



### LABORATORY PUMPS INTRODUCTION

Liquid and air handling are common needs in most labs. With smaller dispense requirements and the need for longer, continuous duty operations, more accurate and robust pumping solutions are necessary. To meet these needs, we now offer pumping solutions from sister IDEX<sup>®</sup> Corporation business units: ISMATEC<sup>®</sup> peristaltic pumps, Sapphire Engineering<sup>™</sup> syringe pump alternatives (PVMs and IPVs), and Gast<sup>®</sup> Manufacturing Air Compressor and Vacuum Pumps.

#### Features of Peristaltic Pumps (pages 136 - 143)

- » Pumping by Speed or Flow Rate
- » Dispensing by Volume or Time
- $\gg$  Interval Dispensing with a Pause
- >>> Dispensing a Volume within a Pre-set Time
- >>> Interval Dispensing with a Pre-set Number of Dispensing Cycles
- Roller Back-steps for Drip-free Dispensing

DEX

NEALIS & SUINCE

- Contamination
   Free Pumping
   Pumping Sterile
- Media
- >>> High Accuracy
- » High
- Repeatability Multi-Channel Pumping
- Features of Syringe Pump Alternatives (pages 144 - 146)

#### PVM (Pump Valve Module) Aspirating/Dispensing System

- » For automated pipetting, diluting and dispensing
- » Self-contained, stepper motor driven module
- >>> Uses IPVs (see below)
- ≫ 100% software compatible with Cavro<sup>™</sup> XP-3000 syringe pumps
- » Many programmable functions
- » RS-232, RS-485 and CAN BUS communication and control
- >>> Selectively work with up to 15 PVMs

#### >>> IPV (Integrated Piston/Valve)

- For use on PVMs and direct plug-in use on Cavro XP-3000 syringe pumps
- Accuracy and precision identical to traditional syringes and valves
   Lasts up to 20 times longer
- Lasts up to 20 times longer than traditional products, with significant lifetime cost savings
- » Made of durable, chemically resistant materials
- $\gg$  Set-up in less than five minutes
- >>> Requires no routine maintenance >>>  $50\mu L - 5.0mL$  volumes available,
- with or without a seal wash option

Please Note: See page 147 for Gast Manufacturing Air Compressor and Vacuum Pump models.

### **PERISTALTIC PUMPS INTRODUCTION**

#### » For a Broad Array of Applications

With a wide range of tubing available, ISMATEC peristaltic tubing pumps are capable of pumping almost any media, including corrosive or sterile fluids.

- » Many tubing materials available
- Independent, yet simultaneous delivery of various media at different flow rates (multichannel pumps-up to 24 channels)
- » Self-priming from a depth of up to 8 m
- >>> Reversible rotation direction
- Extremely accurate dispensing with calibrateable, microprocessor controlled drives
- » Inexpensive to Maintain
- >>> Nearly maintenance-free
- >>> Tubing is the only part to wear
- » No expensive seals, valves or diaphragms
- » Ready again after simple tubing change
- >>>> High quality and precision deliver optimum performance even after years of intensive use
- ≫ Safe and Easy to Use
- Developed for continuous duty, 24 hrs./day, 7 days/week
- No contamination of the fluid or the pump
   Immune to dry-running
- » No valves to clog, hang up or service
- » No seals which can leak
- » No syphoning effect when the pump stops
- >>> No flushing and cleaning required
- Immediately adaptable to new application
   Fast filling and emptying thanks to a MAX key and reversible flow direction

Rotation Direction Reversible



The data in this table are for the ISMATEC pumps listed in this catalog. Please contact ISMATEC for more options (see page 168 for contact information).

Features	
Max. Flow Rate	3,800 mL/min
Min. Flow Rate	0.0004 mL/min
Max. Diff. Pressure	1.5 bar (21 psi)
Suction Lift, Water	7 – 8 m
Dead Volume	practically none
Chemical Compatibility	depends on tubing
Accuracy, Repeatability	high
Self-Priming	yes
Dry-Running	yes
Maintenance	tubing replacement
Pumping	
Multi-channel System	yes
Shearing Forces	low
Contamination Free	ves
Reverse Operation	yes
Pulsation Ratio	low to moderate
Media	
Pump Particles	yes
Viscous Liquids	yes
Pump Living Cells	yes
Foaming	yes
Corrosive / Aggressive	yes
Gas	yes

# Low Flow Peristaltic Pumps

» 4 to 24 Channels

ISMATEC

- $\gg 0.0004$  to 44 mL/min Flow Rates
- » For Dispensing and Continuous Flow Applications
- » Lowest Pulsation, Highest Accuracy
- >>> Very High Repeatability on All Channels

ISMATEC<sup>®</sup> high accuracy, multichannel peristaltic tubing pumps are ideal for both continuous pumping and discrete dispensing applications. Smooth, low pulse and repeatable operation is ensured by a unique planetary drive system (see Note).

These pumps are easily calibrated and can be programmed to dispense by flow rate, volume or time, making them adaptable to many applications. A pause time of up to 999 hours can also be programmed between dispense volumes. There's even a back-step routine option to prevent drips as well as a stand-by mode.

The LED display indicates the current setting. Priming and flushing are accomplished with a simple push of a button on the membrane key pad, without affecting programmed settings.

Choose from ISMATEC's line of standard or low speed units, each available with 4, 8, 12 and 24 channels.

Speed	Model	Flow Rates (mL/min per channel)
Standard	IPC	0.002–44
Low	IPC-N	0.0004-11

Speed (rpm) coupled with the selection of tubing ID determines actual flow rate per channel. The standard Click 'n' go cassettes, supplied with each pump, feature an automatic pressure setting. Maximum differential pressure is 15 psi (1.0 bar), depending on tubing material. Tubing with small IDs and/or optional cassettes with pressure lever (page 141) may enable higher pressures.

Operations can be controlled via RS-232 computer interface. Analog input and output controls via contact closure include: speed control (0-5 or 0-10 V; 0-20 or 4-20mA), speed output (0-10 V or 0-11 kHz), start/stop, rotation direction and autostart. Download drivers for LabVIEW Software at no cost from www.ismatec.com, "Downloads".

Each unit is housed in lacquered stainless steel.

Typical applications for these Ismatec Peristaltic Tubing Pumps include:

- » Toxicological in-vitro use
- » Perfusion of animal tissue slices
- » Sampling from tablet dissolution systems
- >>> Flow injection analyzers

Analog and 16 channel units are available upon request. These items are not stocked items – please contact us for lead times.

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Constant and the second		1	
Motor type		DC motor	
Speed	IPC	0.4 – 45 rpm	(
	IPC-N	0.11 – 11.25 rpn	n
Speed setting		1 – 100%, resolu	ution 0.1%
Flow rate setting		µL/min or mL/m	nin
Power consumption		30 W	
Power supply		230V <sub>AC</sub> /50Hz,11	5V <sub>AC</sub> /60Hz adjustable
Protection rating		IP 30	
DIMENSIONS /	WEIGHT		
	Depth/W	/idth/Height	Weight
	()	mm)	(kg)
4 channels	180 x	175 x 130	4.6
8 channels	220 x	175 x 130	5.1
12 channels	260 x	175 x 130	5.8
24 channels	380 x	175 x 130	7.9



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pump principle of ISMATEC

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pumps.

Multi-Channel Peristaltic Pumps

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Standard Speed (IPC)

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With the planetary drive system, all eight rollers are directly driven in unison by the central wheel. This design prevents axial pushpull friction on the tubing, resulting in increased tubing service life, lower pulsation and high repeatability.

#### Ordering Tubing & Accessories

STANDARD A	CCESSORY	PAGE	1	
Tubing	2-Stop	142 - 143	1 ===	-
Spare Cassettes <sup>1</sup>	CA Click'n'go	141		
Foot Switch	ISM016 / IS100392	141	_	

LOW FL	LOW FLOW PERISTALTIC TUBING PUMPS						
Order No.	Model	Flow Rates (mL/min per channel)	Channels	<b>Speed</b> (rpm)			
Standard	Speed (IPC	)					
ISM930	IPC 4	0.002-44	4	0.4–45			
ISM931	IPC 8	0.002-44	8	0.4-45			
ISM932	IPC 12	0.002-44	12	0.4–45			
ISM934	IPC 24	0.002-44	24	0.4–45			
Low Spee	d (IPC-N)						
ISM935	IPC-N 4	0.0004-11	4	0.11–11.25			
ISM936	IPC-N 8	0.0004-11	8	0.11–11.25			
ISM937	IPC-N 12	0.0004-11	12	0.11–11.25			
ISM939	IPC-N 24	0.0004–11	24	0.11–11.25			

### COMPACT REGLO PERISTALTIC PUMPS

» 2 and 4 Channels

PUMPS

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DEX

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- » 0.002–57mL/min Flow Rates
- » ISMATEC®'s Smallest Calibrateable Dispensing Pump
- >>> Foot Print Only 178 x 100 mm and only 13.5cm high!
- » High Repeatability

ISMATEC® compact REGLO peristaltic tubing pumps offer two or four channels in a small footprint. The eight rollers of these variable-speed pumps provide smooth, consistent flow. Two control options are available — programmable digital and analog.

# REGLO Digital Programmable Pumps with dispensing function

The digital pump version is easily calibrated and programmed via a 6-button membrane keypad and LED display interface. Dispense by flow rate, volume or time. A pause time of up to 999 hours can also be programmed between dispense volumes. Back-steps can also be programmed to prevent drips.

Control operations remotely via RS-232 computer interface. An analog speed output signal is available (see REGLO *Analog*, below). Activate start/stop and autostart with analog contact closure input signals. Drivers for LabVIEW Software are available at no cost from www.ismatec.com, "Downloads."

#### REGLO Analog Pumps without dispensing function

Flow for the analog version is controlled by setting the pump speed (rpm). Speed is adjustable from 1-99% in 1% steps via a 2-digit potentiometer.

Analog input and output controls via contact closure include: speed control (0-5 or 0-10 V; 0-20 or 4-20mA), speed output (2-channel: 0-8 kHz; 4-channel: 0-5 kHz), start/stop and rotation direction.

The combination of pump speed (rpm) and the ID of the selected tubing determines actual flow rate per channel. Standard Click 'n' go cassettes, supplied with each pump, feature an automatic pressure setting. Maximum differential pressure is 15 psi (1.0 bar), depending on tubing material. Tubing with small IDs and/or optional cassettes with pressure lever (see page 141) may enable higher pressures.

REGLO pumps with 6 and 12 rollers are available in each version, with two or four channels. These pumps are not stocked items – please contact us for lead times.

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REGLO Digital

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Service of the servic	20	REGLO Digital	REGLO Analog
Motor type		DC motor	DC motor
Speed	2-channel 4-channel	1.6–160 rpm 1.0–100 rpm	3.2–160 rpm 2.0–100 rpm
Speed setting		rpm, resolution 0.1 rpm	2–99%, resolution 1% 2-digit potentiometer
Flow rate setting		µL/min or mL/min	NA
Power consumption		20 W	20 W
Power supply		85 – 264V <sub>AC</sub> / 47 – 60Hz	230V <sub>AC</sub> /50Hz,115V <sub>AC</sub> /60Hz, adjustable
Protection rating		IP 30	IP 30
Depth/Width/Height	2-channel 4-channel	178 x 100 x 135 mm 190 x 100 x 135 mm	178 x 100 x 143 mm 190 x 100 x 143 mm
Weight	2-channel 4-channel	2.0 kg 2.1 kg	2.0 kg 2.1 kg

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TANDARD A	CCESSORY	PAGE	1-
bing	3-Stop	142 – 143	/
are Cassettes <sup>1</sup>	MS/CA Click'n'go	141	1
oot Switch	Digital: ISM894 Analog: ISM891	141 141	

COMPACT REGLO PERISTALTIC TUBING PUMPS							
Order No.		Flow rates (mL/min per char			<b>Speed</b> (rpm)		
Digital							
ISM832	MS-2/08	0.002–57	2	8	1.6–160		
ISM834	MS-4/08	0.002–35	4	8	1.0-100		
Analog							
ISM829	MS-2/08	0.004–57	2	8	3.2–160		
ISM827	MS-4/08	0.003-35	4	8	2.0-100		

## FIXED-SPEED, RACK-MOUNT PERISTALTIC PUMPS

- ≫ Compact Size
- » 2 and 4 Channels
- $\gg 0.021$  to 21.0 mL/min Flow Rates

ISMATEC<sup>®</sup> Fixed Speed, Rack-Mount Peristaltic Pumps are ideal for limited space applications. These compact, 2 or 4 channel economical pumps are simple to operate – a quick flick of the on/off switch and the eight rollers and synchronous motor ensure steady, reproducible flow rates. Tubing changes are equally simple, and can even be accomplished while the pump is running.

The flow rate of these fixed speed pumps is determined by the inner diameter of the selected tubing. Each pump is supplied with a set of standard Click 'n' go tubing cassettes, with automatic pressure setting. Maximum differential pressure is 15 psi (1.0 bar), depending on tubing material. Tubing with small IDs and/or optional cassettes with pressure lever (see page 141) may enable higher pressures. Pumps are also supplied with a 6-foot cord and mounting rod (5 1/2" L x 1/2" diameter).

Typical applications for these pumps are multichannel delivery processes requiring a constant flow rate, such as:

- Pump seal wash (see Application Note on this page for more information)
- >>> Sipper pump for flow-through cuvettes
- $\gg$  Long-term determination of environmental influences
- >>> Feeding of overflow level control systems

Fixed Speed, Rack-Mounted pumps are available with 6 rollers and flow rates from 0.028 - 26 mL/min. These pumps are not stocked items – please contact us for lead times.

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Specific	ations.	
Lawrence and the second		
Motor type		Synchronous motor
Speed	///	20, 40 or 60 rpm
Power consumption		8 W
Power supply		115V <sub>AC</sub> (50/60 Hz) or 230V <sub>AC</sub> (50/60 Hz)
Protection rating		IP 30
Depth/Width/Height	2-channel 4-channel	125 x 88 x 135 mm 145 x 88 x 135 mm
Weight	2-channel 4-channel	1.2 kg 1.3 kg



Use the card in the back of this catalog to request the complete Ismatec Catalog. This catalog includes ISMATEC's full line of peristaltic, gear and rotary piston pumps and accessories.



#### Multi-Channel Peristaltic Pumps

LABORATORY PUMPS

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Mobile phase buffers are used in many liquid chromatography and syringe pump (see page 144 – 146) applications. When using highly concentrated buffer solutions (>0.01 M), buffer salts may precipitate, reducing the life of the pump pistons and seals. Solve this problem by using one channel of an ISMATEC 2-channel Fixed-Speed Rack-Mount Pump to continuously rinse the back of the seals. This set-up also provides a barrier of liquid to isolate process fluids from the atmosphere.

#### Ordering Tubing

Accessories

STANDARD A	CLESSORT	PAGE
Tubing	3-Stop	142 – 143
Spare Cassettes <sup>1</sup>	MS/CA Click'n'go	141

	ISMATEC FIXED-SPEED, RACK-MOUNT PUMPS						
	Order No.	Model	Flow rates (mL/min per channel)	Channels	Rollers	<b>Speed</b> (rpm)	
	115 Volts (No	rth American	/				
	ISM847-115V	MS-CA 2/820	0.021-7.1	2	8	20	
	ISM849-115V	MS-CA 2/860	0.064–21.0	2	8	60	
1	ISM852-115V	MS-CA 4/820		4	8	20	
	ISM853-115V	MS-CA 4/840	0.043-14.0	4	8	40	
	230 Volts (Eur	ropean)					
	ISM847	MS-CA 2/820		2	8	20	
1	ISM849	MS-CA 2/860		2	8	60	
	ISM852	MS-CA 4/820	0.021–7.1	4	8	20	
	ISM853	MS-CA 4/840	0.043–14.0	4	8	40	



### SINGLE CHANNEL **PERISTALTIC PUMPS**

Ismatec® Single Channel Peristaltic Pumps are cost-effective, space-saving and ideally suited for applications where simple fluid transfer and/or filling are required.

### **REGLO** Quick

PUMPS

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### » 1 Channel, 4 Rollers

- » 2.1-230 ml/min Flow Rates
- » Fast Tubing Change-over
- » Compact Size 178 x 100 mm x 14.3 cm High

This single channel, variable speed pump-head is popular in applications where frequent tubing change-over is required. The easily accessible tube-bed has a wide opening angle, enabling users in changing out their tubing configurations without difficulty. Its compact and innovative design features a transparent protective covering.

Flow is controlled through an analog interface by setting the pump speed, adjustable from 1-99%, in 1% steps via a 2-digit potentiometer. Use only the recommended standard tubing without stoppers, as specified below

Please Note: Only tubing with a 3.2mm ID or 4.8mm ID can be used with the REGLO Quick. See pages 142 – 143 for more information.





State State

2-digit potentiometer 1–99%, resolution 1% (for speed setting)

		REGLO Quick
Notor type		DC motor
peed		3.2-160 RPM
Speed setting		1-99%, resolution 1% 2-digit potentiometer
Power consumption		30 W
Power supply		230V <sub>AC</sub> /50Hz, 115V <sub>AC</sub> /60Hz adjustable
Protection rating		IP 30
Depth/Width/Height		178 x 100 x 143m
Veight		2.2 kg
		and the second se
Orđerin	g Tubing & P	Accessories:
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harris	al franching have	" Space

<sup>1</sup> One set of cassettes provided with each pump.

### Ecofluidic

- » 1 Channel, 3 Rollers
- » 100-3,800 ml/min. per Channel Flow Rates
- » Cost-effective
- » Variable Speed Control, with Forward and Reverse

The Ecofludic is a user-friendly, variable speed pump that provides smooth, consistent flow for simple fluid transfer applications. Its inventive and industrial design is well suited for filling applications as well as for a variety of other uses. The pump's small foot print and compact form lend it increased functionality, perfect for use in modern laboratory environments. The Ecofluidic is safety switch equipped and only runs when the pumphead is closed. The outer housing is made of PPS and stainless steel.



Specifications:	
E JANA MARIA	Ecofluidic
Motor type	DC motor
Speed	80-670 rpm, closed loop control
Speed setting	Variable speed setting via single multi-function control knob
Power consumption	Max. 150 W
Power supply	230V <sub>AC</sub> /50Hz +/- 10% 115V <sub>AC</sub> /60Hz +/- 10%
Protection rating	IP 31
Depth/Width/Height	235 x 128 x 242 mm
Weight	6.3 kg

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STANDARD ACCESSO	RY		PAG	E
The second second		Chan alway (and story)	142 1/	12

Tubing	Standard (no-stop)	142 - 143
-		

#### PERISTALTIC TUBING PUMPS

Order No.	Flow rates (mL/min per channel)	Channels	Rollers	<b>Speed</b> (rpm)
<b>REGLO Quick</b>				
ISM897	2.1-230	1	4	3.2-160
Ecofluidic				
ISM1200	100-3800	1	3	80-670

# **TUBING CASSETTES**

ISMATEC

#### » Developed and Consistently Improved by ISMATEC®

#### Click 'n' go Cassettes (Standard)1 Advantages:

» Automatic tubing pressure; no readjustment necessary

>>> Ideal for non-monitored, long-time use

Please Note: Click 'n' go cassettes are not suitable for differential pressure greater than 1 bar (15 psi). For these conditions you should choose the pressure lever cassettes.



CA Click 'n' ao

### Pressure Lever Cassettes (Optional)

The optional pressure lever allows you to set a different tubing pressure for each channel. Depending on the application, tubing material and diameter, an optimally adjusted tubing pressure can be set. To maintain constant flow rates it may be necessary to periodically adjust the tubing pressure.



MS/CA pressure lever (optional)



CA pressure lever (optional)

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## **FOOT SWITCH**

The ISMATEC foot switch for start/stop is very practical for use with pumps as dispensing systems, e.g. for filling tubes, bottles etc. A foot switch provides the start/stop signal required, allowing hands-free activation of the filling system. The switch's protection rating is IP21 (higher safety categories, e.g. IP67 on request). A 6-foot (1.8m) cable is included.

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ISMATEC offers a wide variety of peristaltic, gear and rotary piston pump solutions for instrument manufacturers. Please contact ISMATEC today to discuss your OEM needs (see page 168).

#### TUBING CASSETTES AND ADAPTERS

Click 'n' go	o Spare Cassettes <sup>1</sup>		
Order No.	Model	Material	Adapters Req'd?
IS3510	MS/CA Click 'n' go	POM-C	No
IS3710	CA Click 'n' go	POM-C	Yes <sup>2</sup>
Pressure L	ever Optional Cassettes		
Order No.	Model	Material	Adapter Req'd?
IS0649	MS/CA Pressure Lever	POM-C	No
IS3629	MS/CA Pressure Lever	PVDF <sup>3</sup>	No
IS0122	CA Pressure Lever	POM-C	Yes <sup>2</sup>
IS3820	CA Pressure Lever	PVDF <sup>3</sup>	Yes <sup>2</sup>
Replaceme	ent Adapters for CA Casset	ttes <sup>2</sup>	
Order No.	Model	Material	
IS0123	Adapter for CA Cassettes	POM-C	
IS3861	Adapter for CA Cassettes	PVDF <sup>3</sup>	
FOOT S	WITCH		
Order No.	Foot switch suitable for pump	o models:	
ISM016	IPC and IPC-N (firmware version	n older than 4.00	)
IS10039	IPC and IPC-N (from firmware v	ersion 4.00)	
ISM891	REGLO Analog, REGLO Quicl	ć	
ISM894	REGLO Digital		
1 1 1 1 1			•••••••••••••••••••••••••••••••••••••••

Included with all Ismatec cassette-style pumps.
 When ordering replacement CA Cassettes, two Adapters per cassette must also be ordered.
 PVDF offers higher chemical resistance.

### **PERISTALTIC PUMPS** AND TUBING

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The pumps presented on pages 137 - 140 require peristaltic tubing to operate. Flow rate of a given fluid through a peristaltic tubing pump depends on two variables:

- 1. The speed of the pump, measured in revolutions per minute (rpm)
- 2. The volume held with the internal diameter (ID) of the selected tubing

#### Variable Speed Pump Flow Rates

For a variable speed pump, such as the products on pages 137 – 140, the flow rate of a channel can be changed by varying the pump rpm, or by using tubing with different IDs, or a combination of both.

#### Fixed Speed Pump Flow Rates

For a fixed speed pump, such as the MS/CA line on page 140, the only variable is the tubing ID. Therefore, to change the flow rate of a fixed speed pump channel, the operator must use tubing with a different ID.

Single channel and multiple channel peristaltic tubing pumps are available in this catalog. The number of channels refers to how many pieces of tubing that can be used simultaneously. Tubing with different IDs can be used in each channel to deliver varying flow rates at any given pump speed.

### **ORDERING YOUR PUMP** AND TUBING

Follow these steps to complete your ISMATEC® peristaltic tubing pump order:

- 1. Select the pump for your application from pages 137 140, determined by the requirements of your fluid delivery task(s):
  - a. Level of accuracy
  - b. Fluid streams (# of channels)
  - c. Flow rate range(s)
  - d. Need for constant flow, discrete dispensing, or both
  - e. Need for variable speed
  - f. Need for automation/programmability
- 2. Note whether the selected pump requires 2-stop, 3no-stop tubing (standard tubing).
- 3. Review the tubing properties table on this page and select th material best suited for your application.
- 4. Refer to the tubing table on page 143 that corresponds to the nu stops required for the pump selected. Find the column in the ri of this table that contains your selected pump model.
- 5. Find the flow rate range in this column that meets your app needs.
- 6. Follow this row back to the tubing material column on the righ the table that corresponds with the tubing material desired.
- 7. If required, order extension tubing that corresponds to the tubing and ID of your 2- or 3-stop tubing.



	a. Level of accuracy	30%	10	10	10
	b. Fluid streams (# of channels)	95-98%	1	1	10
		Bases (NaOH) 10-15%	10	10	10
		30-40%	4	10	10
	<ul> <li>Need for constant flow, discrete dispensing, or both</li> <li>Need for variable speed</li> </ul>	Hydrocarbons (aliphatic)	1	1	1
	f. Need for automation/programmability	Mineral salts	10	10	10
2	Note whether the selected pump requires 2-stop, 3-stop or	Alcohols	1	10	10
	no-stop tubing (standard tubing).	Ketones (Acetone)	1	1	7
	Review the tubing properties table on this page and select the tubing material best suited for your application.	Applications pressure vacuum viscous media sterile media	fair good excellent limited	not recommended excellent good excellent	not recommended good good good
	Refer to the tubing table on page 143 that corresponds to the number of stops required for the pump selected. Find the column in the right side of this table that contains your selected pump model.	Standards compliance		USP Class VI     FDA 21 CFR,     177.2600     NSF listed	USP Class VI     FDA 21 CFR,     177.2600
5.	Find the flow rate range in this column that meets your application		12	(Standard 51)	
	needs.	Sterilization	Steam autoclaveable	Autoclaveable without	Autoclaveable for 30
	Follow this row back to the tubing material column on the right side of the table that corresponds with the tubing material desired.	V. A	and sterilizable with ethylene oxide. Coil loosely in non-linting cloth or paper;	any effects on the service life Caution: Use special	min. at 1 bar (15 psi), 121°C (250°F) Radiation: Irradiate at
	If required, order extension tubing that corresponds to the tubing material and ID of your 2- or 3-stop tubing.	- de caste	autoclave at 121°C (250°F), 1 kg/cm <sup>2</sup> (15 psi) for 30 min. (tubing will appear milky); air dry at max. 66°C (150°F) for 2 to 2.5 hours until clear	tubing version (welded stoppers) when autoclaving 2 or 3-stop color-coded tubing	up to 2.5 MRad Gas: ethylene oxide <u>Caution</u> : cannot be repeatedly sterilized
		Gas permeability <sup>2</sup> CO <sub>2</sub> O <sub>2</sub> N <sub>2</sub>	360 80 40	1200 200 80	ca. 4900 ca. 1000 ca. 350
7		Odor and Taste	none	low	n.a.
18	KA *	Toxicity	non-toxic	non-toxic	n.a.
1	Noter *	Tubing life <sup>3</sup> at 0 bar at 0.7 bar		1000 + hrs. 1000 hrs.	800 + hrs. 800 + hrs.
- 11	Connectors and adapters for peristaltic tubing are	<sup>1</sup> Rating: 1 not recomme	nded: 10 excellent		× =
di manual di	on pages 45, 48 and 49.	<sup>2</sup> Gas permeability = vol are <sup>3</sup> Tubing 6.4mm ID, 1.6mm (ISMATEC tubing pumps	ume of gas (cc) x wall thickn a of tubing i.d. (cm²) x time (se	ec) x pressure drop across tub 00 rpm, 23°C, service life en m)	
	<b>RDER</b> ⊀ Tel: 800.426.0191 / 360.679.2528 · www.upchurch.com			0	
70	<b>TELE OUD.420.0191 / 300.079.2528 · WWW.upchurch.com</b>				

ISMATEC

Tygon<sup>®</sup> MHLL

Chemically resistant and long life tubing

Plasticizer-free
Smooth innerbore

Minimal adhesion

Long life tubing

Special thermoplastic of

Without additives

 Without plasticize Environmental-friendly disposal
Flexible, firm,

opaque

-70°C to +74°C (-94°F to +165°F)

10 10

Low sorption maintains fluid

and d

Potential leaching of additives (lubricants)
 Cannot be repeatedly sterilized

Properties of Ismatec Tubing:

PharMed

Ismapren

The ideal tubing for

pharmaceutical and

medical application and for foodstuffs

• Ideal for cell and

tissue cultures Very long service life
 Non-toxic and non-hemolytic

Impermeable t

normal light and UV-radiation

Appropriate for medical products and foodstuffs

hermoplastic

-60°C to +135°C (-75°F to +275°F)

color

Elastomer based or

Polypropylene
 Firm, opaque, beige

Low gas permeak

Tygon<sup>®</sup> ST R-3603/R-3607

The inexpensive all-around tubing for

general laboratory applications, and for

Resistant to almost al inorganic chemicals

Low gas permeability
Smooth inner surface

Short service life
Potential leaching o

PVC-based material

plasticizers

Thermoplastic

with plasticize

• Flexible, firm,

transparent

-50°C to +74°C

(-58°F to +165°F)

Appropriate for foodstuffs

• Does not age

 High dielectric constant

foodstuffs

Tasteless

• Transparent

Туре

General

description

Advantages

Limitation

Physical properties

Service

temperature range

Acids (H<sub>2</sub>SO<sub>4</sub>) 10%

Chemical Resistance<sup>1,4</sup>

ISMATEC

_									Lo	w Flow	(page 1	37)
_								Pump		Speed PC)		Speed C-N)
		_						Channels	4, 8, 1	2 or 24	4, 8, 12	2, or 24
Tygon <sup>®</sup> S	ST	PharMee	8	Tygon M	HLL	0		Rollers		в		8
R-3603/I		Ismapre	ne		ssive media)	(mm)	Color Code	Speed (rpm)	0.45	45.0	0.11	11.25
Order No.	Qty.1	Order No.	Qty.1	Order No.	Qty. <sup>2</sup>	Tubing ID (mm)		<b>mL/min⁵</b> per channel	Min.	Max.	Min.	Max.
SC0188	12-pk	-	-	_	_	0.13 <sup>3</sup>	Orange-Black		0.002	0.15	0.0004	0.039
SC0001	12-pk	_	_	_	_	0.19 <sup>3</sup>	Orange-Red	1	0.003	0.26	0.0007	0.066
SC0002	12-pk	SC0320	6-pk	_	_	0.25 <sup>3</sup>	Orange-Blue	1	0.005	0.41	0.001	0.10
SC0005	12-pk	SC0322	6-pk	_	_	0.51 <sup>3</sup>	Orange-Yellow	1	0.015	1.5	0.004	0.38
SC0008	12-pk	SC0324	6-pk	SC0717	6-pk	0.764	Black-Black	1	0.032	3.2	0.009	0.81
SC0011	12-pk	SC0326	6-pk	_	_	1.024	White-White	1	0.057	5.7	0.014	1.4
SC0014	12-pk	_	_	_	_	1.224	Red-Grey	1	0.079	7.9	0.020	2.0
SC0017	12-pk	SC0330	6-pk	SC0719	6-pk	1.524	Yellow-Blue	1	0.12	12	0.030	3.0
SC0020	12-pk	SC0332	6-pk	_	_	1.854	Green-Green	1	0.17	17	0.043	4.3
SC0023	12-pk	SC0335	6-pk	_	_	2.544	Purple-Orange	1	0.30	30	0.075	7.5
SC0024	12-pk	SC0336	6-pk	SC0721	6-pk	2.794	Purple-White	1	0.35	35	0.088	8.8
SC0222	12-pk	_	_	_	_	3.174	Black-White	1	0.44	44	0.11	11

#### 3-STOP TUBING FOR MS/CA CASSETTES

_								Pump			page 13 & Analo		Fi	xed-Speed (pag	l, Rack-Mo e 139)	ount
								Channels		2		4	2	2	4	4
Tygon ST		PharMec	1	Tygon M	HLL	_		Rollers		8		В	8	8	8	8
R-3603/F	R-3607	Ismaprer	ne	(for aggre	ssive med	lia) 🖸	Color Code	Speed (rpm)	1.6	160	1.0	100	20	60	20	40
Order No.	Qty.1	Order No.	Qty. <sup>6</sup>	Order No.	Qty.7	lia) Tubing ID (mm)		<b>mL/min⁵</b> per channel	Min.	Max.	Min.	Max.	Fixed Speed	Fixed Speed	Fixed Speed	Fixed Speed
SC0189	12-pk	-	_	-	_	0.13 <sup>3</sup>	Orange-Black		0.002	0.17	0.002	0.11	0.021	0.064	0.021	0.043
SC0049	12-pk	-	_	-	-	0.19 <sup>3</sup>	Orange-Red	]	0.004	0.37	0.003	0.23	-	—	-	-
SC0050	12-pk	SC0303	6-pk	—	_	0.25 <sup>3</sup>	Orange-Blue		0.007	0.65	0.005	0.41	0.08	0.24	0.08	0.16
SC0053	12-pk	SC0305	6-pk	—	_	0.51 <sup>3</sup>	Orange-Yellow		0.027	2.7	0.017	1.7	0.34	1.0	0.34	0.67
SC0056	12-pk	SC0307	6-pk	SC0711*	6-pk	0.764	Black-Black	]	0.058	5.8	0.036	3.6	0.73	2.2	0.73	1.5
SC0059	12-pk	SC0309	6-pk	-	-	1.024	White-White	]	0.10	10	0.063	6.3	1.3	3.8	1.3	2.5
SC0062	12-pk	-	_	-	-	1.224	Red-Grey	]	0.14	14	0.088	8.8	1.8	5.3	1.8	3.5
SC0065	12-pk	SC0313	6-pk	SC0713*	6-pk	1.524	Yellow-Blue		0.20	20	0.13	13	2.6	7.7	2.6	5.1
SC0068	12-pk	SC0315	6-pk	—	_	1.854	Green-Green		0.28	28	0.17	17	3.5	10	3.5	7.0
SC0071	12-pk	SC0318	6-pk	—	-	2.54 <sup>4</sup>	Purple-Orange		0.44	44	0.27	27	5.5	16	5.5	11
SC0072	12-pk	SC0319	6-pk	SC0715*	6-pk	2.794	Purple-White	]	0.50	50	0.31	31	-	—	-	-
SC0224	12-pk	-	_	_	_	3.174	Black-White	1	0.57	57	0.35	35	7.1	21	7.1	14
EXTENS		IG FOR 2- AN	D 3-STOP T	UBING	STANE	ARD (NO-STO	OP) TUBING									
Tygon ST	Г	PharMed											-	Channe		
R-3603/F	R-3607	Ismaprer	ne	Tubing ID							Pump		REGLO ( (page 1		Ecoflu (page '	
Order No.	Qty.	Order No.	Qty.	labi							Channe	s	<del>ر در</del>		1	-1
SC0226	10 m		_	0.133		Tygon ST 3603/R-3607	PI	narMed			Rollers		4		3	

		isinapi cii	•	
Order No.	Qty.	Order No.	Qty.	
6C0226	10 m	-	—	
SC0025	10 m	_	_	
SC0026	10 m	SC0337	3 m	
SC0029	10 m	SC0339	3 m	
5C0032	10 m	SC0341	3 m	
SC0035	10 m	SC0343	3 m	
SC0038	10 m	_	_	
SC0041	10 m	SC0347	3 m	
5C0044	10 m	SC0349	3 m	
5C0047	10 m	SC0352	3 m	
5C0048	10 m	SC0353	3 m	

\_

							Sing	gle Chann	el (page	140)
						Pump		0 <i>Quick</i> e 140)		fluidic e 140)
						Channels		1		1
Тус	gon ST	Ph	arMe	d		Rollers		4		3
R-360	3/R-3607	Isn	na <mark>p</mark> ren	ie		Speed (rpm)	3.2	160	80	670
Order No.	Qty.	Order No.	Qty.		Tubing ID (mm)	mL/min⁵	Min.	Max.	Min.	Max.
MF0030	15 m	MF0012	7.5 m		3.2 <sup>7</sup>		2.1	103	100	750
SC0379	15 m	MF0011	7.5 m		4.87	1	4.6	230	210	1450
MF0031	15 m	MF0013	7.5 m		6.4 <sup>7</sup>				360	2500
MF0032	15 m	MF0014	7.5 m		87				550	3800

<sup>1</sup> Each piece of tubing in the pack is 400 mm in length.

<sup>2</sup> Each piece of tubing in the pack is 381 mm in length.
 <sup>3</sup> Tubing wall thickness is 0.91 mm.

<sup>4</sup> Tubing wall discusses to 0.7 min.
<sup>4</sup> Tubing wall thickness is 0.86 mm, except Tygon MHLL tubing, which are 0.91mm.
<sup>5</sup> Approximate values, determined with Tygon tubing and water at 22°C, with no differential pressure.

<sup>6</sup> Each piece of tubing in the pack is 300 mm in length.
 <sup>7</sup> Tubing wall thickness is 1.6 mm.

0.19<sup>3</sup>

0.25<sup>3</sup>

0.51<sup>3</sup>

0.76<sup>3</sup> 1.024 1.224

1.524 1.85<sup>4</sup> 2.54<sup>4</sup>

2.794

3.174

SC0223 10 m

\* These tubes are only equipped with 2 stoppers.

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PUMPS ARORATORY

Mal

#### Peristaltic Pump Tubing

ABORATORY PUMPS

DE+

NEALLY & SCIENCE

### PUMP AND VALVE MODULE (PVM)

#### Complete Aspirating/Dispensing System

>>> Uses Long Life IPVs

DEX

WEATTS & STILLETS

The compact digital PVM is a self-contained, stepper motor driven module. This product is designed for various liquid handling applications such as automated pipetting, diluting and dispensing.

The PVM uses the patented IPV (Integrated Piston/Valve), which meets and exceeds the precision accuracy of traditional syringe/plug valve systems while offering up to 20x the life. This translates into a major cost savings. Please see pages 145 – 146 for more information regarding IPVs.

The PVM is 100% software compatible with the Cavro<sup>™</sup> XP-3000 syringe pump (standard resolution). It can be operated as a stand-alone module or in automated instruments controlled by an external computer or microprocessor. Each pump has RS-232, RS-485 and CAN BUS connections for communication with a controlling device using Data Terminal protocol.

#### SOFTWARE FEATURES

- >>> 100% software compatible with Cavro XP-3000 syringe pumps
- » Resolution of 3,000 full steps per stroke
- >>> Programmable ramps, cut-offs, backlash compensation, plunger speeds, delays and loops
- >>> Select piston speed
- » Absolute and relative positioning of pistons
- >>> Start and terminate piston movement
- » ≫ Check pump with self-test
- >>> Selectively work with up to 15 PVMs

The performance of each PVM is tested and documented before shipment. The PVM meets the CE EMC Class B specifications. Please see the table on this page for more specifications.

The PVM can be used with your choice of IPV, from  $50\mu$ L – 5.0mL volumes, with or without optional seal wash ports. See page 145 for replacement IPVs.

Please contact Sapphire Engineering (see page 168) regarding custom solutions for instrument manufacturers. Custom options include alternative materials and configurations.

### PVM Specifications:

Piston Drive	DC stepper motor with a step control sensor, self lubricating, 30mm stroke length
Motor Resolution	3,000 steps, standard resolution
Dispense Speed (full stroke)	1.1 sec – 600 sec
Valve Drive	DC stepper motor with optical encoder
Valve Drive Speed	250ms between adjacent ports
Valve Tubing Connections	1/4-28 flat bottom fittings (pages 55 – 57)
Power Requirements	24 VDC ± 5%; 1.2A
Baud Rate	9,600 to 38,400 (RS-232, RS-485)
Input/Output	2 input TTL; 3 output TTL
Dimensions	5.00" H x 1.80" W x 4.50" D (127mm H x 45mm W x 114mm D)
Weight	2.5 lbs. (1.1 kg)
Operating Range Temperature	17° to 37° C
Humidity	10 – 85% R.H. noncondensing
Storage Range	
Temperature	5° to 45° C
Humidity	10 – 95% R.H. noncondensing



PVM with IPVs

PVM / IPV KITS <sup>1</sup>	
With IPV	
81-1003K-4908-50-07	PVM with 50µL IPV
81-1003K-4908-100-07	PVM with 100µL IPV
81-1003K-4908-250-07	PVM with 250µL IPV
81-1003K-4908-500-07	PVM with 500µL IPV
81-1003K-4908-1000-07	PVM with 1.0mL IPV
81-1003K-4908-2500-07	PVM with 2.5mL IPV
81-1003K-4908-5000-07	PVM with 5.0mL IPV
With IPV and Seal Wash	Port
81-1003K-4908W-50-07	PVM with 50µL IPV
81-1003K-4908W-100-07	PVM with 100µL IPV
81-1003K-4908W-250-07	PVM with 250µL IPV
81-1003K-4908W-500-07	PVM with 500µL IPV
81-1003K-4908W-1000-07	PVM with 1.0mL IPV
81-1003K-4908W-2500-07	PVM with 2.5mL IPV
81-1003K-4908W-5000-07	PVM with 5.0mL IPV
<u> </u>	

Please contact Upchurch Scientific® regarding lead times for these products. <sup>1</sup> Includes one PVM pump with IPV, power supply, cabling, software and user manual.

### **INTEGRATED PISTON/VALVES** (IPV)

#### For PVM and Cavro<sup>™</sup> XP-3000 Syringe Pumps

- » Accuracy and Precision Identical to Traditional Syringes and Valves
- » Significant Lifetime Cost Savings
- » Direct Plug-in Products
- » Made of Durable, Chemically Resistant Materials

The Sapphire Engineering<sup>™</sup> Integrated Piston/Valves (IPVs) offer precision and accuracy equivalent to traditional glass barrel/DuPont Teflon® brand resin syringes with Kel-F®/Teflon plug valves (see the Dispense Precision and Accuracy chart, page146). However, extensive tests show the IPV will outlast traditional syringe/valves by as much as 20 fold, yielding major lifetime cost savings (see the Lifetime Savings Comparison chart, page 146). By selecting the seal wash option, you can extend IPV life even longer when using it with aggressive or difficult fluids (such as salt buffer solutions - see Application Note on page 139 for a seal wash pump). The IPV requires no routine preventive maintenance such as cleaning and nut tightening, essential with conventional syringes.

How does the IPV deliver such dramatic savings? The IPV uses patented piston technology to pump fluid via positive displacement in lieu of a traditional syringe. Secondly, a ceramic-on-ceramic shear valve replaces the more-common polymer plug valve. These innovations, combined with proprietary surface finishing processes on the ultra-hard piston, rotor and stator surfaces, mean significantly less wear, less downtime and reduced cost of ownership.

Select an IPV for use on a PVM (Pump and Valve Module page 144), or as a direct plug-in replacement for an existing syringe/valve on a Cavro XP-3000 syringe pump. Getting up and running takes as little as five minutes. Choose from the available 50µL - 5.0mL volumes, with or without a seal wash option.

Use IPVs in traditional syringe valve applications, i.e. to aspirate/dispense small, precise volumes, such as:

- >>> Automated pipetting
- » Lab-on-a-chip infusion
- >>> FIA (Flow Injection Analysis) dosing
- >>> Titrations
- >>> System rinse/wash

The wetted materials of the IPV are Ultem<sup>®</sup>, Tefzel<sup>®</sup>, TZP (Zirconia) ceramic, Alumina ceramic, UHMWPE and Viton®. Please contact Sapphire Engineering (see page 168) regarding custom solutions for instrument manufacturers, including alternative materials and configurations.

#### Syringe Pump Alternatives

IPV with Seal Wash Port Option, shown mounted on a Cavro XP-3000 pump

eramic roto and stator Ultem head and body UHMWPE sea Ceramic piston

DE

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#### **REPLACEMENT IPVS FOR PVM**

With 3-Way Ceramic	"Y" Valve
98-4908-50-07	50µL IPV
98-4908-100-07	100µL IPV
98-4908-250-07	250µL IPV
98-4908-500-07	500µL IPV
98-4908-1000-07	1.0mL IPV
98-4908-2500-07	2.5mL IPV
98-4908-5000-07	5.0mL IPV
With 3-Way Ceramic	"Y" Valve and Seal Wash Port
98-4908W-50-07	50µL IPV
98-4908W-50-07 98-4908W-100-07	50μL IPV 100μL IPV
	-
98-4908W-100-07	100µL IPV
98-4908W-100-07 98-4908W-250-07	100µL IPV 250µL IPV
98-4908W-100-07 98-4908W-250-07 98-4908W-500-07	100µL IPV 250µL IPV 500µL IPV

#### **IPVS FOR CAVRO XP-3000 PUMPS**

With 3-Way Ceramic	"Y" Valve
98-4911-50-07	50µL IPV
98-4911-100-07	100µL IPV
98-4911-250-07	250µL IPV
98-4911-500-07	500µL IPV
98-4911-1000-07	1.0mL IPV
98-4911-2500-07	2.5mL IPV
98-4911-5000-07	5.0mL IPV
With 3-Way Ceramic	"Y" Valve and Seal Wash Port
98-4911W-50-07	50µL IPV
98-4911W-100-07	100µL IPV
98-4911W-250-07	250µL IPV
98-4911W-250-07 98-4911W-500-07	
	250µL IPV
98-4911W-500-07	250μL IPV 500μL IPV

Syringe Pump Alternatives

# IPV(CONT.)

DEX

WEALTS & STILLETS

#### Dispense Precision & Accuracy

As this graph and data indicate, the Sapphire Engineering™ IPV compares favorably with a standard Cavro<sup>™</sup> mounted syringe — both well under 1 percent CV.



### Lifetime Cost Savings With Sapphire Engineering IPV Compared to a Typical Syringe



### **AIR COMPRESSOR/VACUUM** PUMPS

#### DOA Lab Models

GAST

- » Pressure to 60 psi (4.2 bar)
- >>> Vacuum to 25.5" Hg (31 mbar)
- » Open Flow to 1.1 CPM (60 Hz)

Oilless Diaphragm Air Compressors from Gast® Manufacturing are the perfect solution for laboratory applications that require a small, quiet source of cooler air vacuum or pressure. The mounted shaded pole motors carry 1/8 HP (0,09 kW) of horsepower and consume a relatively low level of power. Their compact size and light weight enable them to fit well into streamlined laboratory environments. Additionally, these pumps are constructed of rugged, corrosion resistant materials and are easy to maintain. A repair kit is available for purchase below.

Pumps come equipped with vacuum and pressure gauges, hose barbs, vacuum and pressure regulators, rubber feet and a convenient carrying handle. Please contact Gast for replacement parts (see page 168 for contact information).



DOA-P704-BN inches/mm

1 4 6 **\*ORDER\*** Tel: 800.426.0191 / 360.679.2528 · www.upchurch.com Cord assembly with European Plug



25 20 15 10 5 0 10 20 30 40 50 60 psig In. Hg 30 1.0 200 400 600 800 2,0 3,0 mbar 0

#### Specifications:

Model Number	Motor	Motor Type	<b>RF</b> 60 Hz	PM 50Hz	HP	kW	Lbs.	Kg	Regulatory
DOA-P704-AA	115-60-1	Shaded Pole	—	1575	1/8	0,09	16.0	7,3	UL/CNL
DOA-P704-BN	220/240-50-1	Shaded Pole	1275	—	1/8	0,09	16.0	7,3	CE

#### AIR COMPRESSOR/VACUUM PUMPS

	Speed (rpm)	HP	
DOA-P704-AA	50 Hz, 1575		
DOA-P704-BN	60 Hz, 1275	1/8	
REPAIR KIT			

K294J Repair Kit for DOA Lab Models

NEW NEW