

VARIABLE FLOW MINI-PUMP INSTRUCTIONS

Pump I (Model 3384)—Ultra Low Flow	[]
Pump II (Model 3385)—Low Flow	[]
Pump III (Model 3386)—Medium Flow	[]
Pump IV (Model 3389)—Medium/High Flow	[]

SPECIFICATIONS

Type:	Variable flow, self-priming, peristaltic pump
Flow control:	Variable
Flow rates:	Pump I—Ultra Low Flow: 0.005 to 0.900 ml/min Pump II—Low Flow: 0.03 to 8.20 ml/min Pump III—Medium Flow: 0.4 to 85.0 ml/min Pump IV—Medium Flow: 4.0 to 600 ml/min
Silicone tubing temperature range:	-80 to 500°F (-62 to 260°C)
Motor:	12VDC variable
Case:	ABS plastic
Dimensions:	6 ⁵ / ₈ x 4 ³ / ₄ x 4 ¹ / ₂ inches (16.8 x 12.0 x 11.5 cm)
Weight:	1 ¹ / ₄ lb (567 g)
Power:	120 V, 60 Hz; 9 or 12 V battery; or European 220 V, 50 Hz

CONTROL PANEL

- S1:** Power/Direction switch:
For selecting FORWARD, REVERSE, and power OFF.
- S2:** Pump Speed switch:
For selecting FAST, SLOW, and PRIME (PURGE).
- C1:** Variable Flow Control:
For varying flow rate.

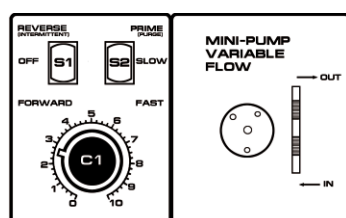


Figure 1 Control Panel

GENERAL INFORMATION

Variable flow Mini-Pump is a bidirectional, self-priming peristaltic pump for precise low-flow deliveries. The squeezing action of the rollers on the tubing progressively moves fluid through the tubing in advance of the rollers, resulting in a peristaltic pumping action. The flow is proportionate to the speed of the pump head and the inside diameter of the tubing, both of which can be varied. A variable speed flow control and five different sized tubing assemblies provide fine resolution with a wide range of flow rates. A PRIME (PURGE) setting is provided to facilitate high speed emptying/filling operations. Mini-Pump is powered by a 12-volt wall adapter that plugs into a wall receptacle. A battery power cord is also supplied for portable operation of the pump using a 9- or 12-volt battery.

SETUP

There are two power cords available; this enables Mini-Pump to operate from a standard (120-volt, 60-hertz wall receptacle or European accessory adaptor 220-volt, 50-hertz) and from a 9- or 12-volt battery. Connect one end of the appropriate power cord to the Mini-Pump and the other end to a power source, the Mini-Pump is now ready to use.

AC Power Cord: This 6-foot cord has a single male plug on one end and a wall adapter on the other. Insert the single male plug into the power receptacle at the back of the pump housing and the wall adapter into a wall receptacle.

Battery Power Cord: This 7-inch cord has a single male plug on one end and a 9-volt battery connector on the other. Insert the single male plug into the power receptacle at the back of the pump housing and connect the battery connector to a 9-volt battery.

NOTE: Mini-Pump can also be operated from a 12-volt car/storage battery by properly splicing the wires to the 9-volt connector. Results are comparable to those on ac operation. Operation of the pump on a 9-volt battery produces slower speeds and flow rates. A standard 9-volt battery runs the pump for a relatively short time (30 min or less) before becoming exhausted.

OPERATION

- Release the protective transparent cover by depressing the tab on the plastic retaining clip located at the bottom of the cover. The hinged cover can then be raised to gain access to the pump head and tubing assembly.
- Take the tubing assembly (plastic fittings and attached tubing) and wrap the tubing around the pump head (white roller). Slide each plastic slotted fitting into each metal slotted U-shaped retaining bracket.
- Attach tubing to the IN and OUT barbed fittings on the pump.
- Move Power/Direction switch (S1) to FORWARD, to activate pump head.
- Move the Pump Speed switch (S2) to PRIME (PURGE), to quickly fill the tubing with liquid.
- Move the Pump Speed switch (S2) to SLOW or FAST.
- Within each of the two speed ranges (SLOW and FAST), the flow rate can be varied for precise delivery by rotating the Variable Flow Control knob (C1).

The adaptor tip is positive (+). Polarity reversal will damage this product.

Selecting a higher reference number increases the revolutions per minute and the flow rate of the pump.

- Select a tubing size with a mid-range for the expected flow rate.
- To extend tubing life, select a tubing size with the largest diameter possible for the desired output and operate pump at lower speeds (without stalling the pump). If too large a diameter tubing is selected, and the pump is set at too slow a speed, the pump motor may stall or stop.
- The tubing in the tubing assembly will eventually wear out and must be replaced. To replace tubing read the following sections: "Tubing Assemblies," "Tubing," etc.

NOTE: If very accurate flow control is important, allow the pump to operate for approximately 20 minutes to condition the tubing.

CAUTION: Mini-Pump is engineered to provide years of satisfactory service if handled properly. Here are a few precautions:

- Do NOT run the pump in reverse for long periods of time. This will shorten the life of the motor.
- Do NOT manually turn the pump head. Turning the pump head manually will damage the pump gears.
- Do NOT touch the pump head while it is turning.
- This product is not designed for nor intended for use in patient-related applications.

TUBING ASSEMBLIES

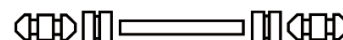


Figure 2 Slotted Tubing Assembly Configuration

Slotted (see Fig. 2)

Slotted tubing assemblies consist of a length of tubing with each end terminating in a straight barbed fitting with a slotted tube-lock holding the fitting in place.

Washer (see Fig. 3)

Washer tubing assemblies consist of a length of tubing with each end terminating in a straight barbed fitting with a washer tube-lock holding the fitting in place.



Figure 3 Washer Tubing Assembly Configuration

Complete tubing assemblies are available (see "Accessories" section).

TUBING

For replacement of the tubing only, consult the chart below for cutting the tubing to the proper length.

Pump I—Ultra Low Flow

Tubing I.D.	Approx. Tubing Length	Approx. Flow Rate
1/50", 0.5mm	3.25", 83mm	0.005–0.013 ml/min
*1/32", 0.8mm	3.5", 89mm	0.008–0.03 ml/min
1/16", 1.6mm	4.25", 108mm	0.05–0.17 ml/min
3/32", 2.4mm	4.5", 114mm	0.08–0.36 ml/min
3/16", 4.8mm	5.0", 127mm	0.35–0.96 ml/min
1/4", 6.4mm	4.375", 111mm	0.38–1.80 ml/min

*Not supplied with pump

Pump II—Low Flow

Tubing I.D.	Approx. Tubing Length	Approx. Flow Rate
1/50", 0.5mm	3.25", 83mm	0.03–0.06 ml/min
*1/32", 0.8mm	3.5", 89mm	0.04–0.14 ml/min
1/16", 1.6mm	4.25", 108mm	0.25–0.8 ml/min
3/32", 2.4mm	4.5", 114mm	0.4–1.7 ml/min
3/16", 4.8mm	5.0", 127mm	1.7–4.6 ml/min
1/4", 6.4mm	4.375", 111mm	1.8–8.2 ml/min

*Not supplied with pump

Pump III—Medium Flow

Tubing I.D.	Approx. Tubing Length	Approx. Flow Rate
1/50", 0.5mm	3.25", 83mm	0.4–0.8 ml/min
*1/32", 0.8mm	3.5", 89mm	0.6–2.2 ml/min
1/16", 1.6mm	4.25", 108mm	3.0–12.0 ml/min
3/32", 2.4mm	4.5", 114mm	5.0–20.0 ml/min
3/16", 4.8mm	5.0", 127mm	17.0–60.0 ml/min
1/4", 6.4mm	4.375", 111mm	18.0–85.0 ml/min

*Not supplied with pump

Pump IV—Medium/High Flow

Tubing I.D.	Approx. Tubing Length	Approx. Flow Rate
1/16", 1.6mm	4.75", 121mm	4–34 ml/min
3/32", 2.4mm	5.375", 137mm	20–90 ml/min
3/16", 4.8mm	5.5", 140mm	40–280 ml/min
1/4", 6.4mm	5.375", 137mm	80–600 ml/min

(Instructions continued on page 2)

(Instructions continued from page 1)

Slightly shorter tubing reduces the diameter by stretching the tubing and reducing the flow. The flow rate can be reduced slightly by cutting the tubing slightly shorter than indicated by the chart.

NOTE: The lengths given are for silicone tubing only, other tubing may require slightly shorter or longer lengths. The flow rates listed are for silicone tubing supplied with Mini-Pump.

For best results—

- Select a tubing size with a mid-range for the expected flow rate.
- To extend tubing life, select a tubing size with the largest diameter possible for the desired output and operate the pump at lower speeds (without stalling the pump). If too large a diameter tubing is selected, and pump is set at too slow a speed, the pump motor may stall or stop.

TUBING ASSEMBLY REMOVAL

1. Release the protective, transparent cover by depressing the tab on the plastic retaining clip located at bottom of the cover. The hinged cover can then be raised to gain access to pump head and tubing assembly.
2. The tubing assembly is held in place by a slotted tube-lock at each end which is fastened securely by friction fit in a metal U-shaped retaining bracket.
3. Grasp the tube-lock (white round slotted part) on each side of the retaining bracket, and remove it by lifting upward.
4. Remove the other tube-lock in the same manner.

PREPARATION FOR INSTALLATION (TUBING ONLY)

1. After removing the tubing assembly, slide the slotted tube-lock on each end away from the barbed fittings. Remove the barbed fittings and tube-locks from the tubing, discarding the tubing.
2. Prepare a new length of tubing for installation by sliding a tube-lock over the end of the tubing. Insert a fitting on the end of the tubing. Make certain to slide the tubing over the barbed portion of the fitting. Repeat this procedure for the other end of the tubing. The tubing assembly is now ready for installation.

TUBING ASSEMBLY INSTALLATION

The 1/4-inch (6.4mm) tubing assemblies have tube-locks that consist of nylon washers—they are not slotted. All other tubing assemblies have tube-locks that are slotted.

Slotted Tube-Lock Fittings

1. Press one slotted tube-lock into the metal U-bracket.
2. Feed the tubing around the pump head (stretching the tubing slightly to ensure a good wraparound fit).
3. Press the second tube-lock into the other metal U-bracket.

Washer Tube-Lock Fittings

1. Slip one end of the tubing assembly into the U-bracket with the washer to the right of the bracket.
2. Feed the tubing around the pump head (stretching the tubing slightly to ensure a good wraparound fit).
3. Slip the second end of the tubing assembly into the other U-bracket with the washer to the right of the bracket.

TUBING

This specially formulated pump tubing is made from FDA-approved ingredients. The unique manufacturing process achieves a tubing flexibility greater than other tubing. It is ultratranslucent so that the flow of the liquid can be observed. It is nontoxic, odorless, and tasteless. It may be used to transfer ultrapure deionized/distilled water with zero contamination. It is biocompatible, resilient, stretchable, and resistant to compression set. Its high “weatherability” properties resist ultraviolet light, ozone, and gases. May be used in the lab and outdoors. It may be autoclaved. Designed for pumping very hot and very cold liquids, -80 to 500°F (-62 to 260°C).

REPLACEMENT SETS OF TUBING

Cat. No. Description

- 3370 Replacement set of tubing and fittings/nipples for pump Cat. #3384 and #3385. Identical to the set supplied with the pump. Supplied with 1/50, 1/16, 3/32, 3/16, and 1/4-inch I.D. tubing and corresponding fittings/nipples.
- 3377 Replacement set of tubing and fittings/nipples for pump Cat. #3386. Identical to the set supplied with the pump. Supplied with 1/50, 1/16, 3/32, 3/16, and 1/4-inch I.D. tubing and corresponding fittings/nipples.
- 3378 Replacement set of tubing and fittings/nipples for pump Cat. #3389. Identical to the set supplied with the pump. Supplied with 1/16, 3/32, 3/16, and 1/4-inch I.D. tubing and corresponding fittings/nipples.

REPLACEMENT TUBING ONLY

Cat. No. Description

- 3360 ... 1/50-inch I.D. Silicone tubing, 25 ft. (all pumps)
- 3361 ... 1/32-inch I.D. Silicone tubing, 25 ft. (all pumps)
Uses the identical fittings/nipples as the 1/50" tubing
- 3362 ... 1/16-inch I.D. Silicone tubing, 25 ft. (all pumps)
- 3363 ... 3/32-inch I.D. Silicone tubing, 25 ft. (all pumps)
- 3364 ... 3/16-inch I.D. Silicone tubing, 25 ft. (all pumps)
- 3365 ... 1/4-inch I.D. Silicone tubing, 25 ft. (Cat. #3384 and #3385)
- 3366 ... 1/4-inch I.D. Silicone tubing, 25 ft. (Cat. #3386 and #3389)

REPLACEMENT TUBING ASSEMBLIES

Cat. No. Description

- 3371 ... 1/50-inch I.D. Silicone tubing and fittings/nipples for Cat. #3384, #3385 and #3386
- 3372 ... 1/16-inch I.D. Silicone tubing and fittings/nipples for Cat. 3384, #3385 and #3386
- 3373 ... 3/32-inch I.D. Silicone tubing and fittings/nipples (fitting color coded red inside) for Cat. #3384, #3385 and #3386
- 3374 ... 3/16-inch I.D. Silicone tubing and fittings/nipples (fitting color coded blue inside) for Cat. #3384, #3385 and #3386
- 3375 ... 1/4-inch I.D. Silicone tubing and fittings/nipples for Cat. #3384 and #3385
- 3376 ... 1/4-inch I.D. Silicone tubing and fitting/nipples for Cat. #3386
- 3390 ... 1/50-inch I.D. Silicone tubing and fittings/nipples for Cat. #3389
- 3391 ... 1/16-inch I.D. Silicone tubing and fittings/nipples for Cat. #3389
- 3392 ... 3/32-inch I.D. Silicone tubing and fittings/nipples for Cat. #3389
- 3393 ... 3/16-inch I.D. Silicone tubing and fittings/nipples for Cat. #3389
- 3394 ... 1/4-inch I.D. Silicone tubing and fittings/nipples for Cat. #3389

ACCESSORIES

Control Cat. No. 3280 Tight-Seal™ Hose/Tubing Clamp Assortment

includes 5 each of 13 different sizes. Clamps have an inside diameter of 0.246 to 1.610 inches. Clamps securely fasten tubing on connectors, pumps, glassware, and filtration units. Chemical-corrosion-resistant, rustproof, and nonconducting nylon is ideal for use in wide-temperature range of 32 to 194°F.

Control Cat. No. 3285 Tight-Ties™, Cable Ties Assortment

includes 400 ties with lengths from 4 to 14 inches. One-piece, self-locking ties are made of chemical-corrosion-resistant, rustproof, and nonconducting nylon, ideal for use in wide-temperature range of -40 to 185°F.

Control Cat. No. 3367 European Power Supply 220 volts, 50 hertz (Powers Pumps I, II, or III).