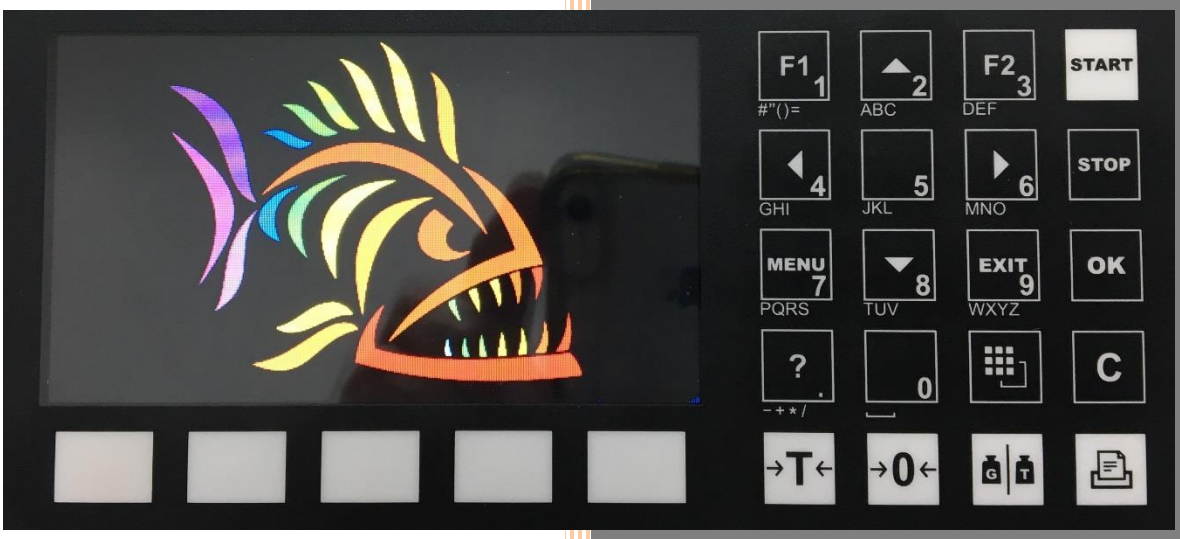
HemiTor Precision Pump System

HemiTor Operating Manual



Piranha Color Systems

3531 Thomas Rd.

Santa Clara, Ca 95054

www.HemiTorPump.com

HemiTor™ Pump System

Single Use, Pulse Free

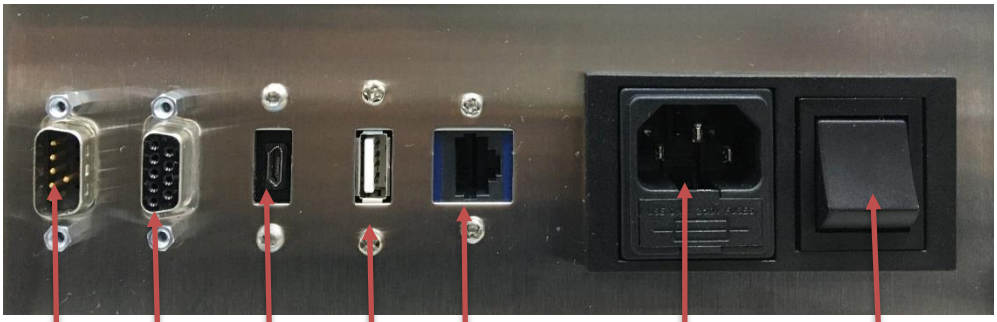
A Positive Displacement, Single Use, Full Vacuum pump head for use in any circulated fluid application where pulsation needs to be minimized and prevention of cross-contamination of pumped fluids is critical.

Is your fluid path sensitive to pulsation or cross-contamination? Many UF/DF (ultrafiltration/diafiltration), culture media, and bioreactor perfusion applications are sensitive to the pulsation from peristaltic pumps. Even at low RPM, peristaltic pump operation can lead to undesirable foaming, bubbles, and cell shear.

The HemiTor™ pump system is a groundbreaking new product for the manufacturing and bioprocess lab that enables a completely integrated, disposable flow-path, liquid handling system that is pulse-free, spallation-free, and single-use. Bags, filters, and tubing assemblies can now be self-driven, pre-sterilized, and completely disposable. For the first time, an affordable, completely single-use fluid path is within reach for your tangential flow, mixing, or bioreactor system!

The HemiTor™ pump system replaces the conventional peristaltic pump head for almost every pump application.

Back panel



RJ45
Ethernet Port

110VAC in

Power Switch

USB

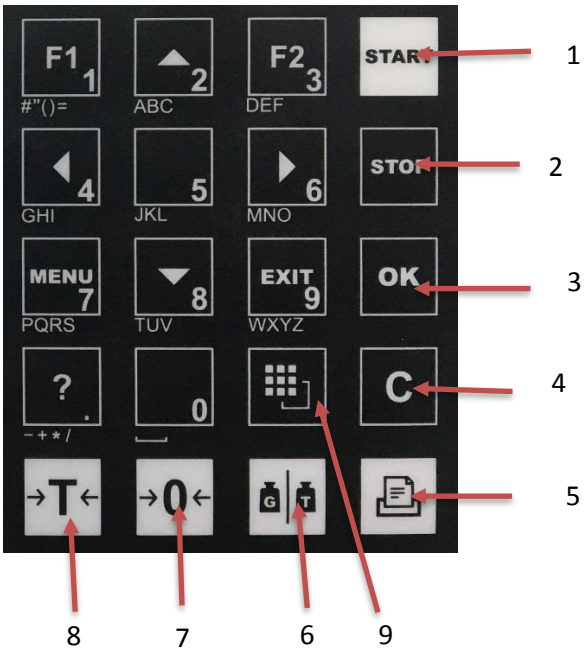
Com port for
Flow Sensor

USB-C for
programming only.
Factory use only.

Com port for
Scale

Getting Started

HemiTor Scale



	Functions
1	Start
2	Stop
3	OK
4	Clear
5	Print
6	Gross Weight / Tare
7	Zero
8	Tare
9	Input: Alpha/Num/var

Overview

Thank you for using Piranha's ***HemiTor Precision Pump*** for your important applications. The HemiTor Precision Pump System delivers ***Precision, Versatility and Efficiency.***

Piranha Color Systems proudly introduces the revolutionary HemiTor Precision Pump System. It is a positive displacement fluid pump for precise dispensing of varying viscosity liquids as well as for critical Life Sciences applications. The innovative pump system utilizes a novel single-use cassette with internal dampening for precise fluid delivery and engineered for ease of use.

The ***HemiTor Precision Pump*** can be used for many different fluid transfer applications. The basic functions are as follows:

- Accurately Dispenses by weight and volume
- Continuous Flow Rate mode
- Timed Flow Rate/Dispense mode
- Simple / universal tubing size
- Fluid Flow Pulse Dampening – Input and Output
- Unique software, easy to update for different customer requirements

Features

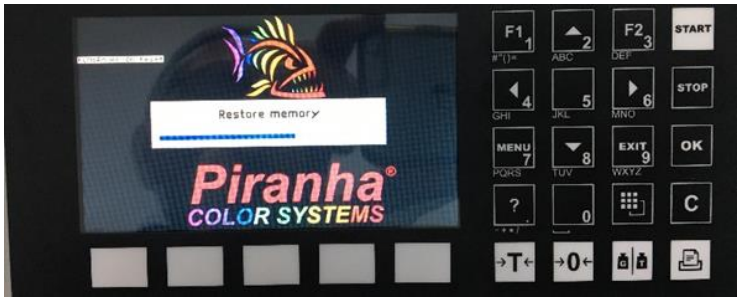
- The HemiTor Patented Single-Use cassette features internal pulse dampening, minimizing product shear
- Fully programmable and customizable, advanced controller with ethernet, USB and serial port connectivity.
- RPM operating range from 1 – 1500 RPM
- Max. operating pressure 30 PSI
- Capable of pumping low to mid viscosity liquids
- Pump delivery flow rates from 0.025 mL/min to 4 L/min
- Easy to install, Single-Use pump cassette isolates the fluid path, eliminates cross contamination and dampens pulsation.

User instructions

Scale Calibration

Turn on power switch on back of pump.

Wait for pump controller to start. Screen will show system booting.

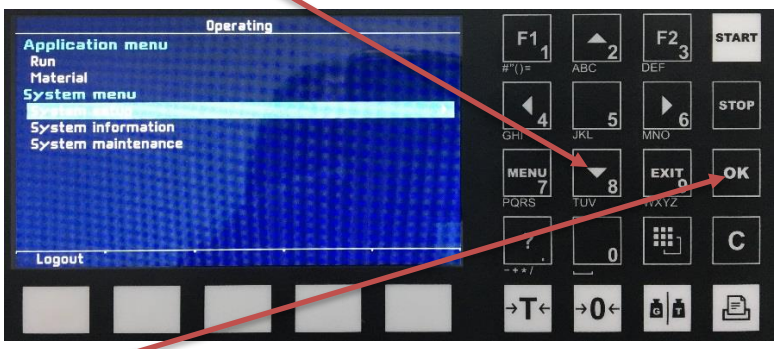


To set and calibrate scale (make sure scale is connected)

Press ***Login***:

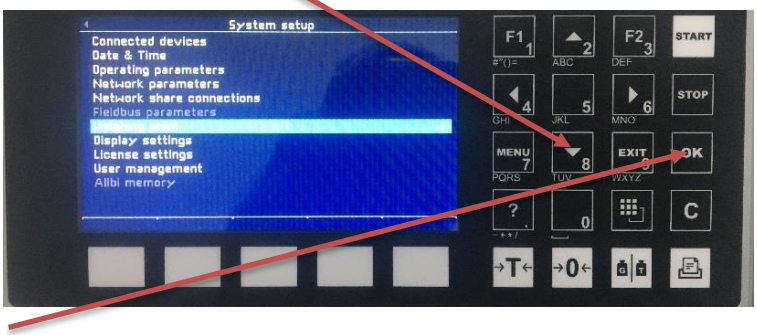
Operating screen will appear

Scroll down to ***System Setup***



Press **OK**

Scroll down to ***Weighing Point***

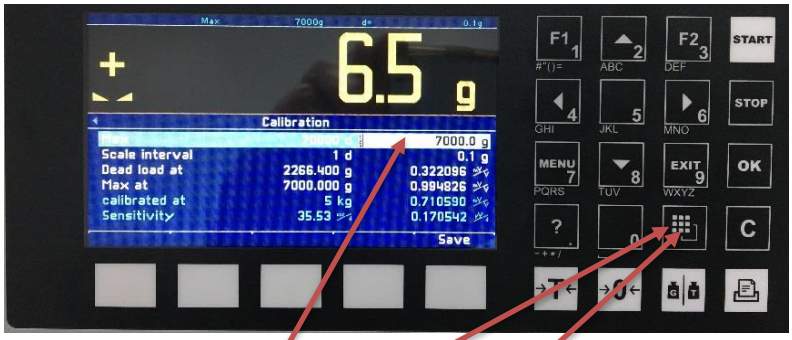


Press **OK**

Press ***Calib***

Press ***Modify***

Set ***Max weight***:

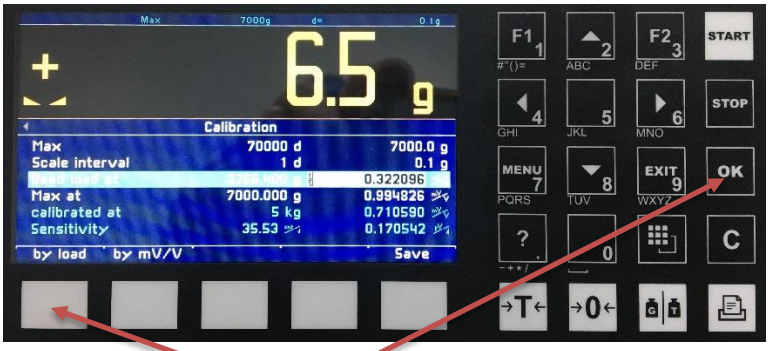


Press this key (alpha/num/sym) once to set **Max d**
enter *7000.0*
Press **OK**
Press Twice to set **Units**.
Set to **g** (grams)
Press **OK**

Set ***Scale Interval***:

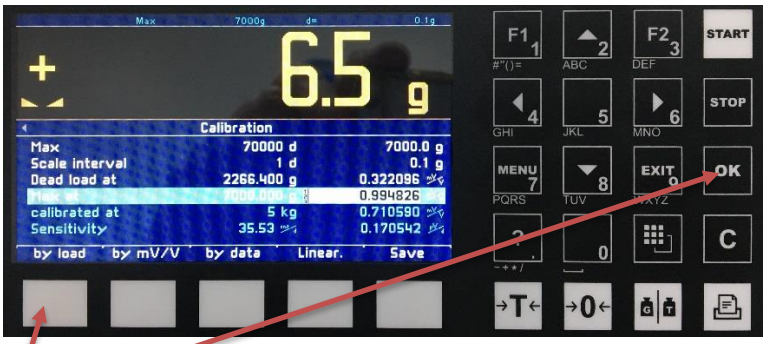
Press **OK**
Scroll to 0.1g Press **OK**

Set ***Dead Load at***:



Press ***by Load,*** Press **OK**

Set **Max at**:



Press ***by Load*** Press **OK**

Follow on screen instructions

place 5 kg weight on scale

enter weight number (e.g. 5kg)

press **OK**

Remove weight and return to case.

Press ***Save***

The pump and scale have now been calibrated.

Operating Modes

Turn on power:

Controller will boot up, login screen will appear:

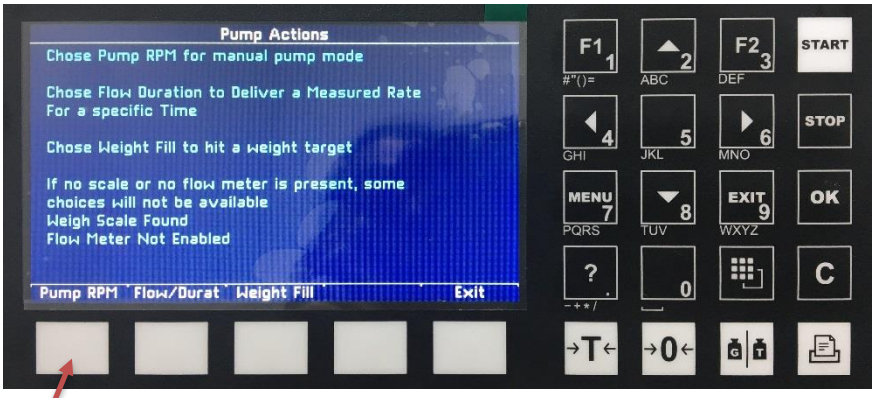
Press ***Login:***

Pump Actions

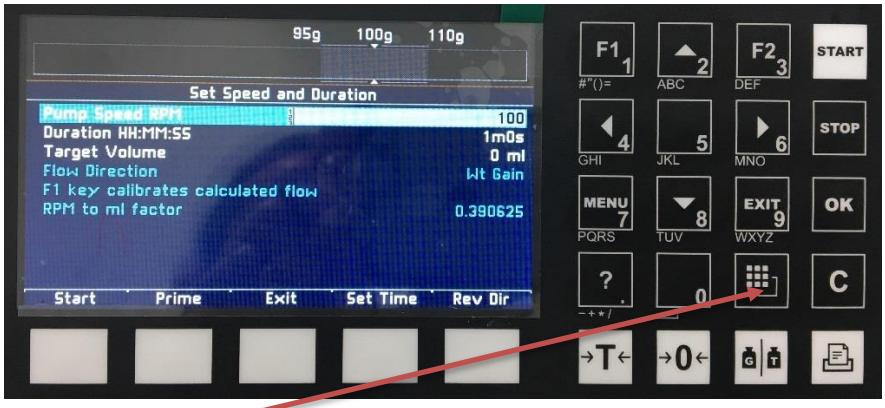
Pump RPM for manual pump mode

Flow Duration for a measured rate for a specific time

Weight Fill for dispensing to a specific weight target



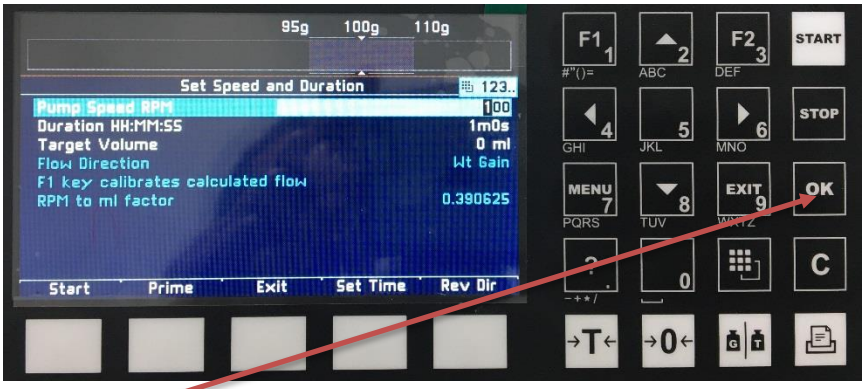
Pump RPM: Press



Set ***Pump speed RPM***:

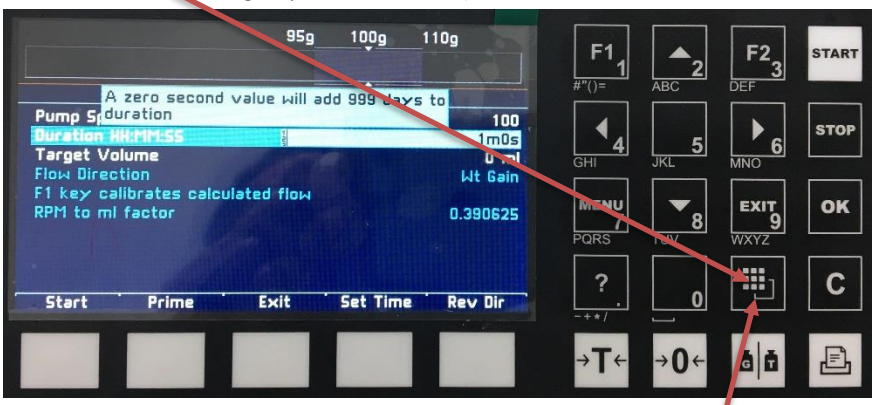
Press to set input to ***123***

Enter desired pump RPM



Press **OK** when done

Press to enter duration (change input format to ***123***)



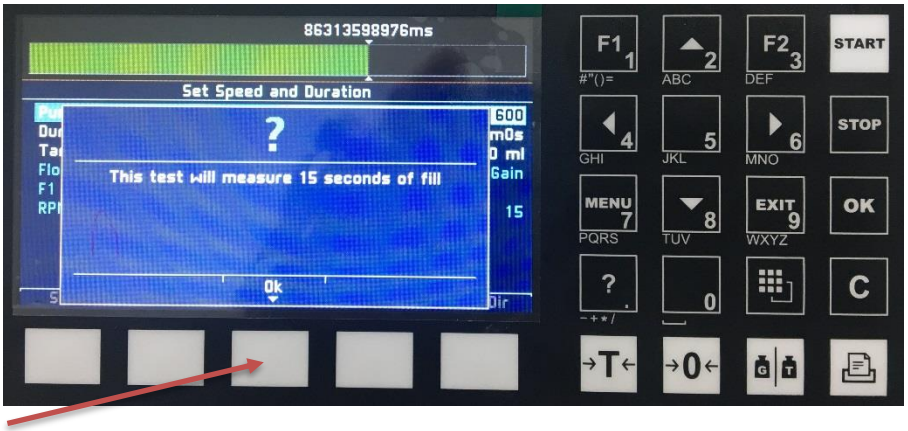
Entering 0 will add 999 days to duration. Enter a number then press again for ***abc,*** enter time increment, s, m, or d (e.g 1m15s)

Press **OK**

Target Volume (note: a flow rate must be calibrated)

To ***Calibrate Flow Rate*** (Scale must be connected to calibrate flow rate)

Press F1 key: test will measure 15 second fill time

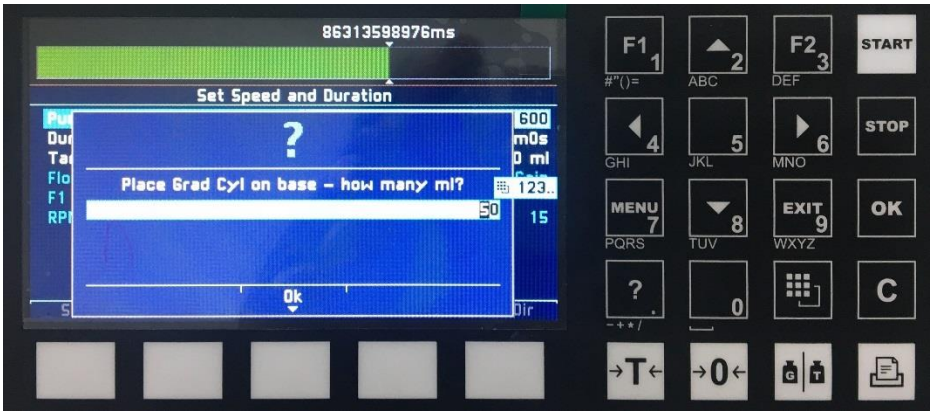


Press **OK**

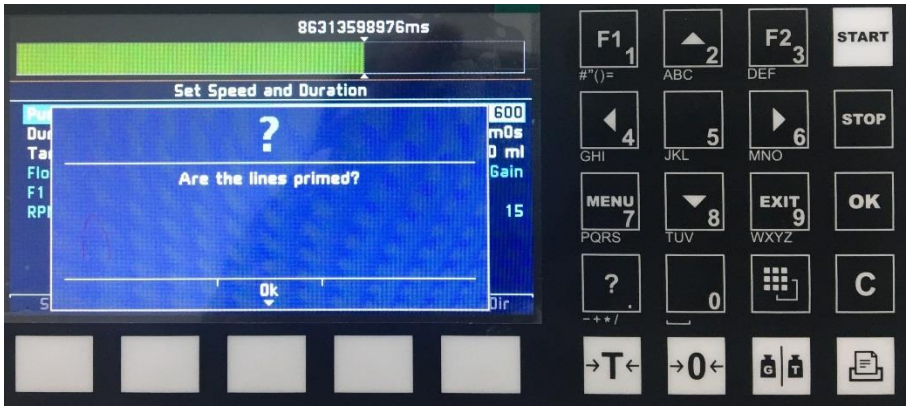
Enter desired speed (RPM) for test

Press **OK**

Place graduated cylinder beneath the filling nozzle, DO NOT let the nozzle touch the graduated cylinder.

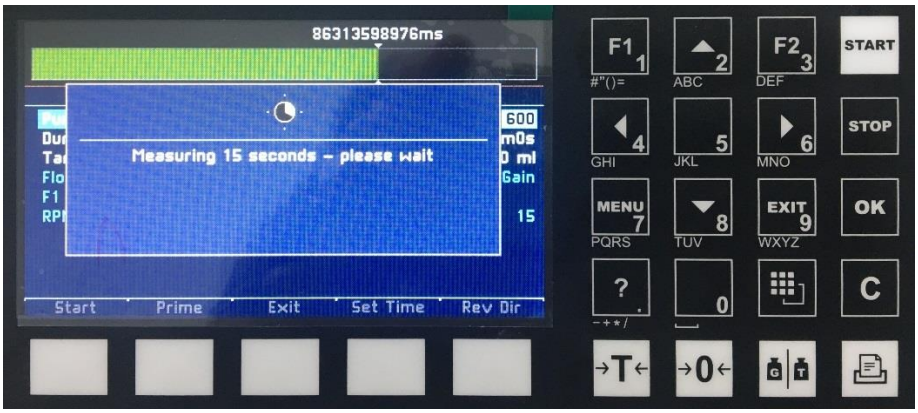


Enter target volume (in mL). Press **OK** when done



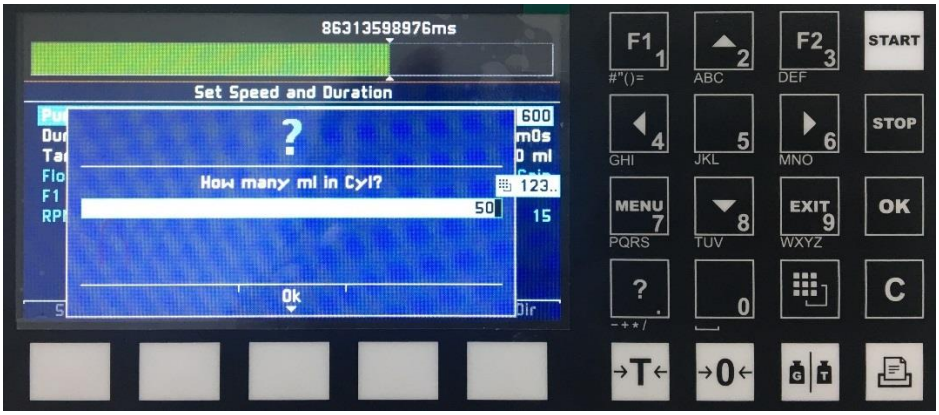
Are Lines Primed? Press **OK**

Pump will run for 15 seconds



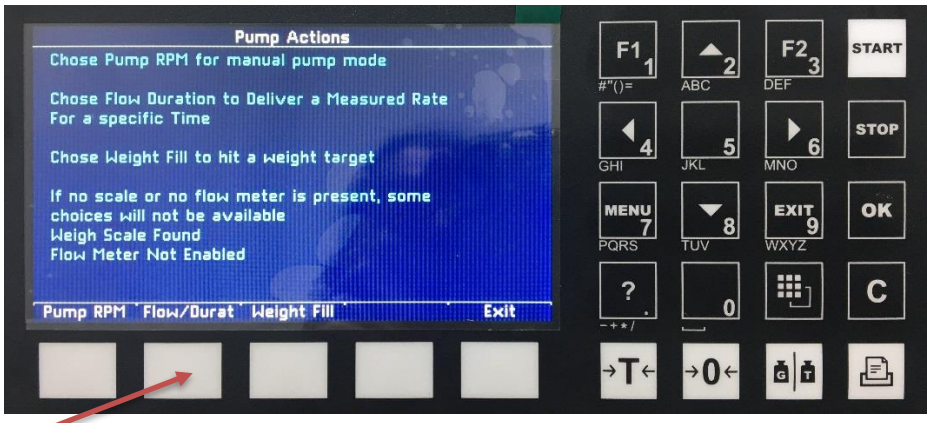
Pump will stop after 15 seconds. Observe volume dispensed into graduated cylinder.

Enter **Volume dispensed (mL)**



Press **OK.** Flow Rate has now been calculated. Target Volume feature can now be used

Flow/Duration:



Press

To ***Set Flow and Duration***

Enter ***Desired Flow Rate***

Enter ***Duration*** , Enter ***Start RPM***

Press ***Prime***

Pump will stop after priming.

Press ***Start***

Pump will run for the designated time period, targeting desired flow rate.

Pump will automatically change its RPM to target desired flow rate over the desired duration, starting at user defined **Start RPM.**

Weight Fill

Enter material (choose from selections on screen), press **OK**

Enter **Target Weight**, press **OK**

Enter **Bulk RPM** (pump speed for filling), press **OK**

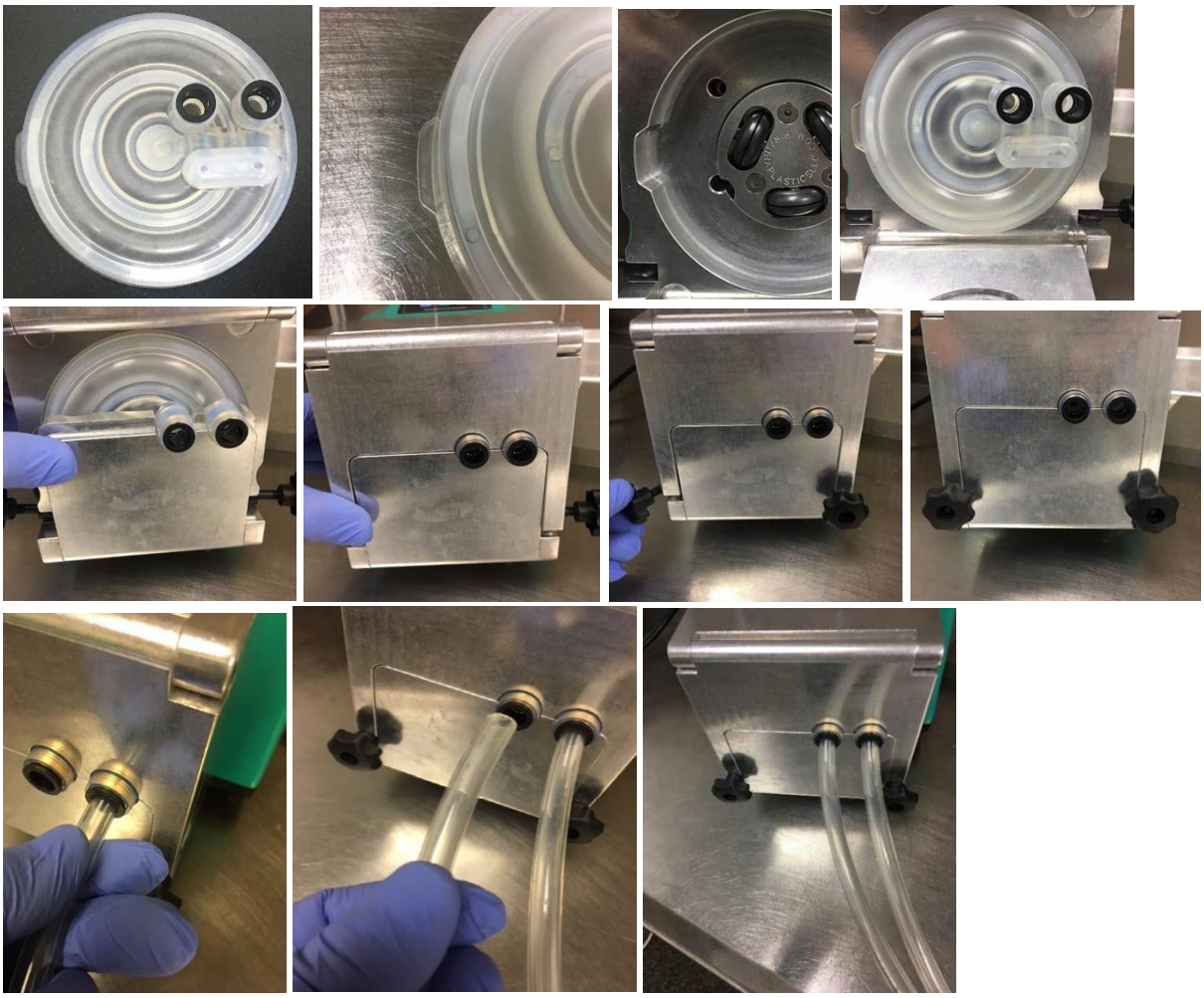
Enter **Bulk to Fine** (how far from target for pump to slow from bulk rpm to fine rpm), press **OK**

Enter **Fine RPM** (pump speed for delivering fine amounts / slow fill) Press **OK**

Enter Target ***Overshoot*** to stop pump

Check Flow Direction, Press ***Start***. Pump will stop after dispensing User defined amount.

HemiTor Pump Cassette Installation



Technical References

Liquid Densities

Alcohol ethyl	25°C	785.06 kg/m³
Alcohol methyl	25°C	786.51 kg/m³
Alcohol propyl	25°C	799.96 kg/m³
Automobile oils	15°C	910 kg/m³
Brine	15°C	1230 kg/m³
Coconut Oil	15°C	924.27 kg/m³
Cream light		1012 kg/m³
Cream heavy		994 kg/m³
Crude Oil, Texas	60F	873 kg/m³
Diesel fuel oil (20-60)	15°C	885 kg/m³
Fruit Juice		1060 kg/m³
Gasoline vehicle	60F	737.22 kg/m³
Glycerin	25°C	1259.37 kg/m³
Sea Water	25°C	1025.18 kg/m³
Sugar solution 68 brix	15°C	1338 kg/m³
Syrup maple		1320 kg/m³
Water Pure	4°C	1000 kg/m³

Material Viscosity (Higher viscosity = higher pressure)

Air	18°C	0.0182 cP
Water	20°C	1.002 cP
Olive Oil	20°C	84 cP
Pancake Syrup	20°C	2500 cP
Honey	20°C	10000 cP
Peanut Butter	20°C	250000 cP

Formulas

Force F = ma where m = mass, a = acceleration

Density ρ=m/V where m = mass, V = volume

Conversion Table for Force Units

mN	mg-force	mp
0.1	10	10.20
0.2	20	20.39
0.3	30	30.59
0.4	40	40.79
0.5	50	50.99
0.6	60	61.18
0.7	70	71.38
0.8	80	81.58
0.9	90	91.77
1	100	101.97
2	200	203.94
3	300	305.92
4	400	407.89
5	500	509.86
6	600	611.83
7	700	713.8
8	800	815.78
9	900	917.75

1N = 1 Newton = 1 kg m/s²
1p = 1 Pond

Conversion Factors

Units of force	Newton (SI unit)	Dyne	kilogram-force, kilopond	pound-force	poundal
1 N	≡ 1 kg·m/s²	= 10^5 dyn	≈ 0.10197 kp	≈ 0.22481 lbf	≈ 7.2330 pdl
1 dyn	= 10^{-5} N	≡ 1 g·cm/s²	≈ 1.0197 × 10^{-6} kp	≈ 2.2481 × 10^{-6} lbf	≈ 7.2330 × 10^{-5} pdl
1 kp	= 9.80665 N	= 980665 dyn	≡ g_n · (1 kg)	≈ 2.2046 lbf	≈ 70.932 pdl
1 lbf	≈ 4.448222 N	≈ 444822 dyn	≈ 0.45359 kp	≡ g_n · (1 lb)	≈ 32.174 pdl
1 pdl	≈ 0.138255 N	≈ 13825 dyn	≈ 0.014098 kp	≈ 0.031081 lbf	≡ 1 lb·ft/s²

The value of g_n as used in the official definition of the kilogram-force is used here for all gravitational units.

Standard prefixes for the metric units of measure

Multiples

Prefix name		deca	hecto	kilo	mega	giga	tera	peta	exa	zetta	yotta
Prefix symbol		da	h	k	M	G	T	P	E	Z	Y
Factor	10^0	10^1	10^2	10^3	10^6	10^9	10^{12}	10^{15}	10^{18}	10^{21}	10^{24}

Submultiples

Prefix name		deci	centi	milli	micro	nano	pico	femto	atto	zepto	yocto
Prefix symbol		d	c	m	µ	n	p	f	a	z	y
Factor	10^0	10^{-1}	10^{-2}	10^{-3}	10^{-6}	10^{-9}	10^{-12}	10^{-15}	10^{-18}	10^{-21}	10^{-24}