

# **SINGLE SPEED SYRINGE PUMP**

**PHM-100**

**USERS MANUAL**

**DOC-083**  
**Rev. 1.6**

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## NOTES

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## CHAPTER 1 | INTRODUCTION

The standard motor speed of the PHM-100 is 3.33 RPM, but other motors are available and can be changed by the user. The PHM-100 pump is activated by a MED-PC<sup>®</sup> 28-volt output and remains on for as long as the output is on. Thus the amount of time that the output is on determines the dose.

An automatic shut-off switch stops the pump motor when the end of the syringe is reached.

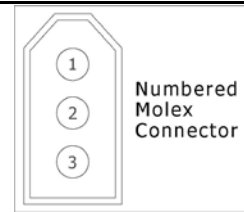
### Hardware Overview

#### MED Control Connector

The pinout of the 3-pin Molex connector is shown in Figure 1.1. Upon receiving an operate signal, the pump will begin the infusion until the operate signal is turned off.

*Figure 1.1 – MED Control Connector Pinout*

Molex Pin #	Function
1	28 Volt Ground
2	Operate
3	+ 28 Volts DC



#### Manual Operate Button

The manual operate button is located below the LED indicator on the side of the pump. The pump motor will operate for as long as this button is held down. See Figure 1.2.

#### LED Indicator

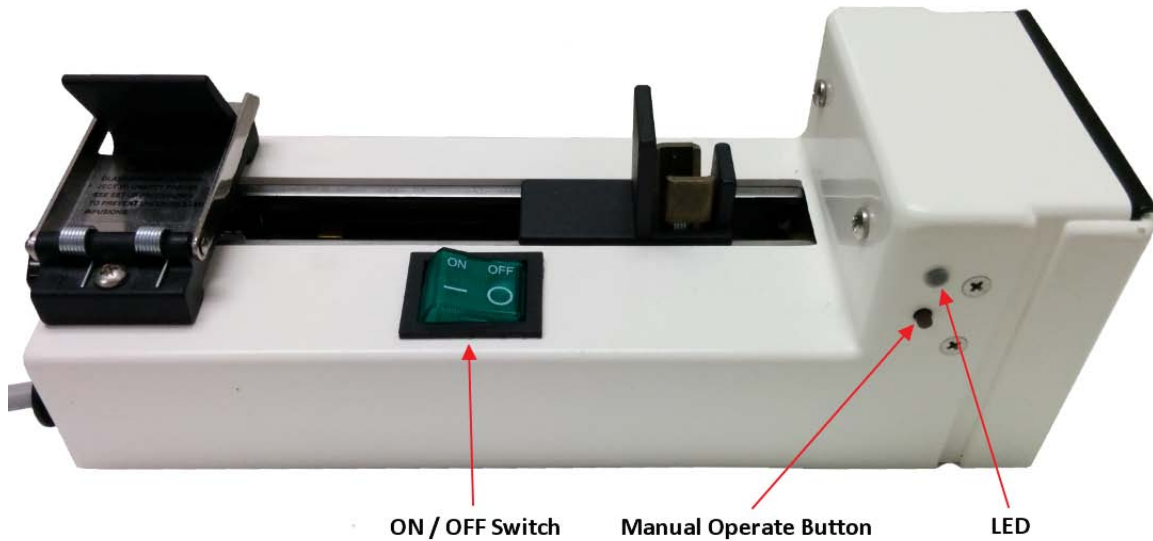
The LED indicator on the side of the pump illuminates red when the pump motor is running. See Figure 1.2.

#### ON/OFF Switch

The green ON/OFF switch is lit up with the pump is switched on and the Automatic Shut-Off Switch is not activated. See Figure 1.2.

*Figure 1.2 – PHM-100 Single Speed Syringe Pump*

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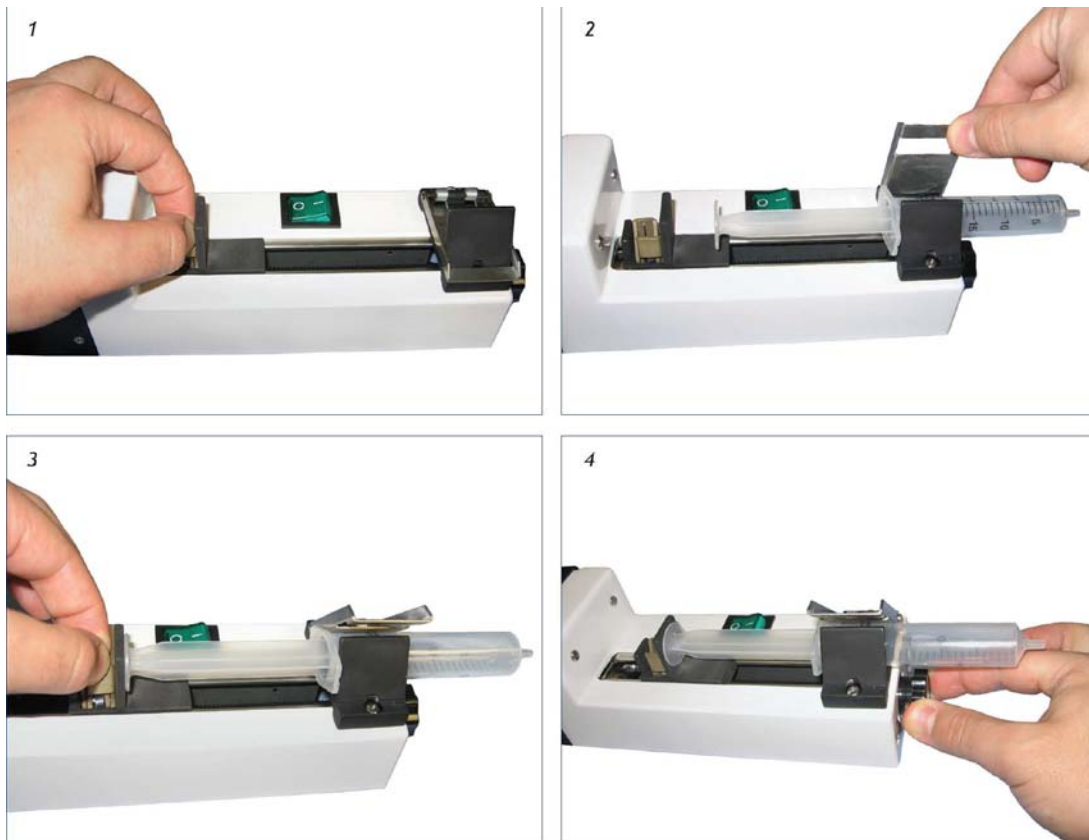
## Wiring Instructions

1. Using the included SG-222 cable, connect the PHM-100 pump to any available **OUTPUT** on a standard MED connection panel.
2. Plug AC cord into 115-volt outlet. (220VAC for PHM-100A)

## CHAPTER 2 | SYRINGE PLACEMENT

Care should be exercised that the hub of the syringe barrel is positioned adjacent to the syringe clamp when loading the syringe pump. If a gap exists between the hub and the clamp, accurate flow rates cannot be assured, as the entire syringe (both barrel and plunger) may move forward. A visual check by observing the plunger move in relation to the barrel by rotating the front knob of the pump is advised. Figure 2.1 shows the procedure for loading a syringe.

*Figure 2.1 – Loading a Syringe*



1. Move the slide to rear (toward motor section) by squeezing the jaws.
2. Insert syringe by lifting clamp cover and placing the syringe body into the clamp.
3. Move the slide to the end of the syringe.
4. Rotate the knob so that the slide makes contact with the plunger and the syringe contacts the clamp.

Once the syringe is installed, operate the pump until liquid drips out of the syringe or tubing. This ensures that fluid will be infused properly when the pump is activated.

## Glass Syringes

Extra caution is needed when using glass syringes with a ground glass plunger. These syringes exhibit almost no sliding friction and thus can cause an uncontrolled infusion in the following two ways:

1. The weight of the plunger may be sufficient to push the fluid out of the syringe if it is positioned with the plunger above the barrel.
2. The weight of the fluid in the tubing may be sufficient to siphon the fluid out of the syringe if the catheter infusion site is below the height of the syringe.

To test for these two conditions, it is suggested that the syringe be connected to the tubing and held vertically at the height of the pump. If no motion occurs, the syringe can then be placed in the pump.

The following may reduce the danger of an uncontrolled infusion:

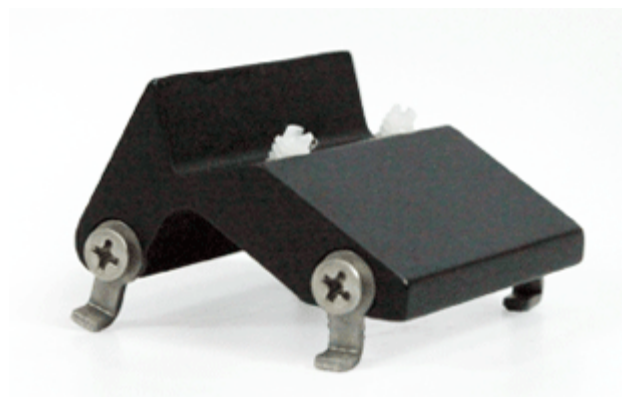
1. Lower the relative height of the infusion pump in relation to the infusion site. With the pump below the infusion site, the instrument will pump the fluid to the higher elevation.
2. Use a smaller bore catheter, which will reduce the weight of the fluid in the tubing and increase the friction on the flowing fluid.
3. Position the pump so that the syringe is vertical (plunger below), thus the weight of the syringe plunger will be acting against the weight of the fluid.
4. Use a syringe with a rubber seal on the plunger, i.e. an O-ring sealed or plastic syringe.

## Small Syringes

Syringes of less than 5mL in capacity can be held more securely in the syringe clamp if the micro syringe insert is used. This insert slides into the standard syringe clamp and can hold up to two micro syringes if required. See Figure 2.2.

*Figure 2.2 – R-ACC Micro Syringe Insert*

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## CHAPTER 3 | DETERMINING THE FLOW RATE

The flow rate of the PHM-100 pump depends on the size of the syringe being used. The tables in Appendix A contain the flow rates that correspond with several commonly used syringe brands and sizes, however the equation shown below can be used to calculate the flow rate. Refer to the charts below for the cross-sectional areas of several commonly used syringes.

The following equation determines the **approximate** flow rate of the pump:

$$\text{Flow Rate (mL/min)} = .19538 \times \text{Motor RPM} \times \text{Syringe Cross Sectional Area (cm}^2\text{)}$$

**NOTE:** If the syringe cross-sectional area is unknown, or in applications where precise control of infusion volume is required, it is recommended that users calibrate each infusion pump using the syringe size of choice. A calibration curve should be created that shows volume output plotted as a function of speed setting. This information can be used to achieve the desired flow rate.

### Syringe Cross-Sectional Areas

MULTIFIT, glass		HAMILTON, glass		UNIMETRICS, glass	
Syringe Size	Cross-section	Syringe Size	Cross-section	Syringe Size	Cross-section
1 mL	0.176 sq cm	10 mL	0.00167 sq cm	.05 mL	0.00833 sq cm
2 mL	0.626 sq cm	25 mL	0.00417 sq cm	.10 mL	0.01667 sq cm
5 mL	1.084 sq cm	.05 mL	0.00833 sq cm	.25 mL	0.04167 sq cm
10 mL	1.692 sq cm	.10 mL	0.01667 sq cm	.50 mL	0.08333 sq cm
20 mL	3.017 sq cm	.25 mL	0.04167 sq cm	1 mL	0.16667 sq cm
30 mL	4.047 sq cm	.50 mL	0.08333 sq cm		
50 mL	6.173 sq cm	1 mL	0.16667 sq cm		
		2.5 mL	0.41667 sq cm		
		5 mL	0.83333 sq cm		
		10 mL	1.6667 sq cm		



<b>MONOJECT, plastic</b>		<b>B-D PLASTIPAK, plastic</b>		<b>TERUMO, plastic</b>	
Syringe Size	Cross-section	Syringe Size	Cross-section	Syringe Size	Cross-section
1 mL	0.173 sq cm	1 mL	0.173 sq cm	3 mL	0.629 sq cm
3 mL	0.622 sq cm	2.5 mL	0.578 sq cm	5 mL	1.327 sq cm
6 mL	1.263 sq cm	5 mL	1.129 sq cm	10 mL	1.961 sq cm
12 mL	1.977 sq cm	10 mL	1.635 sq cm	20 mL	3.189 sq cm
20 mL	3.308 sq cm	20 mL	2.850 sq cm	30 mL	4.191 sq cm
35 mL	4.474 sq cm	30 mL	3.662 sq cm	60 mL	6.651 sq cm
60 mL	5.545 sq cm	60 mL	5.556 sq cm		

## CHAPTER 4 | OPERATING INSTRUCTIONS

1. Load the syringe that will be used for the infusion. Refer to the “Syringe Placement” section of this manual.
2. Switch the On/Off switch to **ON**.
3. The syringe pump may be operated either manually, by pressing the push-button switch located near the connector on the side, or remotely by addressing the appropriate output on the interface.

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**NOTE:** The red light on the front indicates the pump is in operation.

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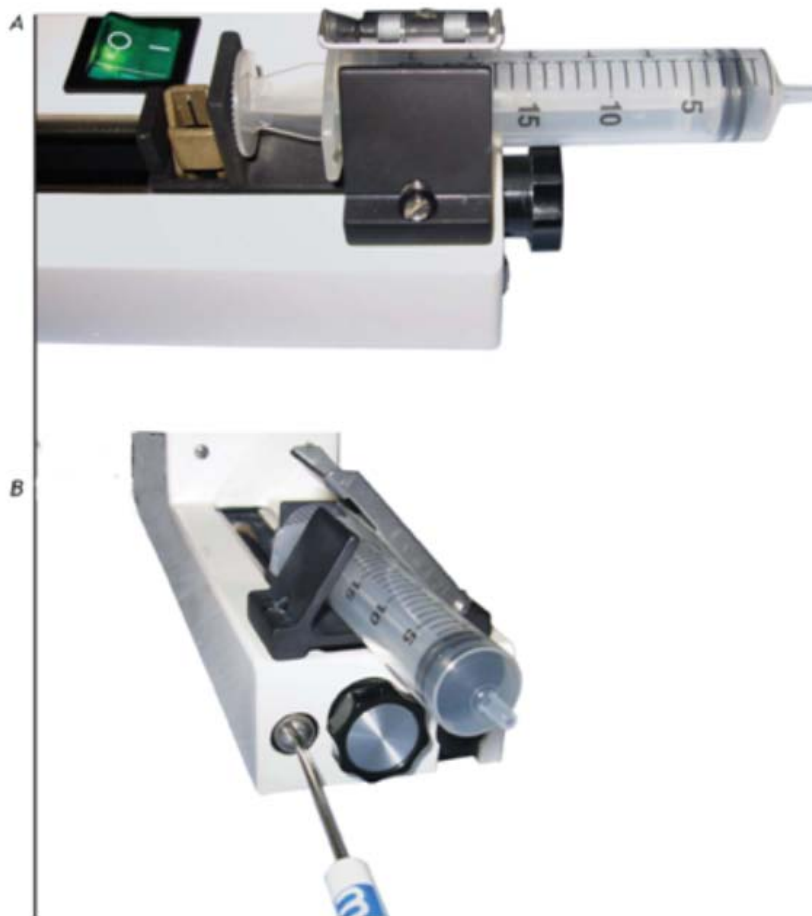
4. If the automatic shut-off switch is activated, the infusion will stop.

## CHAPTER 5 | AUTOMATIC SHUT-OFF SWITCH

The automatic shut-off switch is activated when the pump reaches the end of the syringe, and it causes the pump motor to cease operation and the lighted power switch will disconnect, thus providing a visual indication that the infusion is complete. The automatic shut-off switch uses an internal micro-switch that detects when the slide assembly reaches a certain point. This point is adjustable so that the pump can accommodate various sizes and brands of syringes.

To adjust the automatic shut-off switch, insert an empty syringe with the plunger at the desired shut-off position. Move the slide assembly to the rear of the plunger (Figure 3A). With the pump turned on, rotate the adjustment screw (Figure 3B) until the power light goes out. Turning the screw counterclockwise will allow the pump to operate longer before the automatic shut-off switch activates. Conversely, turning the screw clockwise will cause the automatic shut-off switch to activate sooner. In order to resume pump operation once the automatic shut-off switch has been activated, the slide must be moved back until the switch is deactivated.

*Figure 3 – Automatic Shut-Off Switch Adjustment*



## CHAPTER 6 | MAINTENANCE AND TROUBLESHOOTING

**Cleaning:** Clean the pump case using a soft cloth that is dampened with water and a detergent. The pump case is an ABS plastic.



**DO NOT AUTOCLAVE**



**DO NOT SUBMERGE**

**Lubrication:** A drop of oil on the bearings, and Vaseline or silicone spray on the lead screw is recommended annually.

**Changing Motor:** With the electric plug removed from the outlet, remove the motor cover. Remove the motor by pulling the electrical connector from its mate. The motor is held in position by 2 pins. Replacing the motor is accomplished by reversing the procedure. The front knob is used for aligning the slot in the lead screw with the cross drive on the motor shaft.

**Mechanical:** If the syringe is not emptying, check if the tubing is kinked or if the syringe is bound. Check the pressure capability of the A-1008 slide assembly by either using a pressure gauge or by sealing a 50mL syringe with 50mL of air, and running the pump until the air inside is compressed to 36mL. If the slide is not capable of pushing the syringe, both the lead screw and the slide should be inspected for wear, and any worn part should be replaced.

## APPENDIX A | FLOW RATES

The following tables contain the flow rates in **milliliters per minute** for several commonly used syringe brands and sizes. The most commonly used motor RPM is 3.33, however other speeds have been included in the tables.

**MULTIFIT, glass**

Motor RPM	1 mL	2 mL	5 mL	10 mL	20 mL	30 mL	50 mL
0.50	0.017	0.061	0.106	0.165	0.295	0.395	0.603
1.00	0.034	0.122	0.212	0.331	0.589	0.791	1.206
1.50	0.052	0.184	0.318	0.496	0.884	1.186	1.809
2.00	0.069	0.245	0.424	0.661	1.179	1.581	2.412
3.33	0.115	0.408	0.706	1.102	1.965	2.636	4.02
5.00	0.172	0.612	1.059	1.653	2.947	3.954	6.031
10.00	0.344	1.223	2.118	3.306	5.895	7.907	12.061
15.00	0.516	1.835	3.177	4.959	8.843	11.861	18.092
20.00	0.688	2.446	4.236	6.612	11.789	15.814	24.122

**B-D PLASTIPAK, plastic**

Motor RPM	10 mL	20 mL	30 mL	50-60 mL
0.50	0.160	0.278	0.358	0.542
1.00	0.320	0.557	0.715	1.084
1.50	0.480	0.835	1.073	1.626
2.00	0.640	1.114	1.431	2.169
3.33	1.066	1.856	2.385	3.614
5.00	1.600	2.784	3.577	5.421
10.00	3.198	5.895	7.155	10.843
15.00	4.798	8.353	10.732	16.264
20.00	6.397	11.137	14.310	21.686

**MONOJECT, plastic**

Motor RPM	12 mL	20 mL	35 mL	50-60 mL
0.50	0.193	0.323	0.437	0.542
1.00	0.386	0.646	0.874	1.084
1.50	0.579	0.969	1.311	1.626
2.00	0.773	1.292	1.748	2.169
3.33	1.288	2.154	2.914	3.614
5.00	1.931	3.231	4.371	5.421
10.00	3.863	6.462	8.741	10.843
15.00	5.794	9.694	13.112	16.264
20.00	7.726	12.925	17.483	21.686

## APPENDIX B | CONTACT INFORMATION

Please contact MED Associates, Inc. for information regarding any of our products.

Visit our website at [www.med-associates.com](http://www.med-associates.com) for contact information.

For technical questions, email [support@med-associates.com](mailto:support@med-associates.com).