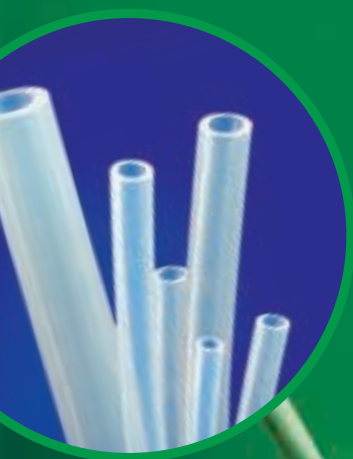


300 and 400 series

NEW

The new standards in laboratory and benchtop pumping



300 and 400 Series from Watson-Marlow BredeI

The new standard in pumping

With over one million pumps sold, Watson-Marlow BredeI is the world's leading peristaltic pump manufacturer, entrusted with the handling of valuable, difficult and sensitive fluids in research, pilot and production processes everywhere that science is building our future.

science

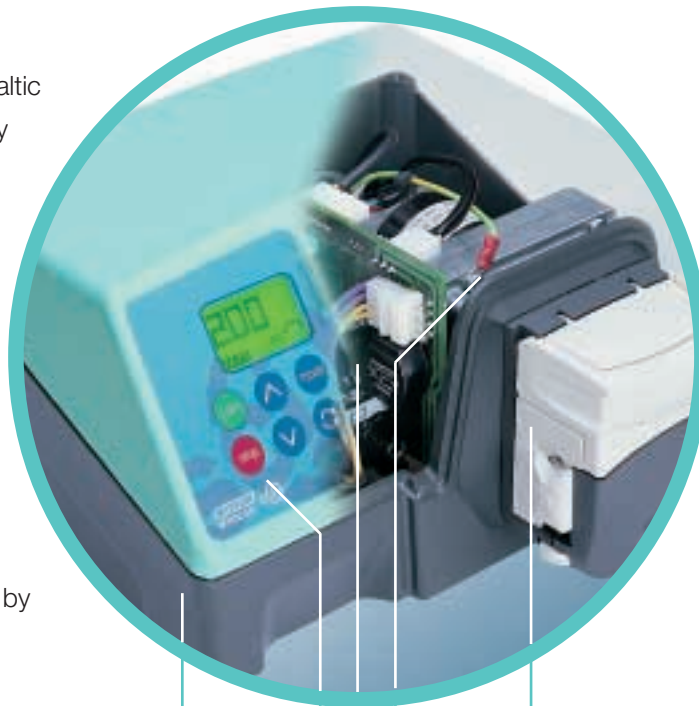
Watson-Marlow BredeI pumps have been created for **science**, by science, exploiting every latest technique from 3D solid design, finite element analysis, rapid prototyping, intensive tooling and cellular build. The results are as near perfection as the state of the art can provide.

intelligence

At the heart of a Watson-Marlow BredeI pump is microprocessor **intelligence**, but what really marks it out is the intelligence of its design, born from a passion for engineering fluid-handling solutions. Watson-Marlow BredeI creates intelligent designs for intelligent users.

quality

The highest **quality** peristaltic pump available today, every Watson-Marlow BredeI product is engineered for quality. Zero-maintenance motors, whisper-quiet gearboxes and the most sophisticated control electronics designed and manufactured to ISO9001:2000 are backed by expert local support.



- Bioreactors/fermenters - nutrient feed, harvesting, anti-foam, perfusion, pH adjustment
- Ultrafiltration and diafiltration
- Chromatography
- Media preparation
- Benchtop dispensing

Inside the 323

Durable chemical-resistant case, crevice-free for hygiene; distinctive, contemporary and functional

Easy-use interface: high-visibility display and contoured membrane keypad designed for intuitive operation

Full integration with PLC and other equipment; includes digital, analog and serial RS232 communication

Five modular pumphead types for single or multi-channel flows from $\mu\text{l}/\text{minute}$ to 2.0 liters per minute

Precision brushless DC motor: servo-quality for precise speed control; zero maintenance

Assured aseptic and sterile pumping ...

The all-new 300 series is designed exclusively for laboratory pumping needs and brings a stunning new level of performance and quality to the benchtop. The 400 series is Watson-Marlow Bredel's range of instrument-quality ultra-compact pumps.

All are ideal for bench top applications and there is a choice of single and multi-channel pumpheads. Each 400 series pumphead is precision machined and has its own tube compression adjustment ensuring superior set-up accuracy and repeatable flow rates:

- **Giving superior flow rate stability and metering accuracy**
- **Facilitating aseptic and sterile applications**



- Bioreactors/fermenters - nutrient feed, harvesting, anti-foam, perfusion, pH adjustment
- Ultrafiltration and diafiltration • Chromatography • Media preparation • Benchtop dispensing

... to give you the best results ...

Zero contamination

Watson-Marlow Bredel pumps totally contain the fluid so that it is isolated from any source of contamination including the metallic components of the pump. Superior tubing material technology further enhances the integrity of the process and provides improved batch consistency which is particularly important with fermentation and mammalian cell culture.

Sterility

Residues of pumped product trapped or left in the pump are major sources of bacterial contamination to the process. This problem can be found in any pump with crevices and dead spots, such as rotary lobe pumps. Watson-Marlow Bredel pumps have a clear straight-through flow path and the pump chamber is always fully swept, eliminating possible batch contamination and downtime.

Low shear

Transfer of the product without degradation or damage is critical to the process. Traditional pumps can damage the product with high velocities and arduous flow paths, due to impellers, vanes, lobes or valves. Watson-Marlow Bredel pumps avoid all these with their clean low-shear action, ensuring improved product quality.

Accuracy

Metering or dosing of pharmaceutical products, live cell cultures, nutrients, or bioreactor constituents demands accurate and repeatable flow rates. Watson-Marlow Bredel pumps provide true positive displacement with no product back-flow or slip, giving accuracies up to $\pm 0.5\%$ ensuring process stability and finished product quality.

Reliability

Pump failure during production cannot be tolerated due to the intrinsic value of the product. Watson-Marlow Bredel pumps' design, high quality manufacture and advanced elastomer technology gives long and predictable service life, and batch or production runs can be completed without interruption.



Cost-effective pump features a large clear LCD display with accurate digital monitoring and intuitive operation. Also features ultra-clean brushless DC motor for excellent speed control, quiet operation and no maintenance. The pump has a small package size tough chemical resistant ABS case. Every Watson-Marlow Bredel pump is engineered for quality. With zero maintenance motors, whisper-quiet gearboxes and sophisticated control electronics designed and manufactured to ISO9001.

300

POWER AND PERFORMANCE FOR THE BENCHTOP

SERIES

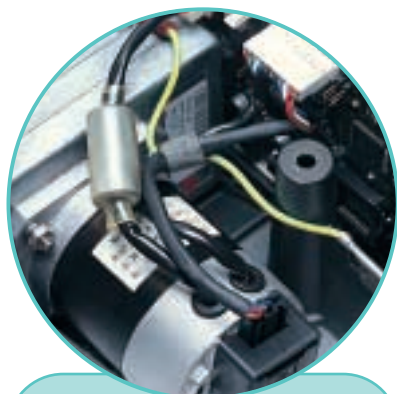
The new 323 range is designed exclusively for scientific pumping needs and brings a stunning new level of performance and quality to the benchtop. Five brand new drives coupled with four pumphead options meet every need. Up to five 313 and 314 pumpheads (they can be mixed) can be fitted to a single drive, and up to two 314MC or 318MC five-channel pumpheads (which can also be mixed) can be fitted to a single drive to provide ten channels of flow.



High visibility display, wipe-clean keypad



Chemical-resistant case, distinctive, contemporary and functional



Brushless DC motor means zero maintenance and precision control



Choice of control options – manual, analog auto, digital RS232/auto

323E/D manual control variable speed pump

- 313D pumphead produces flow rates to 2000ml/min
- 27:1 speed control ratio
- Snap-fit 313X extension pumpheads provide up to five channels
- Two year comprehensive warranty

Digital speed control from 15 to 400rpm in 5rpm steps. Instantly reversible, rapid-loading 313 flip-top pumphead accepts seven tube sizes. Switchable between 100-120V or 220-240V.

323E drives may also be fitted with 314 four roller pumpheads if lower pulsing is required, or with 313D2 or 314D2 pumpheads which accept 3/32" (2.4mm) thick wall tubing for higher pressure operation or pumping more viscous fluids.

See the 300 series drive and pumpheads section on page 7 for details.

For tubing for the 323E/D, see table on page 9.

323E/D flow rate ranges (ml/min)						
Pump	Speed range	1/16"	1/8"	3/16"	1/4"	5/16"
		1.6mm	3.2mm	4.8mm	6.4mm	8.0mm
323E/D	15 to 400rpm	4.1-110	15-400	33-880	54-1400	75-2000



323E/D

323S/D high-performance manual control variable speed pumps

- High-performance microprocessor controlled pumps
- 323S/D can be extended with 313X extension pumpheads to five channels
- Flow rates to 2000ml/min with 323S/D

323S/D speed adjusts in 1rpm steps from 3 to 400rpm. Instantly reversible, rapid-loading flip-top pumphead accepts seven tube sizes, keypad lock prevents tampering or accidental changes, auto restart for power failure recovery, switchable between 100-120V or 220-240V, two year comprehensive warranty. MemoDose facility for accurate single shot dosing.

323S drives may also be fitted with 314 four roller pumpheads if lower pulsing is required, or with 313D2 or 314D2 pumpheads which accept 3/32" (2.4mm) thick wall tubing for higher pressure operation or pumping more viscous fluids.

For low-flow pumping, up to ten channels, 323S drives may be fitted with 314MC (four-roller) and 318MC (eight-roller) microcassette pumpheads, which can be extended to ten channels by adding one 314MCX or 318MCX extension pumphead. See the 300 series drive and pumpheads section on page 7 for details.

For tubing for the 323S/D, see table on page 9.

323S/D flow rate ranges (ml/min)						
Pump	Speed range	1/16"	1/8"	3/16"	1/4"	5/16"
		1.6mm	3.2mm	4.8mm	6.4mm	8.0mm
323S/D	3.0 to 400rpm	0.81-110	3.0-400	6.6-880	11-1400	15-2000



323S/D

Ordering information for 323E/D and 323S/D pumps

Pump	Pumphead fitted	Speed range	Supply	Product code
323E/D	313D three roller pumphead	15 to 400rpm	100-120/220-240V 50/60Hz 1ph 100VA	030.3124.3D0*
323S/D	313D three roller pumphead	3.0 to 400rpm	100-120/220-240V 50/60Hz 1ph 100VA	030.3134.3D0*

*Replace last 0 with A, E or U for American, European or UK mains lead

Extension pumpheads	Product code
313X three-roller extension pumphead (maximum five - see page 9)	033.3431.000

323E and 323S specifications

Weights	10.3lbs	Dimensions (inches)	H5.2 x W9.1 x L8.9
Standards	EN60529 (IP31) CE		



323U/D

323U/D analog auto/manual control variable speed pumps

- Manual control or remote 4-20mA or 0-10V analog auto-control
- Digital, remote switch or TTL inputs for run/stop and direction
- Flow rates to 2000ml/min
- 323U/D can be extended with 313X extension pumpheads to five channels



323U/D speed adjusts in 1rpm steps from 3 to 400rpm. Instantly reversible, rapid-loading flip-top pumphead accepts seven tube sizes, keypad lock prevents tampering or accidental changes, auto restart for power failure recovery, switchable between 100-120V or 220-240V, two year comprehensive warranty. Control card mounted on the rear panel accepts 4-20mA or 0-10V analog auto-control signals, and remote switching of direction and run/stop. MemoDose facility for accurate single shot dosing.

323U drives may also be fitted with 314 four roller pumpheads if lower pulsing is required, or with 313D2 or 314D2 pumpheads which accept 3/32" (2.4mm) thick wall tubing for higher pressure operation or pumping more viscous fluids.

For low-flow pumping through up to ten channels, 323U drives may be fitted with 314MC (four-roller) and 318MC (eight-roller) microcassette pumpheads, which can be extended to ten channels by adding one 314MCX or 318MCX extension pumphead. See the 300 series drive and pumpheads section on page 7 for details.

For tubing for the 323U/D, see table on page 9.

323U/D flow rate ranges (ml/min)

Pump	Speed range	1/16"	1/8"	3/16"	1/4"	5/16"
		1.6mm	3.2mm	4.8mm	6.4mm	8.0mm
323U/D	3.0 to 400rpm	0.81-110	3.0-400	6.6-880	11-1400	15-2000

Ordering information for 323U/D pumps

Pump	Pumphead fitted	Speed range	Supply	Product code
323U/D	313D three-roller pumphead	3.0 to 400rpm	100-120/220-240V 50/60Hz 1ph 100VA	030.3144.3DA

Extension pumpheads

	Product code
313X three-roller extension pumphead (maximum four - see page 8)	033.3431.00A

323U specifications

Weights	323U/D 10.3lbs
Dimensions (inches)	H5.2 x W9.1 x L8.9
Control ratio	323U/D 400rpm 133:1
Standards	IEC 335-1, EN60529 (IP31Wipedown) CE



323Du/D

323Du/D RS232 analog auto/manual control variable speed pumps

- Precision digital auto-control, RS232 serial communication
- Digital, remote switched or TTL inputs for run/stop and direction
- Manual control or 4-20mA or 0-10V analog auto-control
- 323Du/D can be extended with 313X extension pumpheads to five channels of flow up to 2000ml/min per channel



323Du/D speed adjusts in 1rpm steps from 3 to 400rpm. Instantly reversible, easy-loading flip-top pumpheads accept seven tube sizes, keypad lock prevents tampering or accidental changes, auto restart for power failure recovery, switchable between 100-120V or 220-240V. Control card mounted on the rear panel accepts RS232 signals, 4-20mA or 0-10V analog auto-control signals and remote switching of direction and run/stop. MemoDose facility for accurate single shot dosing. Two year comprehensive warranty.

323Du drives may also be fitted with 314 four roller pumpheads if lower pulsing is required, or with 313D2 or 314D2 pumpheads which accept 3/32" (2.4mm) thick wall tubing for higher pressure operation or pumping more viscous fluids.

For low-flow pumping through up to ten channels, 323Du drives may be fitted with 314MC (four-roller) and 318MC (eight-roller) microcassette pumpheads, which can be extended to ten channels by adding one 314MCX or 318MCX extension pumphead. See the 300 series drive and pumpheads section on page 7 for details.

For tubing for the 323Du/D, see table on page 9.

323Du/D flow rate ranges (ml/min)

Pump	Speed range	1/16"	1/8"	3/16"	1/4"	5/16"
		1.6mm	3.2mm	4.8mm	6.4mm	8.0mm
323Du/D	3.0 to 400rpm	0.81-110	3.0-400	6.6-880	11-1400	15-2000

Ordering information for 323Du/D pumps

Pump	Pumphead fitted	Speed range	Supply	Product code
323Du/D	313D three-roller pumphead	3.0 to 400rpm	100-120/220-240V 50/60Hz 1ph 100VA	030.3154.3DA

Extension pumpheads

	Product code
313X three-roller extension pumphead (maximum four - see page 8)	033.3431.00A

323Du specifications

Weights	323Du/D 10.3lbs
Dimensions (inches)	H5.2 x W9.1 x L8.9
Control ratio	323Du/D 400rpm 133:1
Standards	IEC 335-1, EN60529 (IP31 Wipedown) CE



323Dz/D

323Dz/D general purpose benchtop dispenser

- Dispenses 100ml in 3 seconds
- Accurate to within $\pm 1\%$
- Menu driven calibration procedure with mid-batch re-calibration
- Dispensing by key press or an additional footswitch/handswitch
- Fitted with 313D three roller pumphead with flip-top design, ensuring easy cleaning and ultra-fast set up
- Also accepts 314D four roller pumphead for greater accuracy and low pulsation
- Extension pumpheads can be fitted for up to six channels of flow



323Dz/D extends the laboratory range with a unique dispensing unit that combines accuracy and versatility. Designed for precise dispensing up to 2.0 liter/minute without the need for stored programs or printed records. The new 323Dz/D general purpose dispensing pump incorporates zero-maintenance brushless DC motors that are dust and contaminant-free. It is simple to use and benefits from a microprocessor control that delivers a dosing accuracy of $\pm 1.0\%$. Additional features include soft-start "ramp", which reduces splashes and frothing, and a "suck-back" facility eliminates drips at the end of each dose.

Digital speed control from 3rpm to 400rpm and instantly reversible. Switchable between 100-120V and 220-240V. 313D and 314D pumpheads accept five bore sizes of tubing. For use with 2.4mm wall thickness tubing, use 313D2 and 314D2 pumpheads (these cannot be extended). The maximum speed a 314D pumphead can be run is 300rpm.

323Dz/D flow rate and dose ranges (ml/min)

Pump	Speed range	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm
323Dz/D	2.0 - 400rpm	0.54-110	2.0-400	4.4-880	54-1400	75-2000
Minimum recommended dose (ml)						
		1.4	5.0	11.0	18.0	25.0

Dose size and approximate dose time - using 323Dz/D at 400rpm

	10ml	25ml	50ml	100ml	250ml
Recommended tube bore					
High accuracy $\pm 1\%$	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm
Seconds	5.6	3.8	3.4	3.0	7.5
Recommended tube bore					
Normal	3.2mm	4.8mm	8.0mm	6.4mm	8.0mm
Seconds	1.5	1.7	1.5	3.0	7.5

Ordering information for 323Dz/D dispenser

Pump	Pumphead fitted	Speed range	Supply	Product code
323Dz/D	313D three-roller pumphead	3.0 to 400rpm	100-120/220-240V 50/60Hz 1ph 100VA	030.3184.3D0*

*Replace last 0 with **A**, **E** or **U** for **American**, **European** or **UK** mains lead

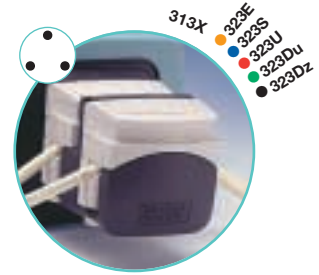
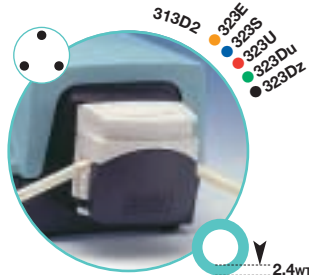
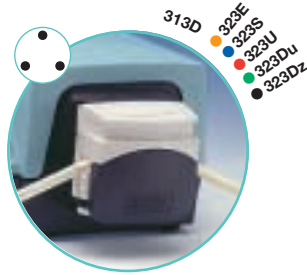
323Dz/D specifications

Weight	4.7kg
Dimensions	H125 x W230 x L225mm
Control ratio	133:1
Standards	EN60529(IP31) CE

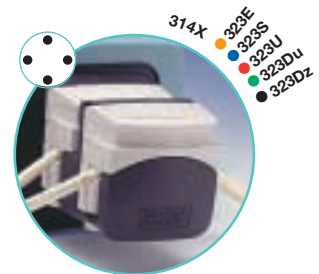
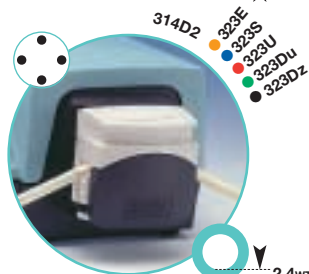
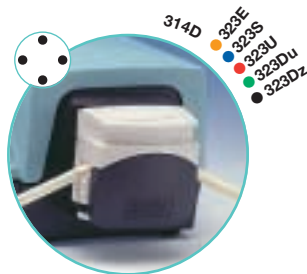
300 series drives and pumpheads

The modular design means that many more combinations of drives and pumpheads than those shown on the previous page are possible. Five drives couple to four pumphead types, options to meet every need: Up to six 313 or 314 pumpheads can be fitted to one drive, and up to two 314MC or 318MC (which can also be mixed) can be fitted to a single drive to provide ten channels of flow.

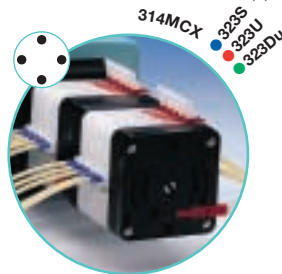
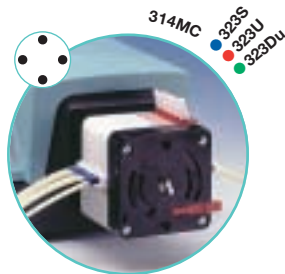
- 313D three-roller high flow pumphead
- 313D2 three-roller high flow pumphead for 3/32" (2.4mm) wall tubing
- 313X three-roller extension pumphead - add up to five extra channels



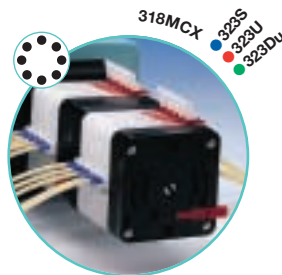
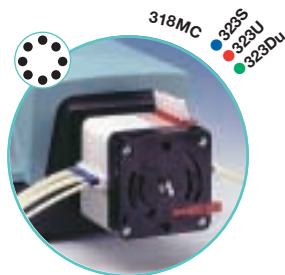
- 314D four-roller higher-accuracy, low-pulse pumphead up to 300rpm only
- 314D2 four-roller pumphead for 3/32" (2.4mm) wall tubing
- 314X four-roller extension pumphead - add up to four extra channels



- 314MC four-roller higher-flow five channel cassette pumphead up to 110rpm only
- 314MCX four-roller extension pumphead - add one for ten channel pumping



- 318MC eight roller higher-accuracy five channel cassette pumphead up to 110rpm only
- 318MCX eight roller extension pumphead - add one for ten channel pumping



SERIES



314D

323 drives can be fitted with 314D four-roller pumpheads when lower pulsing is required (flow rates will be lower than with the 313 three-roller pumphead), and up to four 314X extension pumpheads can be fitted, depending on the size of the tubing fitted and the pressure in the system. Note that 314D pumpheads can be run up to a maximum of 300rpm.

323E, 323S, 323U, 323Du and 323Dz drives may also be fitted 313D2 or 314D2 pumpheads which accept 2.4mm thick wall tubing for higher pressure operation or pumping more viscous fluids. 313D2 or 314D2 pumpheads make higher torque demands, and extension pumpheads may not be fitted.

For low-flow pumping through up to ten channels, 323S, 323U and 323Du drives may be fitted with 314MC (four-roller) and 318MC (eight-roller) microcassette pumpheads, which can be extended to ten channels by adding one 314MCX or 318MCX extension pumphead.

314D and 314X pumphead flow rate ranges (ml/min)

Drive	Speed range	1/16"	1/8"	3/16"	1/4"	5/16"
		1.6mm	3.2mm	4.8mm	6.4mm	8.0mm
323E	15 to 300rpm	3.8-75	13-260	29-570	45-900	60-1200
323S, 323U, 323Du and 323Dz	3.0 to 300rpm	0.75-75	2.6-260	5.7-570	9.0-900	12-1200

Ordering information for 323E, 323S, 323U, 323Du and 323Dz drives and 314 four-roller pumpheads

Drive	Pumphead	Speed range	Supply	Drive code	Pumphead code
323E	314D	15 to 300rpm	100-120/220-240V 50/60Hz 1ph 100VA	036.3124.00A	033.4451.00A
323S	314D	3.0 to 300rpm		036.3134.00A	033.4451.00A
323U	314D	3.0 to 300rpm		036.3144.00A	033.4451.00A
323Du	314D	3.0 to 300rpm		036.3154.00A	033.4451.00A
323Dz	314D	3.0 to 300rpm		036.3164.00 A	033.4451.00A

Extension pumphead

314X four-roller extension pumphead	Pumphead code
	033.4431.00A

Maximum number of 313 and 314 pumpheads which can be fitted to 323 drives

	Tube number	14	16	25	17	18
Tubing	Pressure	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm
Platinum silicone	0.5 bar (7 psig)	5	3	2	2	1
	2 bar (30 psig)	5	3	2	1	1
Bioprene, Marprene, PVC, Neoprene	0.5 bar (7 psig)	4	2	2	1	1
	2 bar (30 psig)	4	2	2	1	1
Chem-Sure, Sta-Pure	0.5 bar (7 psig)	1	1	1	1	1
	2 bar (30 psig)	1	1	1	1	1

Note that only one 313D2 or 314D2 may be fitted to a 323E, 323S, 323U, 323Du and 323Dz drive

Ordering information for 323E, 323S, 323U, 323Du and 323Dz drives and pumpheads

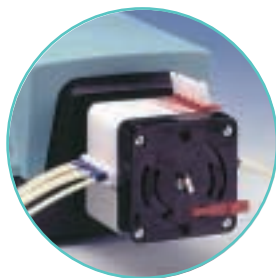
Drive	Speed range	Drive code	313D2	314D2	314MC	318MC
323E	15 to 400rpm	036.3124.00A	033.3551.000	033.4551.000	033.6453.000	033.6853.00A
323S	3.0 to 400rpm	036.3134.00A	033.3551.000	033.4551.000	033.6453.000	033.6853.00A
323U	3.0 to 400rpm	036.3144.00A	033.3551.000	033.4551.000	033.6453.000	033.6853.00A
323Du	3.0 to 400rpm	036.3154.00A	033.3551.000	033.4551.000	033.6453.000	033.6853.00A
323Dz	3.0 to 400rpm	036.3164.00A	033.3551.000	033.4551.000	033.6453.000	033.6853.00A

2.4mm wall tubing for 313D2 and 314D2 pumpheads

Tube bore	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm	9.6mm
Bioprene	903.0016.024	903.0032.024	903.0048.024	903.0064.024	903.0080.024	903.0096.024
Marprene	902.0016.024	902.0032.024	902.0048.024	902.0064.024	902.0080.024	902.0096.024
Platinum silicone	913.A016.024	913.A032.024	913.A048.024	913.A064.024	913.A080.024	913.A096.024

Ordering information for 314MC and 318MC extension pumpheads

314MCX four-roller extension pumphead (maximum one extension pumphead)	Pumphead code
	033.6454.00A
318MCX eight-roller extension pumphead (maximum one extension pumphead)	Pumphead code
	033.6854.00A



314MC

314MC pumphead flow rate ranges (ml/min) - maximum 10 channels. Note speed must not exceed 110rpm.

Drive	Speed range	Orange/Black 0.13mm	Orange/Red 0.19mm	Orange/Blue 0.25mm	Orange/Green 0.38mm	Orange/Yellow 0.50mm
323S, 323U, 323Du	3.0-110rpm	0.002-0.09	0.01-0.3	0.01-0.5	0.03-0.9	0.05-1.7
Drive	Speed range	Orange/White 0.63mm	Black/Black 0.76mm	Orange/Orange 0.88mm	White/White 1.02mm	Red/Red 1.14mm
323S, 323U, 323Du	3.0-110rpm	0.08-3.1	0.13-4.6	0.17-6.4	0.22-8.1	0.27-9.9
Drive	Speed range	Gray/Gray 1.29mm	Yellow/Yellow 1.42mm	Yellow/Blue 1.52mm	Blue/Blue 1.65mm	Green/Green 1.85mm
323S, 323U, 323Du	3.0-110rpm	0.35-13	0.46-17	0.52-19	0.60-22	0.76-28
Drive	Speed range		Purple/Purple 2.05mm	Purple/Black 2.29mm	Purple/Orange 2.54mm	Purple/White 2.79mm
323S, 323U, 323Du	3.0-110rpm		0.90-33	1.1-40	1.3-47	1.4-53

318MC pumphead flow rate ranges (ml/min) - maximum 10 channels. Note speed must not exceed 110rpm.

Drive	Speed range	Orange/Black 0.13mm	Orange/Red 0.19mm	Orange/Blue 0.25mm	Orange/Green 0.38mm	Orange/Yellow 0.50mm
323S, 323U, 323Du	3.0-110rpm	0.002-0.09	0.01-0.3	0.01-0.5	0.02-0.8	0.04-1.4
Drive	Speed range	Orange/White 0.63mm	Black/Black 0.76mm	Orange/Orange 0.88mm	White/White 1.02mm	Red/Red 1.14mm
323S, 323U, 323Du	3.0-110rpm	0.07-2.6	0.11-3.9	0.14-5.3	0.18-6.6	0.24-8.8
Drive	Speed range	Gray/Gray 1.29mm	Yellow/Yellow 1.42mm	Yellow/Blue 1.52mm	Blue/Blue 1.65mm	Green/Green 1.85mm
323S, 323U, 323Du	3.0-110rpm	0.27-10	0.33-12	0.38-14	0.46-17	0.55-20
Drive	Speed range		Purple/Purple 2.05mm	Purple/Black 2.29mm	Purple/Orange 2.54mm	Purple/White 2.79mm
323S, 323U, 323Du	3.0-110rpm		0.65-24	0.79-29	0.90-33	0.98-36

Tubing for 323E/D, 323S/D, 323U/D, 323Du/D and 323Dz/D

Tube bore	1/16"	1/8"	3/16"	1/4"	5/16"
Tube number	14	16	25	17	18
	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm
Bioprene	903.0016.016	903.0032.016	903.0048.016	903.0064.016	903.0080.016
Marprene	902.0016.016	902.0032.016	902.0048.016	902.0064.016	902.0080.016
Sta-Pure	960.0016.016	960.0032.016	960.0048.016	960.0064.016	960.0080.016
Platinum silicone	913.A016.016	913.A032.016	913.A048.016	913.A064.016	913.A080.016
Neoprene	920.0016.016	920.0032.016	920.0048.016	920.0064.016	920.0080.016
PVC	950.0016.016	950.0032.016	950.0048.016	950.0064.016	950.0080.016
Chem-Sure	965.0016.016	965.0032.016	965.0048.016	965.0064.016	965.0080.016

Double pump segment manifold pump tubing for 314MC and 318MC microcassette pumpheads

Color code	Bore	Marprene	Autoclavable Marprene	PVC	Silicone
Orange/black	0.005" (0.13mm)			981.0013.000	
Orange/red	0.007" (0.19mm)			981.0019.000	
Orange/blue	0.010" (0.25mm)	979.0025.000	979.0025.00+	981.0025.000	
Orange/green	0.015" (0.38mm)	979.0038.000	979.0038.00+	981.0038.000	
Orange/yellow	0.020" (0.50mm)	979.0050.000	979.0050.00+	981.0050.000	
Orange/white	0.025" (0.63mm)	979.0063.000	979.0063.00+	981.0063.000	983.0063.000
Black/black	0.030" (0.76mm)	979.0076.000	979.0076.00+	981.0076.000	983.0076.000
Orange/orange	0.035" (0.88mm)	979.0088.000	979.0088.00+	981.0088.000	983.0088.000
White/white	0.040" (1.02mm)	979.0102.000	979.0102.00+	981.0102.000	983.0102.000
Red/red	0.045" (1.14mm)	979.0114.000	979.0114.00+	981.0114.000	983.0114.000
Gray/gray	0.050" (1.29mm)	979.0129.000	979.0129.00+	981.0129.000	983.0129.000
Yellow/yellow	0.055" (1.42mm)	979.0142.000	979.0142.00+	981.0142.000	983.0142.000
Yellow/blue	0.060" (1.52mm)	979.0152.000	979.0152.00+	981.0152.000	983.0152.000
Blue/blue	0.065" (1.65mm)	979.0165.000	979.0165.00+	981.0165.000	983.0165.000
Green/green	0.070" (1.85mm)	979.0185.000	979.0185.00+	981.0185.000	983.0185.000
Purple/purple	0.080" (2.05mm)	979.0205.000	979.0205.00+	981.0205.000	983.0205.000
Purple/black	0.090" (2.29mm)	979.0229.000	979.0229.00+	981.0229.000	983.0229.000
Purple/orange	0.100" (2.54mm)	979.0254.000	979.0254.00+	981.0254.000	983.0254.000
Purple/white	0.110" (2.79mm)	979.0279.000	979.0279.00+	981.0279.000	983.0279.000

SERIES



401U/D1



401U/DM2



401U/DM3

401U/D1, 401U/DM2 and 401U/DM3 manual/auto control ultra compact pumps

- 401U/D1 provides single channel flows up to 120ml/min
- 401U/DM2 and 401U/DM3 provide two and three channel flows up to 36ml/min
- Highly-compact with single control potentiometer for direction, speed and start/stop
- Analog speed control and remote switching via a 15D connector
- Reversible for easy fluid recovery

The 401U/D1 accepts standard 1/16" (1.6mm) wall tubing up to 5/32" (4mm) bore in seven different tube materials.

401U/DM2 and 401U/DM3 multi-channel pumps with precision machined aluminum rotor accept three-bridge manifold tubing and provide flow rates from 0.001-36ml/min per channel.

All are supplied with a 100-120V 15VAC transformer. Order remote switching cables separately. Accepts 4-20mA or 0-10V analog signals and remote TTL (PLC compatible) start/stop and direction switching. Quick release sprung tube clamps on D1 model. A precision machined four-roller aluminum rotor gives smooth, precise flows.



401U/D1 flow rates per channel (ml/min)

Tube bore	1/50"	1/32"	1/16"	3/32"	1/8"	5/32"
	0.5mm	0.8mm	1.6mm	2.4mm	3.2mm	4.0mm
1.2 to 12rpm	0.01-0.1	0.03-0.3	0.14-1.4	0.29-2.9	0.49-4.9	0.70-7.0
4.0 to 40rpm	0.05-0.5	0.12-1.2	0.45-4.5	0.97-9.7	1.6-16	2.3-23
20 to 200rpm	0.23-2.3	0.58-5.8	2.3-23	4.9-49	8.1-81	12-120

401U/DM2 and 401U/DM3 flow rates (ml/min)

Color	Orange/Black	Orange/Red	Orange/Blue	Orange/Green	Orange/Yellow
Tube bore	0.005"	0.007"	0.010"	0.015"	0.020"
	0.13mm	0.19mm	0.25mm	0.38mm	0.50mm
1.2 to 12rpm	0.001-0.01	0.002-0.02	0.004-0.04	0.01-0.1	0.02-0.2
4.0 to 40rpm	0.004-0.04	0.008-0.08	0.014-0.14	0.03-0.3	0.06-0.6
10 to 100rpm	0.009-0.09	0.020-0.20	0.035-0.35	0.08-0.8	0.14-1.4

Color	Orange/White	Black/Black	Orange/Orange	White/White	Red/Red
Tube bore	0.025"	0.030"	0.035"	0.040"	0.045"
	0.63mm	0.76mm	0.88mm	1.02mm	1.14mm
1.2 to 12rpm	0.03-0.3	0.04-0.4	0.05-0.5	0.07-0.7	0.08-0.8
4.0 to 40rpm	0.09-0.9	0.12-1.2	0.17-1.7	0.22-2.2	0.28-2.8
10 to 100rpm	0.22-2.2	0.31-3.1	0.43-4.3	0.55-5.5	0.70-7.0

Color	Gray/Gray	Yellow/Yellow	Yellow/Blue	Blue/Blue	Green/Green
Tube bore	0.050"	0.055"	0.060"	0.065"	0.070"
	1.29mm	1.42mm	1.52mm	1.65mm	1.85mm
1.2 to 12rpm	0.11-1.1	0.13-1.3	0.15-1.5	0.17-1.7	0.21-2.1
4.0 to 40rpm	0.35-3.5	0.43-4.3	0.49-4.9	0.56-5.6	0.70-7.0
10 to 100rpm	0.89-8.9	1.1-11	1.2-12	1.4-14	1.8-18

Color	Purple/Purple	Purple/Black	Purple/Orange	Purple/White
Tube bore	0.080"	0.095"	0.100"	0.110"
	2.05mm	2.38mm	2.54mm	2.79mm
1.2 to 12rpm	0.26-2.6	0.31-3.1	0.37-3.7	0.44-4.4
4.0 to 40rpm	0.85-8.5	1.0-10	1.2-12	1.5-15
10 to 100rpm	2.1-21	2.6-26	3.1-31	3.6-36

Ordering information for 401

401U/D1 single channel 1.6mm wall tubing pump		Product code
1.2 to 12rpm	Single channel standard tubing pump	040.181D.01A
4.0 to 40rpm		040.1H1D.01A
20 to 200rpm		040.1S1D.01A

401U/DM2 one or two channel manifold tube pump

1.2 to 12rpm	Two channel manifold tubing pump	040.181D.M2A
4.0 to 40rpm		040.1H1D.M2A
10 to 100rpm		040.1P1D.M2A

401U/DM3 three channel manifold tube pump

1.2 to 12rpm	Three channel manifold tubing pump	040.181D.M3A
4.0 to 40rpm		040.1H1D.M3A
10 to 100rpm		040.1P1D.M3A

Remote switching cables for 401U

400AC1	0-10V CW/Stop/CCW 3.45 feet (1.5m) remote cable	049.0011.00A
400AC2	4-20mA CW/Stop/CCW 3.45 feet (1.5m) remote cable	049.0031.00A
400AC3	CW/Stop/CCW 3.45 feet (1.5m) remote cable	049.0051.00A
400AC4	Start/Stop 10 feet (3m) remote cable fitted with foot switch	049.0071.00A

Tubing for 401U/D1

Tube bore	#	Bioprene	Marprene	Platinum Silicone	Neoprene
1/50" (0.5mm)	112	903.0005.016	902.0005.016	913.A005.016	
1/32" (0.8mm)	13	903.0008.016	902.0008.016	913.A008.016	920.0008.016
1/16" (1.6mm)	14	903.0016.016	902.0016.016	913.A016.016	920.0016.016
3/32" (2.4mm)			902.0024.016	913.A024.016	
1/8" (3.2mm)	16	903.0032.016	902.0032.016	913.A032.016	920.0032.016
5/32" (4.0mm)			902.0040.016	913.A040.016	
Tube bore		Sta-Pure	Chem-Sure	PVC	
1/16" (1.6mm)	14	960.0016.016	965.0016.016	950.0016.016	
1/8" (3.2mm)	16	960.0032.016	965.0032.016	950.0032.016	

Double segment manifold pump tubing for 401U/DM2 and 401U/DM3

Color code	Bore	Marprene	Autoclavable Marprene	PVC	Silicone
Orange/black	0.005" (0.13mm)			981.0013.000	
Orange/red	0.007" (0.19mm)			981.0019.000	
Orange/blue	0.010" (0.25mm)	979.0025.000	979.0025.00+	981.0025.000	
Orange/green	0.015" (0.38mm)	979.0038.000	979.0038.00+	981.0038.000	
Orange/yellow	0.020" (0.50mm)	979.0050.000	979.0050.00+	981.0050.000	
Orange/white	0.025" (0.63mm)	979.0063.000	979.0063.00+	981.0063.000	983.0063.000
Black/black	0.030" (0.76mm)	979.0076.000	979.0076.00+	981.0076.000	983.0076.000
Orange/orange	0.035" (0.88mm)	979.0088.000	979.0088.00+	981.0088.000	983.0088.000
White/white	0.040" (1.02mm)	979.0102.000	979.0102.00+	981.0102.000	983.0102.000
Red/red	0.045" (1.14mm)	979.0114.000	979.0114.00+	981.0114.000	983.0114.000
Gray/gray	0.050" (1.29mm)	979.0129.000	979.0129.00+	981.0129.000	983.0129.000
Yellow/yellow	0.055" (1.42mm)	979.0142.000	979.0142.00+	981.0142.000	983.0142.000
Yellow/blue	0.060" (1.52mm)	979.0152.000	979.0152.00+	981.0152.000	983.0152.000
Blue/blue	0.065" (1.65mm)	979.0165.000	979.0165.00+	981.0165.000	983.0165.000
Green/green	0.070" (1.85mm)	979.0185.000	979.0185.00+	981.0185.000	983.0185.000
Purple/purple	0.080" (2.05mm)	979.0205.000	979.0205.00+	981.0205.000	983.0205.000
Purple/black	0.095" (2.29mm)	979.0229.000	979.0229.00+	981.0229.000	983.0229.000
Purple/orange	0.100" (2.54mm)	979.0254.000	979.0254.00+	981.0254.000	983.0254.000
Purple/white	0.110" (2.79mm)	979.0279.000	979.0279.00+	981.0279.000	983.0279.000

401U specifications

Weight	Operating temperature	Control ratio	Noise	Standards
2.2lbs	5-40C	10:1	<70dBA at 1m	CE, BS0800, IEC335-1, EN60529 IP21
Supply through a power transformer		15VAC		

SERIES



403U/R



403U/R1



403U/L



405U/R1



405U/L

403U/R, 403U/R1, 403U/L and 403U/L2 auto/manual control compact pumps

- The 403U/R produces single channel flows from 0.05 to 83ml/min
- The 403U/R1 produces single channel flows from 0.06 to 150ml/min
- The 403U/L produces low-pulsing, single channel flows from 0.11 to 180ml/min
- The 403U/L2 produces dual channel flows up to 92ml/min per channel
- Digital speed control via top panel mounted keypad
- Reversible motor for easy fluid recovery
- "Max" high speed priming function

The 403U/R, 403U/R1, 403U/L and 403U/L2 are precision manual/auto-control pumps which use 1/16" (1.6mm) wall tubing. All have spring-loaded tracks to maximize tube life and flow precision against pressures up to 30 psi (2 bar). The 403U/R accepts Marprene and Bioprene tubing in addition to platinum cured silicone.

403 low-flow models provide speeds up to 50rpm, 405 high-flow models up to 200rpm. All pumpheads have transparent polyester resin (PET) guards.

20:1 speed control. R1 single channel four-roller pumphead accepts up to 1/4" (6.4mm) bore tubing. L2 dual channel or "L" low pulsing Y element option up to 3/16" (4.8mm) bore with twin, precision offset aluminum rotors with four stainless steel rollers. All pumps accept 4-20mA or 0-10V analog signals and remote TTL (PLC compatible) start/stop and CCW/CW switching. Two year comprehensive warranty.



405U/R1, 405U/L and 405U/L2 manual/auto control high-flow pumps

- The 405U/R1 produces single channel flows from 0.22 to 610ml/min
- The 405U/L produces low-pulsing, single channel flows from 0.43 to 730ml/min
- The 405U/L2 produces dual channel flows up to 370ml/min per channel
- Digital speed control via front panel mounted keypad
- Reversible motor for easy fluid recovery
- "Max" high speed priming function

The 405U/R1, 405U/L and 405U/L2 pumps are precision manual/auto-control pumps which use 1/16" (1.6mm) wall tubing. All have spring-loaded tracks to maximize tube life and flow precision against pressures up to 30 psi (2 bar).

20:1 speed control. R1 single channel four-roller pumphead accepts up to 1/4" (6.4mm) bore tubing. L2 dual channel or "L" low pulsing Y element option up to 3/16" (4.8mm) bore with twin, precision offset aluminum rotors with four stainless steel rollers. All pumps accept 4-20mA or 0-10V analog signals and remote TTL (PLC compatible) start/stop and CCW/CW switching. Two year comprehensive warranty.





403U/L2

403U and 405U flow rates per channel (ml/min)								
Pump	Speed range	1/50"	1/32"	1/16"	3/32"	1/8"	3/16"	1/4"
		0.5mm	0.8mm	1.6mm	2.4mm	3.2mm	4.8mm	6.4mm
403U/R	2.5 to 50rpm	0.05-1.1	0.1-2.5	0.5-11		2-41	4-83	
403U/R1	2.5 to 50rpm	0.06-1.1	0.14-2.8	0.55-11	1.2-24	2.1-43	4.6-92	7.6-150
403U/L	2.5 to 50rpm	0.11-2.2	0.28-5.6	1.1-22	2.4-49	4.3-86	9.2-180	
403U/L2	2.5 to 50rpm	0.06-1.1	0.14-2.8	0.55-11	1.2-24	2.1-43	4.6-92	
405U/R1	10 to 200rpm	0.22-4.4	0.55-11	2.2-44	4.9-98	8.6-170	18-370	30-610
405U/L	10 to 200rpm	0.43-8.6	1.1-22	4.4-88	9.8-200	17-340	37-730	
405U/L2	10 to 200rpm	0.22-4.4	0.55-11	2.2-44	4.9-98	8.6-170	18-370	

Ordering information				
Pump	Speed range	Description	Supply	Product code
403U/R	2.5 to 50rpm	Single channel low flow pump	100-120V 50/60Hz 1ph	040.3K11.01A
403U/R1	2.5 to 50rpm	Single channel low flow pump		040.3K1R.01A
403U/L	2.5 to 50rpm	Y-element low flow pump		040.3K1L.01A
403U/L2	2.5 to 50rpm	Dual channel low flow pump		040.3K1L.02A
405U/R1	10 to 200rpm	Single channel high flow pump		040.5S1R.01A
405U/L	10 to 200rpm	Y-element high flow pump		040.5S1L.01A
405U/L2	10 to 200rpm	Dual channel high flow pump		040.5S1L.02A

Remote switching cables for 403U and 405U			Product code
400AC1	0-10V CW/Stop/CCW 3.45 feet (1.5m) remote cable		049.0011.00A
400AC2	4-20mA CW/Stop/CCW 3.45 feet (1.5m) remote cable		049.0031.00A
400AC3	CW/Stop/CCW 3.45 feet (1.5m) remote cable		049.0051.00A
400AC4	Start/Stop 10 feet (3m) remote cable with foot switch fitted		049.0071.00A

Tubing for R, R1 and L2 pumpheads				
Bore	#	Bioprene	Marprene	Platinum silicone
1/50" (0.5mm)	112	903.0005.016	902.0005.016	913.A005.016
1/32" (0.8mm)	13	903.0008.016	902.0008.016	913.A008.016
1/16" (1.6mm)	14	903.0016.016	902.0016.016	913.A016.016
3/32" (2.4mm)			902.0024.016	913.A024.016
1/8" (3.2mm)	16	903.0032.016	902.0032.016	913.A032.016
3/16" (4.8mm)	25	903.0048.016	902.0048.016	913.A040.016
1/4" (6.4mm)	17	903.0064.016	902.0064.016	913.A064.016

Bore	#	Neoprene	Sta-Pure	Chem-Sure	PVC
1/32" (0.8mm)	13	920.0008.016			
1/16" (1.6mm)	14	920.0016.016	960.0016.016	965.0016.016	950.0016.016
1/8" (3.2mm)	16	920.0032.016	960.0032.016	965.0032.016	950.0032.016
3/16" (4.8mm)	25	920.0048.016	960.0048.016	965.0048.016	950.0048.016
1/4" (6.4mm)	17	920.0064.016	960.0064.016	965.0064.016	950.0064.016

Y-elements for L pumphead		
Bore	Marprene	Platinum Silicone
1/16" (1.6mm)	902.E016.K16	913.AE16.K16
3/32" (2.4mm)	902.E024.K16	913.AE24.K16
1/8" (3.2mm)	902.E032.K16	913.AE32.K16
3/16" (4.8mm)	902.E048.K16	913.AE48.K16

403U and 405U specifications	403U	405U
Weights	5.5lbs	7.7lbs
Power	13VA	30VA
Supply	100-120V 50/60Hz 1ph	
Operating temperature	5-40C	
Control ratio	20:1	
Noise	<70dBA at 1m	
Standards	IEC335-1, EN60529 (IP21), CE	



405U/L2



403U/VM2



401U/VM3



401U/VM4

403U/VM2, 403U/VM3 and 403U/VM4 auto/manual control compact pumps

- VM2 pumphead provides two channels, VM3 three channels and VM4 four channels
- Flow rates from 0.001 to 17ml/min per channel
- Ten stainless-steel rollers with low-friction bearings
- Digital speed control via top panel mounted keypad
- Reversible with Max priming function

403U/VM pumps provide extremely accurate multi-channel pumping, having spring-loaded tracks with individual occlusion adjustment. The VM rotor has stainless-steel low-friction rollers for low pulsation and repeatable flow rates. The fixed position clamping block provides easy tube loading and removal. Pumpheads accept standard two-bridge manifold tubing.

With 20:1 speed control, the 0.5 to 10rpm drive provides low flow accuracy and the 2.5 to 50rpm drive provides higher flows. All pumps accept 4-20mA or 0-10V analog signals and remote low voltage or TTL (PLC compatible) start/stop and direction switching. Two year comprehensive warranty.



Flow rates per channel for 403U/VM2, 403U/VM3 and 403U/VM4 pumpheads (ml/min)

Color	Orange/Black	Orange/Red	Orange/Blue	Orange/Green	Orange/Yellow
Bore	0.005"	0.007"	0.010"	0.015"	0.020"
	0.13mm	0.19mm	0.25mm	0.38mm	0.50mm
0.5 to 10rpm	0.001-0.01	0.001-0.03	0.002-0.04	0.005-0.1	0.01-0.2
2.5 to 50rpm	0.003-0.06	0.006-0.13	0.011-0.2	0.025-0.5	0.04-0.9

Color	Orange/White	Black/Black	Orange/Orange	White/White	Red/Red
Bore	0.025"	0.030"	0.035"	0.040"	0.045"
	0.63mm	0.76mm	0.88mm	1.02mm	1.14mm
0.5 to 10rpm	0.01-0.3	0.02-0.4	0.03-0.5	0.03-0.7	0.04-0.9
2.5 to 50rpm	0.07-1.4	0.10-2.0	0.13-2.6	0.17-3.5	0.21-4.3

Color	Gray/Gray	Yellow/Yellow	Yellow/Blue	Blue/Blue	Green/Green
Bore	0.050"	0.055"	0.060"	0.065"	0.070"
	1.29mm	1.42mm	1.52mm	1.65mm	1.85mm
0.5 to 10rpm	0.05-1.1	0.06-1.3	0.07-1.4	0.08-1.7	0.10-2.0
2.5 to 50rpm	0.27-5.4	0.32-6.4	0.36-7.2	0.41-8.3	0.50-10.0

Color	Purple/Purple	Purple/Black	Purple/Orange	Purple/White
Bore	0.080"	0.095"	0.100"	0.110"
	2.05mm	2.38mm	2.54mm	2.79mm
0.5 to 10rpm	0.12-2.3	0.14-2.7	0.16-3.1	0.17-3.4
2.5 to 50rpm	0.59-12	0.69-14	0.78-16	0.85-17

Tube selection guide

CHOOSING THE BEST TUBE

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

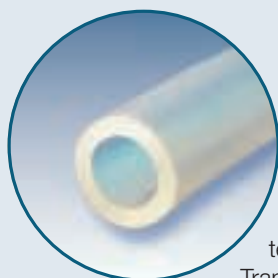
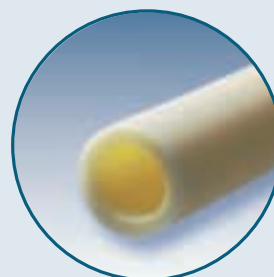
The tubing largely dictates pump performance: Its restitution creates suction, its strength resists pressure, its flex resistance determines pumping life, its bore defines the flow rate, and its wall thickness controls pumping efficiency.



Marprene is Watson-Marlow Bredel'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 40F to 175F. 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 40F to 175F. Beige. Available in 15 meter packs only.



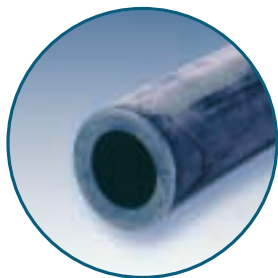
Silicone is the standard laboratory tubing used for small bore sizes up to 9.6mm. Food and medical quality, meets USP and NSF Class VI standards and autoclavable.

Watson-Marlow Bredel manufactures a specially developed **platinum-cured silicone tubing, Pumpsil**, 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 -4F to 175F. High permeability to oxygen. Translucent. Autoclavable.

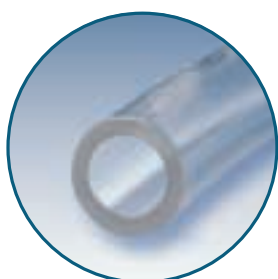
Sta-Pure has a unique composite construction of silicone in a PTFE lattice giving it superior burst resistance up to 100psi (7 bar) and 18 times longer life than silicone tubing. It produces virtually no spalling, is USP Class VI approved and is classified as non toxic. Working temperature range 32F to 176F. 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 tubing



PVC tubing

Neoprene offers excellent performance with abrasive slurries and sustained pressure applications. Good suction and pressure capabilities. Food quality. Working temperature range 32F - 175F. 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 70F - 140F. Glass clear

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 3/8" (9.6mm), and Neoprene tubing for bore sizes of 1/2" (12.7mm) or more.

For maximum tube life, use a large bore tube at low speed. For maximum flow rate use the largest tube at maximum speed. For maximum accuracy, use a small bore tube at maximum speed.

Suction lift depends on the tube reinitiating fully before the advance of the next roller. If it does not, the flow rate will be reduced. For maximum suction lift or pressure, use the smallest practicable bore size of tubing and run the pump at the slowest possible speed.

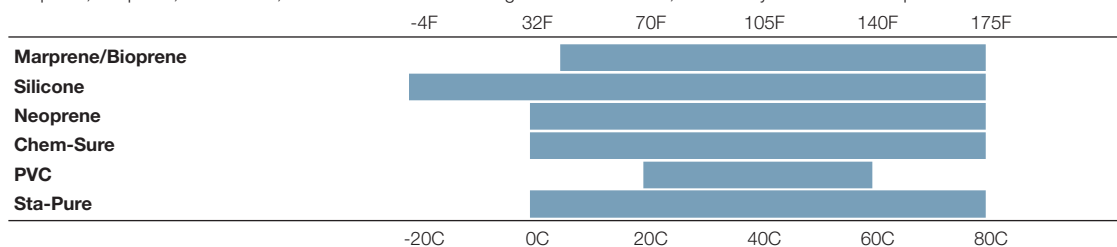
CHECKING YOUR CHOICE WITH AN IMMERSION TEST

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 Bredel 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.

PHYSICAL COMPATIBILITY

Temperature

The chart shows the temperature range of each tubing type when suction and delivery pressures are negligible. Operating temperatures of Bioprene, Marprene, Chem-Sure, Sta-Pure and silicone tubing are limited to 175F, but all may be autoclaved up to 275F.



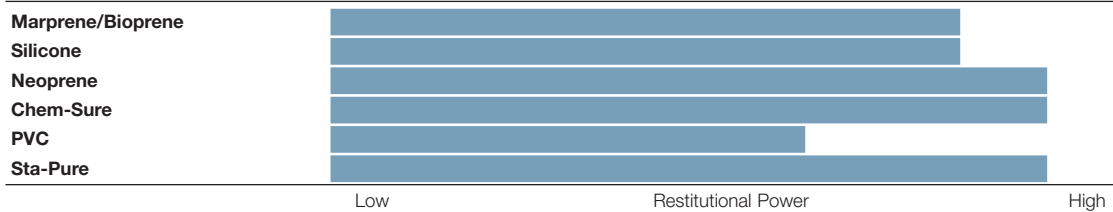
Pressure

Choose the smallest bore size of tubing which will give the required flow rate.

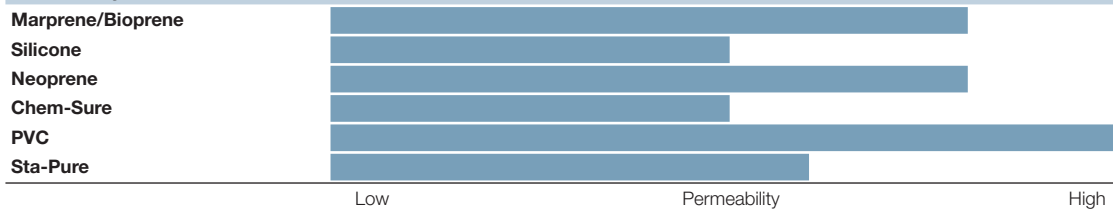


Suction

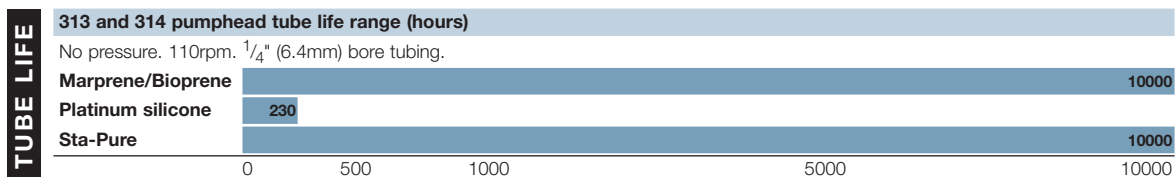
As with pressure, choose the smallest bore of tube which will produce the required flow rate. Equally important, however, is the restititional power of the tubing material:



Permeability



TUBE LIFE



VISCOSITY

The flow rates given in this brochure are valid for fluids with viscosities in the range 1 to 100 centipoise. Increased fluid viscosity will result in decreased flow rate. Choose a tubing with as large a wall thickness as possible. Following this guidance will allow fluids with viscosities up to 2500 centipoise to be satisfactorily handled.

Contact Watson-Marlow Bredel or its local distributor for advice on specific applications.

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The information contained in this document is believed to be correct but Watson-Marlow Bredel accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING
These products are not designed for use in, and should not be used for, patient connected applications.

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STA-PURE and CHEM-SURE are trademarks of W.L. Gore & Associates Inc.



Pump Series

Flow Rates

Put a peristaltic pump in your pumps Improve your performance

100	Low flow single channel pumps. Fixed and manual/auto control variable speed.	1µl/min - 53ml/min	101F/R
200	Near pulseless, multi-channel pumps with up to 32 channels.	0.6µl/min - 22ml/min	205S/CA
300	NEW Single or multi-channel benchtop pumps with manual, remote, analogue, RS232 control and accurate dispensing.	2µl/min - 3 liter/min	323E/D
400	NEW Ultra-compact scientific pumps for low flow single or multi-channel applications.	1µl/min - 610ml/min	401U/D1
500	NEW Superb range of IP31 and IP66 rated pumps for science and industry as well as fixed and variable speed close-coupled pumps.	10µl/min - 4.4 liter/min	520S/R
600	IP55 mid-flow process pumps with full clean-in-place and steam-in-place capability.	50ml/min - 18.3 liter/min	623S/R
700	Industrial cased and baseplate mounted pumps for use with continuous tubing or new LoadSure elements. Three phase motors, ATEX rated drives or pneumatic.	1.6 liter/min - 2,000 liter/hr	704U/R and 704S/R
800	High-flow hygienic pumping using USP Class VI Bioprene tubing or STA-PURE tubing.	2 liter/min - 8,000 liter/hr	825
SPX	High flow high-pressure industrial pumps with unique patented direct coupled design. Duplex and CIP models available.	0.3 liter/min 80m ³ /hr	SPX40
OEM	A wide range of instrument quality and industrial OEM pumpheads for fitting to users own drives, or with faceplate-mounted motor options.	0.01µl/min - 33 liter/min	100
Tubing Hoses	Extensive range of tubing ensures chemical compatibility. USP Class VI and FDA approvals. Precision machined, re-inforced hoses provide flow stability and excellent suction performance.		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 stabilize. 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 brochure were obtained pumping water at 68F (20C) with zero suction and delivery heads. PVC tubing was used to obtain the 200 series flow rates. All other flow rates were obtained using silicone tubing.

OPERATING AND STORAGE TEMPERATURES

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

IEC 335-1 is the International Electrotechnical Commission standard dealing with the "Safety of household and similar appliances, general requirements". Equivalents are BS3456: Part 101 and DIN VDE 0700: Part 1).

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 Bredel'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 Bredel's control and cannot be guaranteed, but every effort will be made to honor this policy.

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