04	0.12	0.43	1.86	4.05	6.35	10.0
Maximum continuous flow rate: ml/min	12.0	36.0	129	558	1215	1905	3000
Maximum intermittent flow rate: ml/min	20.0	60.0	215	930	2025	3175	5000

For tube selections, see tables A & B on page 48.

## Specifications

Bore mm Bore *	1.6mm (1/16") wall thickness tubing						
	0.5mm 1/5"	0.8mm 1/32"	1.6mm 1/16"	3.2mm 1/8"	4.8mm 3/16"	6.4mm 1/4"	8.0mm 5/16"
Maximum continuous speed: rpm	300	300	300	300	300	300	300
Maximum intermittent speed: rpm	500	500	500	500	500	500	500
<b>Marpene tubing</b> (standard springs, clockwise rotation)							
Required torque up to 0.5 bar: kg cm	3.2	3.2	3.8	4.8	5.0	6.6	6.6
Required torque up to 1 bar: kg cm	4.0	4.0	4.3	5.0	6.5	9.2	9.2
Maximum pressure: Bar	2	2	2	2	2	1	1

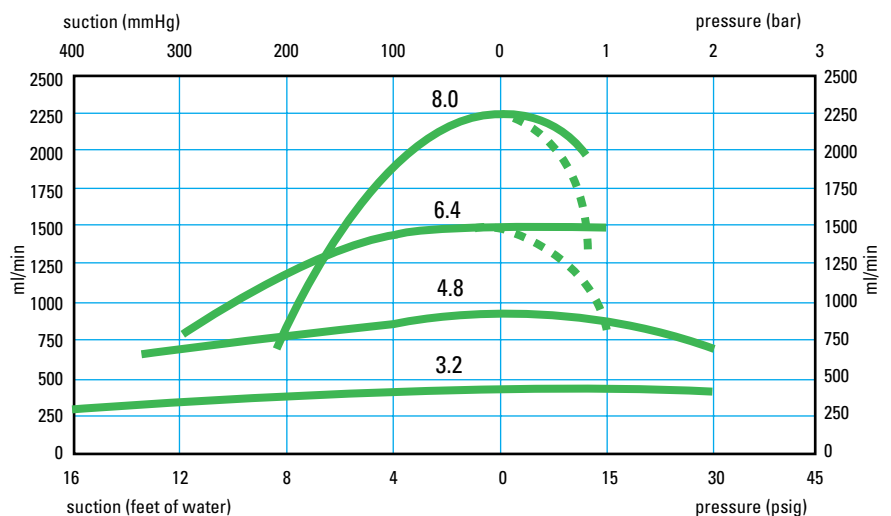
## Performance against pressure

### Conditions:

- Suction curves obtained with zero output pressure.
- Pressure curves obtained with zero lift.
- Pumphead speed 220rpm.
- Anti-clockwise rotation - - - - -
- Clockwise rotation —————

### Conversion Factors:

Suction pressure in bar x 760 = mm Hg  
Suction pressure in bar x 33.5 = Ft H<sub>2</sub>O  
Back pressure in bar x 14.5 = psi



## 501FDP/RL fixed/variable speed DC pump



The 501FDP/RL is our highest quality, high flow OEM DC pump offering precise speed regulation, low electrical and audible noise, and long operating life.

The 501FDP/RL OEM pump is made up of a single channel 501RL pumphead, a powerful 12 or 24V direct current motor-gearbox, and an aluminium faceplate. The spring-loaded rotor assembly provides long tube life and accurate flows. The coreless DC motors provide high torque output, and speed in a small case size. When fitted with 8.0mm bore tubing, these pumps provide flow rates of up to 2500 ml/min. Select from 7 tube bore sizes to precisely match the pump to your flow requirements.

### Ordering information

12V DC		24V DC	
50rpm	<a href="#">040.MK10.RL0</a>	50rpm	<a href="#">040.LK10.RL0</a>
100rpm	<a href="#">040.MP10.RL0</a>	100rpm	<a href="#">040.LP10.RL0</a>
250rpm	<a href="#">040.MT10.RL0</a>	250rpm	<a href="#">040.LT10.RL0</a>

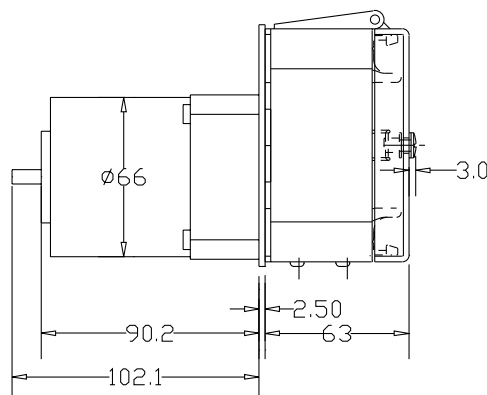
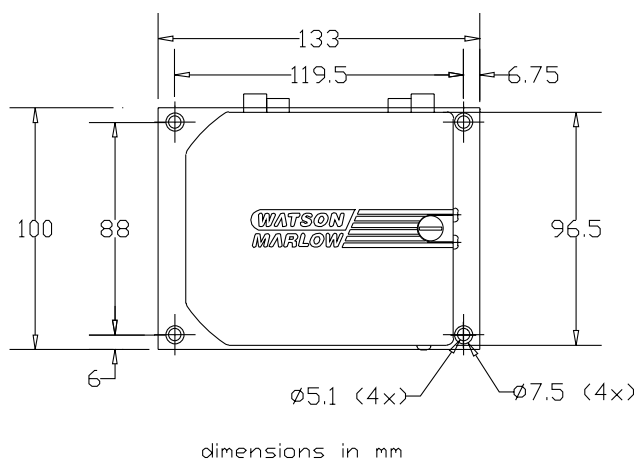
### Specifications

Motor type	12 or 24V DC
Motor torque output	50rpm 11kgcm 100rpm 14kgcm 250rpm 6kgcm
Power consumption	5/30VA
Weight	3kg

### Flow rates

	1.6mm (1/16") wall tubing						
	0.5mm 1/5"	0.8mm 1/32"	1.6mm 1/16"	3.2mm 1/32"	4.8mm 3/16"	6.4mm 1/16"	8.0mm 5/16"
50rpm	2.00	6.00	21.5	93.0	203	318	500
100rpm	4.00	12.0	43.0	186	405	635	1000
200rpm	8.00	24.0	86.0	372	810	1270	2000
250rpm	10.00	30.0	107.5	465	1013	1588	2500

For tube selections, see tables A and B on page 47.



## 501VDL/RL variable speed brushless DC pump



The 501VDL/RL combines our highest quality pump with a brushless DC motor, that providing precise speed regulation and low electrical and audible noise. Brushless DC motors have an extremely long service life as they have no internal wear parts. The 501VDL/RL OEM pump is made up of a single channel 501RL pumphead, a powerful 24V brushless DC gearmotor with built-in controller, and an aluminium faceplate. The spring-loaded rotor assembly provides long tube life and accurate flows. When fitted with 8.0 mm bore tubing, these pumps provide flow rates of up to 3500 ml/min. The built-in controller allows control of speed, stop/start, direction, and a frequency tacho output.

### Ordering information

	24V DC Brushless
100rpm	040.NP10.RL0
350rpm	040.NU10.RL0

### Specifications

Motor type	24V DC
Motor torque output	100rpm 21.0kg cm 350rpm 7.3kg cm
Power consumption	35 VA
Weight	3kg

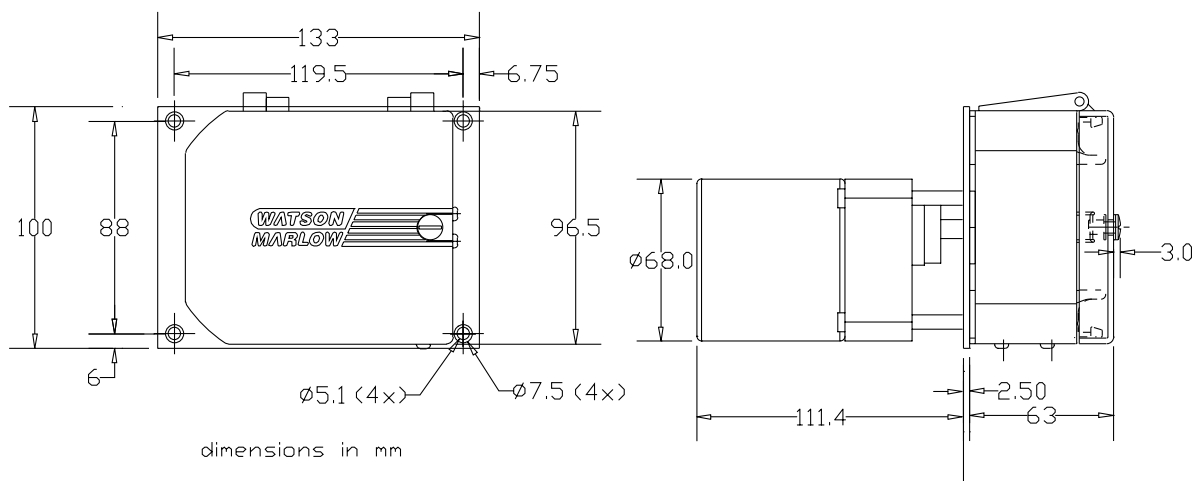
### Motor/controller connections

Lead no.	Lead Colour	Function	Descriptions
1	brown	FW/RV	Direction control input: 'High' CW, 'Low' CC (shaft side)
2	white	Vin	Input voltage (set-point) for speed loop. Resulting speed approx. 1000 rpm/V Vin < 4V: motor at full speed, speed loop off (open loop)
3	green	FG	Frequency generator output, 36 ppr; R out = 4kOhm (approx.)
4	black	GND	Motor return, ground (0v)
5	red	Vp	Motor supply voltage +24V (min 14V – Max 30V)
6	bare	shield	Shield for cable and connection to motor housing

### Flow rates

	1.6mm (1/16") wall tubing						
Bore mm	0.5mm	0.8mm	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm
Bore "	1/5"	1/32"	1/16"	1/32"	3/16"	1/16"	5/16"
100rpm	4.00	12.0	43.0	186	405	635	1000
350rpm	14.0	42.0	151	651	1418	2223	3500

For tube selections, see Tables A and B on page 47.



## 501FAC/RL single channel OEM pump



The 501FAC/RL has been introduced to the 500 series OEM system as a quality, single-channel OEM pump, and is made up of a 501RL spring loaded pumphead, an induction motor, Watson-Marlow's purpose-designed gearbox, and a faceplate. This pump is available in a choice of three voltages and four speeds, providing flow rates up to 3240 ml/min from 8.0 mm bore tubing (2700 ml/min when used at 50Hz).

All 501FAC/RL OEM pumps are suitable for use with either 50Hz or 60Hz supplies and may be wired to give either clockwise or anti-clockwise rotation.

### Ordering information

	220VAC	240VAC	100-120VAC
33/40rpm 50/60Hz	050.1812.L00	050.1811.L00	050.1801.100
67/80rpm 50/60Hz	050.1832.L00	050.1831.L00	050.1821.100
135/162rpm 50/60Hz	050.1852.L00	050.1851.L00	050.1841.100
270/324rpm 50/60Hz	050.1872.L00	050.1871.L00	050.1861.100

### Specification

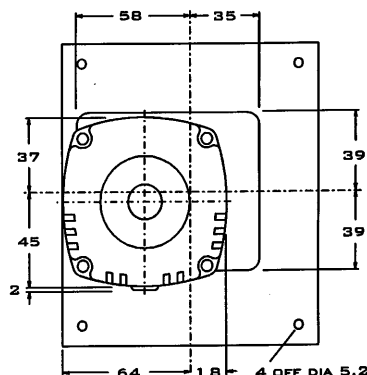
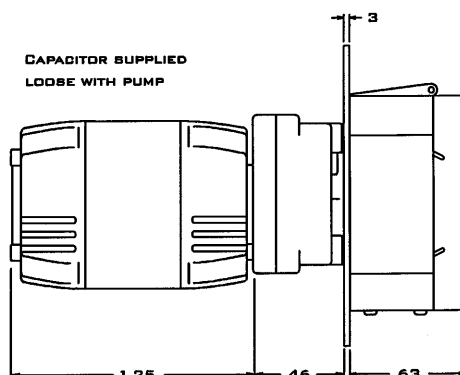
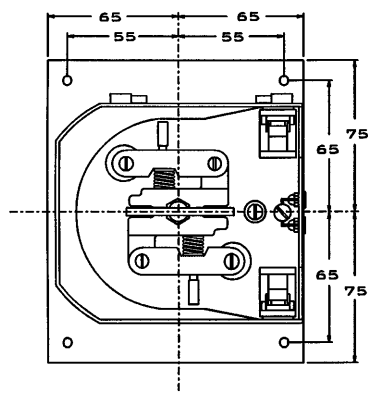
Motor type	Induction
Motor torque output	33/67rpm 20kg cm 40/80rpm 16kg cm 135/270rpm 10kg cm 162/324rpm 8kg cm
Power consumption	50VA
Weight	3.2kg

### Flow rates (ml/min)

		1.6mm (1/16") wall tubing						
		0.5mm 1/5"	0.8mm 1/32"	1.6mm 1/16"	3.2mm 1/8"	4.8mm 3/16"	6.4mm 1/4"	8.0mm 5/16"
50	33	1.32	3.96	14.2	61.4	134	210	330
	67	2.68	8.04	28.8	125	271	425	670
	135	5.40	16.2	58.0	251	547	857	1350
	270	10.8	32.4	116	502	1093	1715	2700
60	40	1.60	4.80	17.2	74.4	162	254	400
	80	3.20	9.60	34.4	149	324	508	800
	162	6.50	19.4	69.6	301	656	1029	1620
	324	13.0	39.0	139	603	1312	2057	3240

For tube selections, see Tables A and B on page 47.

ALL DIMENSIONS IN MILLIMETRES



# OEM

## 501FDC/RL fixed speed DC pump



The 501FDC/RL OEM pump is made up of a single channel 501RL pumphead, a powerful 12V direct current motor, the new Watson-Marlow gearbox, and an aluminum faceplate. When fitted with 8.0mm x 1.6mm tubing, these pumps provide flow rates of up to 2200 ml/min.

The 501FDC/RL provides the highest torque output, pump speeds and flow rates of all Watson-Marlow 500 series OEM pumps.

The pump is also available without the lock on the guard and is known as the 501FDC/R.

### Ordering information

12V DC

220rpm

050.1931.L00

### Specifications

Motor type 12V DC

Motor torque output 14kg cm

Power consumption 35VA

Weight 3kg

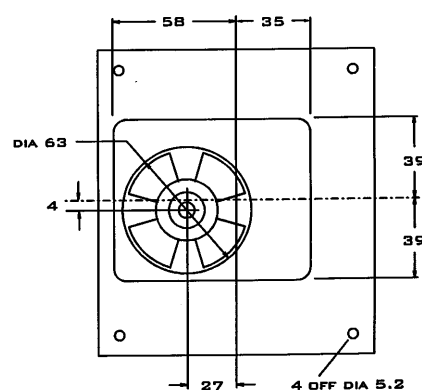
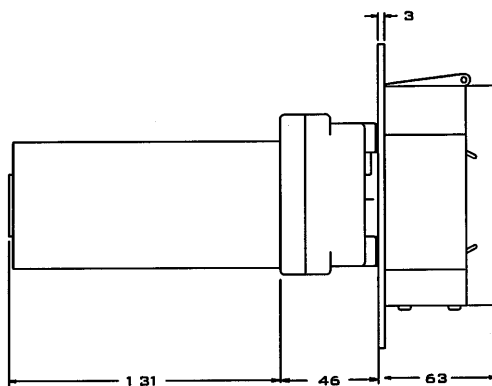
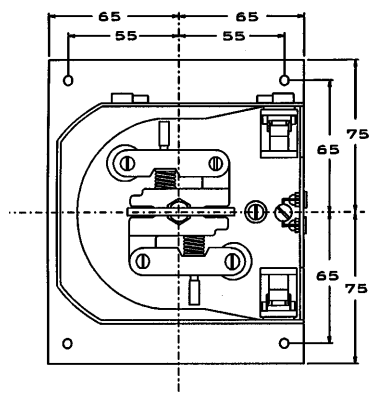
Brush life 2500 hours

### Flow rates (ml/min)

	1.6mm (1/16") wall tubing						
	0.5mm 1/5"	0.8mm 1/32"	1.6mm 1/16"	3.2mm 1/32"	4.8mm 3/16"	6.4mm 1/16"	8.0mm 5/16"
rpm							
220	8.80	26.4	94.6	409.2	891	1397	2200

For tube selections, see Tables A and B on page 47.

ALL DIMENSIONS IN MILLIMETRES



## 621F/R close coupled high flow pumps



The close coupled pump features the 620RE pumphead that accepts tube elements for flow up to 18 litre/min (4.8 GPM). The unique LoadSure tube element design makes tube changes fast and error-free and secures process pressures up to 4 bar (60psi).

The pumphead has retractable rollers, to make tube loading easier, and allows for SIP or CIP to be run with the tubing installed in the pump. The pumphead can be configured for LoadSure elements or continuous tubing, two rollers for higher flow, or four rollers for lower pulsation.

The standard pump comes with an AC induction motor and gearbox that bolts directly to the pumphead, saving space. It can also be provided with an air motor, gear reducer only, and explosion proof drives. Please contact one of our sales engineers who can help you select the right pump for your application.

### Ordering information

The 620R allows you to build a pump with the components you need to customize to your needs. Please contact our factory for a quote on a specific unit. Some of the more standard options are listed below.

#### Pumphead Options

Number of Rollers	2 higher flow, 4 lower pulsation
LoadSure tube elements	4.0 mm WT, 3/4 cam and groove or tri-clamp fittings, pressure to 4bar (60 psi) (Table D on page 47)
Continuous tubing	3.2mm WT, free ends, pressure to 30 psi (Table E on page 47)

#### Drive Options

Simplex	Single drive pumphead
Duplex	Single drive with right angle gearbox for driving two heads simultaneously
Fixed/variable speed	Add a VFD for variable speed over a 10:1 range
Gear motor finish	Standard orange, or FDA white finish
Gear reducer only	Supply your own 56C motor to complete the unit
Explosion proof	Consult Watson-Marlow Bredel for specific Class ratings
Voltages	Available 230/460VAC 3-ph or 120/240VAC 1-ph
Pneumatic	Requires (100 psi) filtered and lubricated air source

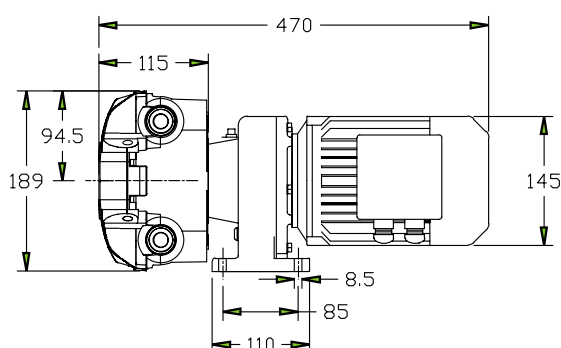
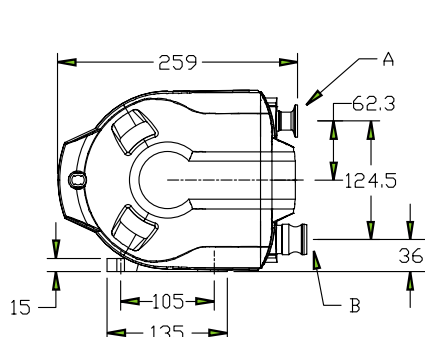
### Flow rates liters/min (GPM)

		Pumphead Type R					Type RE	
		Bore mm	6.4mm	9.6mm	12.7mm	15.9mm	LoadSure™12mm	LoadSure™17mm
		Bore"	1/16"	3/8"	1/2"	5/8"	LoadSure™15/32"	LoadSure™11/16"
Tubing material	Speed range (rpm)							
Marprene™, Bioprene™	77/251	-	-	-	-	-	2.85/9.29	4.54/14.8
Marprene™, Bioprene™	77/251	1.00/3.26	1.93/6.28	3.08/10.0	4.21/11.3		2.85/9.29	5.18/16.9
Silicone	77/251	0.92/3.01	2.08/6.78	3.23/10.5	4.74/14.5		2.98/9.71	4.69/15.3
Neoprene, STA-PURE	77/251	0.92/3.01	1.93/6.28	3.08/10.0	4.70/15.3		3.06/9.99	5.66/18.1

Flow rates vary depending on tube material. Contact Watson-Marlow Bredel for a complete flow table by tube material.

### Materials of construction

Track	Aluminium LM24M Powder coated
Guard	Polyurethane PBA/Grilamid TR55
Rotor	Body: Forton 114OL4 (PPS) Rollers: 304SS
Gearbox	Cast iron epoxy powder coated (FDA white available).
Tube clamps	Polypropylene
Tube fittings	Tri Clamp style: PVDF Cam and Groove style: polypropylene





## Motor Specifications

### 102R, B1, D, M and N pumps

Motor Type	No Load Speed
Standard 5 Watt DC	<i>An instrument-quality DC motor. This motor is powerful for its size, whisper-quiet, and has a brush life up to 10,000 hours. A wide speed reduction ratio (20:1) can be obtained with the speed controllers on page 37.</i> 3000rpm
Economy DC 5 Watt	<i>Used primarily for fixed speed intermittent duty applications. This motor is small in size and a high rpm capability for its size.</i> 6000rpm
Brushless DC 5 Watt	<i>A 1 phase, 2 core reluctance motor with 4 pole ferrite magnet. Hall position sensors and has commutation electronics are integrated. The design is brushless, giving it a long service life. Speed is adjusted by varying the 24V DC supply.</i> 4000rpm
Synchronous AC	<i>Motors run on mains voltages. The motor speed is based on supply frequency giving a consistent reproducible motor speed. This design is brushless giving it an extremely long service life.</i> 500/600rpm (50/60 Hz)

### 313D, 501RL, R1, L2, GM and VM pumps

Motor Type	No Load Speed
Standard 5 Watt DC	<i>An instrument-quality DC motor. This motor is powerful for its size, whisper-quiet, and has a brush life up to 10,000 hours. A wide speed reduction ratio (20:1) can be obtained with the speed controllers on page 37.</i> 3000rpm
Standard 30 Watt DC	<i>An instrument-quality DC motor. This motor is powerful for its size, whisper-quiet, and has a brush life up to 10,000 hours. A wide speed turndown ratio (20:1) can be obtained with the speed controllers on page 37.</i> 2000rpm
Brushless DC 35 Watt 24VDC	<i>This brushless DC motor features a built-in controller that can be remotely operated via analog signals from a PC or PLC. Speed can be controlled by a 0-4 Volt control signal, and stop/start and direction can be controlled by relays. The controller has a pulsed tachometer output.</i> 3650rpm

### Additional options for 313D & 501RL

Motor Type	No Load Speed
DC motor for 313FD /D	<i>This is an economical DC motor with a brush life of approximately 2000 hours, and speeds up to 100 rpm. The 313SCB on page 6 can be used to control speed with a turndown ratio of 10:1</i> 2500 rpm
DC motor for 313FDC/D & 501FDC/RL	<i>These are economical motors offering a speed of 220 rpm at 12 volts, and a brush life of approximately 2500 hours. Contact Watson-Marlow Bredel for speed controller.</i> 2500 rpm
AC Induction Motors	<i>A high torque output permanent split capacitor AC motor. The motors run at a constant speed are rated for continuous duty, and reversible.</i> 2500 rpm
AC Shaded Pole Motors	<i>Feature a low cost, and reliability at relatively constant speeds. Motors are limited by torque capability, but are rated for continuous duty.</i> 2700 rpm

### Non-standard motors

Motor Type	No Load Speed
Stepper Motors	<i>Gives the user precise control down to a fraction of a revolution, making them the choice when dispensing a set volume. The stepper must be controlled by a specialized drivers and logic circuits provided by the end user. Steppers are a custom option that can be provided for most pump models.</i>

## Tube Selection and Sample Compatibility

### CHOOSING THE BEST TUBE

Watson-Marlow tubing is available in seven materials and over forty sizes, giving an extraordinary range of chemical and application capability. Watson-Marlow pumps are designed for Watson-Marlow tubing tolerances and performance, and no other tubing will provide comparable results.

The tubing largely dictates pump performance: its restitution creates suction; its strength resists pressure; its flex resistance determines pumping life; its bore defines the flow rate; and its wall thickness controls pumping efficiency.

**Marprene** is Watson-Marlow's exclusive thermoplastic elastomer.



Always our first recommendation, Marprene is the longest-life tubing with a wide chemical compatibility, and is highly resistant to oxidizing agents such as ozone and peroxides and sodium hypochlorite. Marprene is beige in color, opaque to both visible and ultra-violet light, with low permeability to gases such as oxygen, carbon dioxide and nitrogen, and meets USDA standards for food handling. Working temperature range 5C to 80C. Autoclavable.

**Bioprene** has the same long life as Marprene but complies with USP Class VI, FDA requirements 21 CFR 177.2600 and NSF and USDA standards for food handling. It has a wide chemical compatibility, and can handle repeated autoclaving. Bioprene can be sterilized by ethylene oxide or gamma irradiation. Working temperature range is 5C to 80C. Beige. Available in 15 meter packs only.



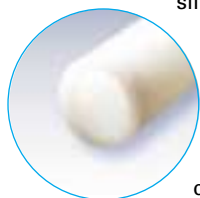
**Silicone** is the standard laboratory tubing used for small bore sizes up to 9.6mm.

Food and medical quality, meets USP and NSF Class VI standards and autoclavable.

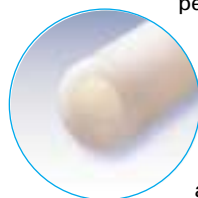


**Watson-Marlow** manufactures a specially developed **platinum-cured silicone tubing** for additional protection from contamination during the pumping process. Platinum-cured tubing produces a smoother surface; less protein binding offers high levels of purity. It is ideal for medical devices, chemical analysis and pharmaceutical production applications, particularly where there is long term contact with the process fluid. Working temperature range -20C to 80C. High permeability to gases. Translucent. Autoclavable.

**Sta-Pure** has a unique composite construction of silicone in a PTFE lattice, giving it superior burst resistance up to 7 Bar (100psi) and 18 times longer life than silicone tubing. It produces virtually no spalling, is USP Class VI approved and is classified as non-toxic. Working temperature range is 0C to 80C. Opaque white. Autoclavable, SIP and CIP compatible.



**Chem-Sure** is effectively pumpable PTFE - a high performance composite of PTFE and a high-grade fluoroelastomer - offering extraordinary chemical resistance, long life and very high burst pressures. Chem-Sure is USP Class VI and food grade approved, making it suitable for foods and pharmaceuticals as well as aggressive chemicals.



**Neoprene** offers excellent performance with abrasive slurries and sustained pressure applications. Good suction and pressure capabilities. Food quality. Working temperature range is 0C to 80C. Black.



**PVC** has a high Shore hardness giving excellent pressure and suction performance and low gas permeability. FDA approved for use with food and is NFS listed. Working temperature range 0C - 60C. Glass clear.



### Sample Compatibility

The best way to select a tube is to first decide which materials are chemically suitable, and then choose the one which best meets the physical demands of the application. Normally, use the longest tube life material, which will usually be Bioprene or Marprene if they are chemically and physically suitable. Otherwise, silicone tubing is most often chosen for sizes up to (9.6mm) 3/8", and Neoprene tubing for bore sizes of (12.7mm) 1/2" or more.

### Checking your choice with an immersion test

Always conduct an immersion test before choosing a tube material for critical applications. Immerse a short length of the tubing or a disk of rubber sample (always available from Watson-Marlow or its distributors) in a closed container of the fluid for 48 hours, and then examine for signs of attack, swelling, embrittlement or other deterioration.

# TUBING

## Ordering information

**Table A 1. 6mm wall thickness tubing for 102R, 313, 314, 400F/B1, 400F/R1, and 501RL pumps**

Tube#	Tube bore	Bioprene	Marprene	Silicone	Sta-Pure	Chem-Sure
112	0.5mm 1/50"	<a href="#">903.0005.016</a>	<a href="#">902.0005.016</a>	<a href="#">913.A005.016</a>		
13	0.8mm 1/32"	<a href="#">903.0008.016</a>	<a href="#">902.0008.016</a>	<a href="#">913.A008.016</a>		
14	1.6mm 1/16"	<a href="#">903.0016.016</a>	<a href="#">902.0016.016</a>	<a href="#">913.A016.016</a>	<a href="#">960.0016.016</a>	<a href="#">965.0016.016</a>
	2.4mm 3/32"		<a href="#">902.0024.016</a>	<a href="#">910.0016.016</a>		
16	3.2mm 1/8"	<a href="#">903.0032.016</a>	<a href="#">902.0032.016</a>	<a href="#">913.A032.016</a>	<a href="#">960.0032.016</a>	<a href="#">965.0032.016</a>
	4.0mm 5/32"		<a href="#">902.0040.016</a>	<a href="#">910.0040.016</a>		
25	4.8mm 3/16"	<a href="#">903.0048.016</a>	<a href="#">902.0048.016</a>	<a href="#">913.A048.016</a>	<a href="#">960.0048.016</a>	<a href="#">965.0048.016</a>
17	6.4mm 1/4"	<a href="#">903.0064.016</a>	<a href="#">902.0064.016</a>	<a href="#">913.A064.016</a>	<a href="#">960.0064.016</a>	<a href="#">965.0064.016</a>
18	8.0mm 5/16"	<a href="#">903.0080.016</a>	<a href="#">902.0080.016</a>	<a href="#">913.A080.016</a>	<a href="#">960.0080.016</a>	<a href="#">965.0080.016</a>
Tube#	Tube bore	Neoprene	Butyl	PVC	Fluorel	
112	0.5mm 1/50"				<a href="#">970.0005.016</a>	
13	0.8mm 1/32"	<a href="#">920.0008.016</a>			<a href="#">970.0008.016</a>	
14	1.6mm 1/16"	<a href="#">920.0016.016</a>	<a href="#">932.0016.016</a>	<a href="#">950.0016.016</a>	<a href="#">970.0016.016</a>	
16	3.2mm 1/8"	<a href="#">920.0032.016</a>	<a href="#">932.0032.016</a>	<a href="#">950.0032.016</a>	<a href="#">970.0032.016</a>	
25	4.8mm 3/16"	<a href="#">920.0048.016</a>	<a href="#">932.0048.016</a>	<a href="#">950.0048.016</a>	<a href="#">970.0048.016</a>	
17	6.4mm 1/4"	<a href="#">920.0064.016</a>	<a href="#">932.0064.016</a>	<a href="#">950.0064.016</a>	<a href="#">970.0064.016</a>	
18	8.0mm 5/16"	<a href="#">920.0080.016</a>	<a href="#">932.0080.016</a>	<a href="#">950.0080.016</a>	<a href="#">970.0080.016</a>	

**Table B 2.4mm wall thickness tubing for 313D2, 314D2, and 501RL pumpheads**

Tube#	Tube bore	Bioprene	Marprene	Silicone	Sta-Pure	Chem-Sure
105	0.5mm 1/50"			<a href="#">913.A005.024</a>		
108	0.8mm 1/32"			<a href="#">913.A008.024</a>		
119	1.6mm 1/16"	<a href="#">903.0016.024</a>	<a href="#">902.0016.024</a>	<a href="#">913.A016.024</a>	<a href="#">960.0016.024</a>	<a href="#">965.0016.024</a>
120	3.2mm 1/8"	<a href="#">903.0032.024</a>	<a href="#">902.0032.024</a>	<a href="#">913.A032.024</a>	<a href="#">960.0032.024</a>	<a href="#">965.0032.024</a>
15	4.8mm 3/16"	<a href="#">903.0048.024</a>	<a href="#">902.0048.024</a>	<a href="#">913.A048.024</a>	<a href="#">960.0048.024</a>	<a href="#">965.0048.024</a>
24	6.4mm 1/4"	<a href="#">903.0064.024</a>	<a href="#">902.0064.024</a>	<a href="#">913.A064.024</a>	<a href="#">960.0064.024</a>	<a href="#">965.0064.024</a>
121	8.0mm 5/16"	<a href="#">903.0080.024</a>	<a href="#">902.0080.024</a>	<a href="#">913.A080.024</a>	<a href="#">960.0080.024</a>	<a href="#">965.0080.024</a>
122	9.6mm 3/8"	<a href="#">903.0096.024</a>	<a href="#">902.0096.024</a>	<a href="#">913.A096.024</a>	<a href="#">960.0096.024</a>	<a href="#">965.0096.024</a>

**Table C 1.0mm wall thickness tubing for 400F/D2-D3, and 400F/N, not elements**

Bore Size	Marprene	Silicone
0.5	<a href="#">903.0005.010</a>	<a href="#">910.0005.010</a>
1.0	<a href="#">903.0010.010</a>	<a href="#">910.0010.010</a>
2.0	<a href="#">903.0020.010</a>	<a href="#">910.0020.010</a>
3.0	<a href="#">903.0030.010</a>	<a href="#">910.0030.010</a>
4.0	<a href="#">903.0040.010</a>	<a href="#">910.0040.010</a>

**Table D LoadSure® tube elements for 620RE pumpheads**

Bore/Connector	Bioprene TM	Bioprene TL	Sta-Pure	Plat Silicone	Marprene TM	Marprene TL	Neoprene
12.0mm / 15/32" Tri Clamp	<a href="#">903.M120.PFT</a>	<a href="#">903.L120.PFT</a>	<a href="#">960.0120.PFT</a>	<a href="#">913.A120.PFT</a>			
17.0mm / 11/16" Tri Clamp	<a href="#">903.M170.PFT</a>	<a href="#">903.L170.PFT</a>	<a href="#">960.0170.PFT</a>	<a href="#">913.A170.PFT</a>			
12.0mm / 15/32" Cam Lock					<a href="#">902.M120.PPC</a>	<a href="#">902.L120.PPC</a>	<a href="#">902.0120.PPC</a>
17.0mm / 11/16" Cam Lock					<a href="#">902.M170.PPC</a>	<a href="#">902.L170.PPC</a>	<a href="#">902.0170.PPC</a>

**Table E 3.2mm wall thickness tubing for 620R close coupled pumphead**

Tube#	Tube bore	Bioprene	Marprene	Sta-Pure	Silicone
123	4.8mm 3/16"			<a href="#">960.0048.032</a>	<a href="#">913.A048.032</a>
26	6.4mm 1/4"	<a href="#">903.0064.032</a>	<a href="#">902.0064.032</a>	<a href="#">960.0064.032</a>	<a href="#">913.A064.032</a>
73	9.6mm 3/8"	<a href="#">903.0096.032</a>	<a href="#">902.0096.032</a>	<a href="#">960.0096.032</a>	<a href="#">913.A096.032</a>
82	12.7mm 1/2"	<a href="#">903.0127.032</a>	<a href="#">902.0127.032</a>	<a href="#">960.0127.032</a>	<a href="#">913.A127.032</a>
184	15.9mm 5/8"	<a href="#">903.0159.032</a>	<a href="#">902.0159.032</a>	<a href="#">960.0159.032</a>	<a href="#">913.A159.032</a>
Tube#	Tube bore	Neoprene	Butyl	PVC	Flourel
125	3.2mm 1/8"		<a href="#">932.0032.032</a>		
26	6.4mm 1/4"	<a href="#">920.0064.032</a>	<a href="#">932.0064.032</a>	<a href="#">950.0064.032</a>	<a href="#">970.0064.032</a>
73	9.6mm 3/8"	<a href="#">920.0096.032</a>	<a href="#">932.0096.032</a>	<a href="#">950.0096.032</a>	<a href="#">970.0096.032</a>
82	12.7mm 1/2"	<a href="#">920.0127.032</a>	<a href="#">932.0127.032</a>	<a href="#">950.0127.032</a>	<a href="#">970.0127.032</a>
184	15.9mm 5/8"	<a href="#">920.0159.032</a>	<a href="#">932.0159.032</a>	<a href="#">950.0159.032</a>	<a href="#">970.0159.032</a>

**Table F 3-Stop Manifold Tubing for 400F/DM and microcassette pumps**

	Colour Code	Marprene	Silicone	PVC
0.13	0.005"	orange/black		<a href="#">981.0013.000</a>
0.19	0.007"	orange/red		<a href="#">981.0019.000</a>
0.25	0.010"	orange/blue	<a href="#">979.0025.000</a>	<a href="#">981.0025.000</a>
0.38	0.015"	orange/green	<a href="#">979.0038.000</a>	<a href="#">981.0038.000</a>
0.50	0.020"	orange/yellow	<a href="#">979.0050.000</a>	<a href="#">981.0050.000</a>
0.63	0.025"	orange/white	<a href="#">979.0063.000</a>	<a href="#">981.0063.000</a>
0.76	0.030"	black/black	<a href="#">979.0076.000</a>	<a href="#">981.0076.000</a>
0.88	0.035"	orange/orange	<a href="#">979.0088.000</a>	<a href="#">981.0088.000</a>
1.02	0.040"	white/white	<a href="#">979.0102.000</a>	<a href="#">981.0102.000</a>
1.14	0.045"	red/grey	<a href="#">979.0114.000</a>	<a href="#">981.0114.000</a>
1.29	0.050"	grey/grey	<a href="#">979.0129.000</a>	<a href="#">981.0129.000</a>
1.42	0.055"	yellow/yellow	<a href="#">979.0142.000</a>	<a href="#">981.0142.000</a>
1.47	0.058"	translucent	<a href="#">983.0417.000</a>	
1.52	0.060"	yellow/blue	<a href="#">979.0152.000</a>	<a href="#">981.0152.000</a>
1.65	0.065"	blue/blue	<a href="#">979.0165.000</a>	<a href="#">981.0165.000</a>
1.85	0.070"	green/green	<a href="#">979.0185.000</a>	<a href="#">981.0185.000</a>
2.05	0.080"	purple/purple	<a href="#">979.0205.000</a>	<a href="#">981.0205.000</a>
2.29	0.090"	purple/black	<a href="#">979.0238.000</a>	<a href="#">981.0238.000</a>
2.54	0.100"	purple/orange	<a href="#">979.0254.000</a>	<a href="#">981.0254.000</a>
2.79	0.110"	purple/white	<a href="#">979.0279.000</a>	<a href="#">981.0279.000</a>

## Ordering information

Table G) 2-Stop Manifold Tubing for 400F/VM and 400F/GM pumps

		Colour Code	Marprene	Silicone	PVC	PVC Solvent Resist	Acid Resistant
0.13	0.005"	orange/black			980.0013.000	984.0013.000	
0.19	0.007"	orange/red			980.0019.000	984.0019.000	
0.25	0.010"	orange/blue	978.0025.000		980.0025.000	984.0025.000	
0.38	0.015"	orange/green	978.0038.000		980.0038.000	984.0038.000	
0.50	0.020"	orange/yellow	978.0050.000		980.0050.000	984.0050.000	986.0050.000
0.63	0.025"	orange/white	978.0063.000	982.0063.000	980.0063.000	984.0063.000	986.0063.000
0.76	0.030"	black/black	978.0076.000	982.0076.000	980.0076.000	984.0076.000	986.0076.000
0.88	0.035"	orange/orange	978.0088.000	982.0088.000	980.0088.000	984.0088.000	986.0088.000
1.02	0.040"	white/white	978.0102.000	982.0102.000	980.0102.000	984.0102.000	986.0102.000
1.14	0.045"	red/grey	978.0114.000	982.0114.000	980.0114.000	984.0114.000	986.0114.000
1.29	0.050"	grey/grey	978.0129.000	982.0129.000	980.0129.000	984.0129.000	986.0129.000
1.42	0.055"	yellow/yellow	978.0142.000	983.0142.000	980.0142.000	984.0142.000	986.0142.000
1.47	0.058"	translucent		982.0417.000			
1.52	0.060"	yellow/blue	978.0152.000	982.0152.000	980.0152.000	984.0152.000	986.0152.000
1.65	0.065"	blue/blue	978.0165.000	982.0165.000	980.0165.000	984.0165.000	986.0165.000
1.85	0.070"	green/green	978.0185.000	982.0185.000	980.0185.000	984.0185.000	986.0185.000
2.05	0.080"	purple/purple	978.0205.000	982.0205.000	980.0205.000	984.0205.000	986.0205.000
2.29	0.090"	purple/black	978.0238.000	982.0238.000	980.0238.000	984.0238.000	986.0238.000
2.54	0.100"	purple/orange	978.0254.000	982.0254.000	980.0254.000	984.0254.000	986.0254.000
2.79	0.110"	purple/white	978.0279.000	982.0279.000	980.0279.000	984.0279.000	986.0279.000

\* For autoclavable tubing, please replace last "0" of Product code with "\*" - for example, 978.0229.00\*



## Standard 410 Elements for 400F/M1

## Tube ordering codes

Bore / wall (mm)	Tubing material		Peroxide Silicone	Connects to
	Marprene	PVC		
0,5 / 1,6	049.EF6M.E05	Not available	Not available	FTLL, see Transfer Connections below
0,8 / 1,6	049.EF6M.E08	Not available	049.EH6M.E08	FTLL, see Transfer Connections below
1,6 / 1,6	049.EF6M.E16	049.ET6M.E16	049.EH6M.E16	FTLL, see Transfer Connections below
2,4 / 1,6	049.EF6M.E24	049.ET6M.E24	049.EH6M.E24	FTLL, see Transfer Connections below
3,2 / 1,6	049.EF6M.E32	049.ET6M.E32	049.EH6M.E32	FTLL, see Transfer Connections below
4,0 / 1,6	049.EF6M.E40	049.ET6M.E40	049.EH6M.E40	FTLL, see Transfer Connections below

## Transfer connections

Connects to	Ordering codes
Tube bore 1,6	FTLL210-6
Tube bore 2,4	FTLL220-6
Tube bore 3,2	FTLL230-6
Tube bore 4,0	FTLL240-6
Tube bore 4,8	FTLL250-6

## Standard 420 Elements for 400F/N2

## Tube ordering codes

Bore / wall (mm)	Tubing material		Connects to
	Marprene	Peroxide Silicone	
0,5 / 1,0	049.EF6N.N05	Not available	Tube bore 3,0
1,0 / 1,0	049.EF6N.N10	049.EH6N.N10	Tube bore 3,0
2,0 / 1,0	049.EF6N.N20	049.EH6N.N20	Tube bore 3,0
3,0 / 1,0	049.EF6N.N30	049.EH6N.N30	Tube bore 3,0





## Standard 430 Elements for 400F/D2 and 400F/D3

Tube ordering codes			
Bore / wall (mm)	Tubing material		Connects to
	Marprene	Peroxide Silicone	
0,5 / 1,0	049.EF6D.N05	Not available	Tube bore 3,0
1,0 / 1,0	049.EF6D.N10	049.EH6D.N10	Tube bore 3,0
2,0 / 1,0	049.EF6D.N20	049.EH6D.N20	Tube bore 3,0
3,0 / 1,0	Not available	049.EH6D.N30	Tube bore 3,0

## Standard 440 Elements for 400F/L2

Tube ordering codes				
Bore / wall (mm)	Tubing material		Peroxide Silicone	Connects to
	Marprene	PVC		
0,8 / 1,6	049.EF6L.E08	049.ET6L.E08	049.EH6L.E08	FTLL, see Transfer Connections below
1,6 / 1,6	049.EF6L.E16	049.ET6L.E16	049.EH6L.E16	FTLL, see Transfer Connections below
2,4 / 1,6	049.EF6L.E24	049.ET6L.E24	049.EH6L.E24	FTLL, see Transfer Connections below
3,2 / 1,6	049.EF6L.E32	049.ET6L.E32	049.EH6L.E32	FTLL, see Transfer Connections below
4,0 / 1,6	049.EF6L.E40	049.ET6L.E40	049.EH6L.E40	FTLL, see Transfer Connections below
4,8 / 1,6	049.EF6L.E48	049.ET6L.E48	049.EH6L.E48	FTLL, see Transfer Connections below

Transfer connections	
Connects to	Ordering codes
Tube bore 1,6	FTLL210-6
Tube bore 2,4	FTLL220-6
Tube bore 3,2	FTLL230-6
Tube bore 4,0	FTLL240-6
Tube bore 4,8	FTLL250-6



## Y Connectors transforming 2 channels to 1 low pulse channel

## Standard 440 Y Elements for 400F/L2

Tube ordering codes				
Bore / wall (mm)	Tubing material		Peroxide Silicone	Connects to
	Marprene	PVC		
1,6 / 1,6	049.EF6L.Y16	049.ET6L.Y16	049.EH6L.Y16	FTLL, see Transfer Connections below
2,4 / 1,6	049.EF6L.Y24	049.ET6L.Y24	049.EH6L.Y24	FTLL, see Transfer Connections below
3,2 / 1,6	049.EF6L.Y32	049.ET6L.Y32	049.EH6L.Y32	FTLL, see Transfer Connections below
4,0 / 1,6	049.EF6L.Y40	049.ET6L.Y40	049.EH6L.Y40	FTLL, see Transfer Connections below
4,8 / 1,6	049.EF6L.Y48	049.ET6L.Y48	049.EH6L.Y48	FTLL, see Transfer Connections below

Transfer connections	
Connects to	Ordering codes
Tube bore 1,6	FTLL210-6
Tube bore 2,4	FTLL220-6
Tube bore 3,2	FTLL230-6
Tube bore 4,0	FTLL240-6
Tube bore 4,8	FTLL250-6





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## Pump Series

## Flow Rates

Put a peristaltic in your process Improve your performance

<b>100</b>	Single channel, low flow pumps. Fixed or variable speed.	1µl/min - 53ml/min	101U
<b>200</b>	Near pulseless, multi-channel pumps with up to 32 channels.	0.6µl/min - 22ml/min	205U
<b>300</b>	NEW Compact, single or multi-channel laboratory pumps with manual, remote, analogue, RS232 or dispensing control.	2µl/min - 2.2 litre/min	323U
<b>400</b>	Instrument-quality, ultra-precise, single and multi-channel pumps with manual or process control.	1µl/min - 730ml/min	405U
<b>500</b>	Microprocessor controlled and IP55 industrial pumps with manual, auto and digital control.	10µl/min - 4.4 litre/min	505S
<b>600</b>	IP55 mid-flow industrial pumps. Fixed or variable speed.	50ml/min - 18.3 litre/min	624U
<b>700</b>	IP55 industrial pumps with manual or auto control, single or twin channel.	1.6 litre/min - 66 litre/min	704U
<b>800</b>	High flow hygienic pumps with full CIP and SIP capability.	2 litre/min - 133 litre/min	840
<b>SPX</b>	Bredel: High flow industrial pumps operating at pressures up to 16 bar (230 psi).	0.3 litre/min 80m <sup>3</sup> /hr	SPX40

**Tubing Hoses** Extensive range of tubing ensures chemical compatibility. USP Class VI and FDA approvals. Precision machined, reinforced hoses provide flow stability and excellent suction performance.

- Twelve tubing materials in bore sizes 0.13mm to 25.4mm
- Autoclavable Marprene, Bioprene, STA-PURE, Chem-Sure and Pumpsil (platinum-cured Silicone)

Tubing



### PROFILE OF FLOW RATE AGAINST TIME

The flow rate of all peristaltic pump tubing will reduce over time, with the majority of the change occurring in the first hours and days of use, after which the flow rate will stabilise. Maximum accuracy of metering and dosing will be obtained during this period of stability. Where precise flow rates are required, it is recommended that the flow rate is calibrated after at least a one hour running-in period.

### FLOW RATES

All flow rates given in this catalogue were obtained pumping water at 20°C (68°F) with zero suction and delivery heads. PVC tubing was used to obtain the 200 series flow rates, Marprene or Bioprene tubing to obtain the 600 series flow rates. All other flow rates were obtained using silicone tubing.

### OPERATING AND STORAGE TEMPERATURES

Unless otherwise stated, all pumps listed in this catalogue may be operated at ambient temperatures between 5°C and 40°C (41°F and 104°F). They may be stored at temperatures between -40°C and 70°C (-40°F and 158°F), but allow time for acclimatisation before operating.

### STANDARDS

CE Meets all relevant directives

**EN601010** is the European Norm standard dealing with "Safety requirements for electrical equipment for measurement, control and laboratory use".

**EN60529** is the European Norm standard dealing with the "Classification of degrees of protection provided by enclosures for rotating machines. Equivalents are BS 4999: Part 105, IEN 60 034: Part 5, and DIN VDE 0530: Part 5. IP numbers (such as IP34, IP42, IP55) indicate the degree of ingress protection of the product, with the first digit indicating protection against the ingress of objects, and the second digit indicating the degree of protection against the ingress of water.

### SPARE PARTS AVAILABILITY

Watson-Marlow's policy is to provide spare parts for all products for a minimum of seven years from discontinuation. The ability to implement this policy is not entirely within Watson-Marlow's control and cannot be guaranteed, but every effort will be made to honour this policy.



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