



Installation and Operation Manual



V21 Series Peristaltic Chemical Feed Pump

December 20, 2023

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1.0 - System Overview

The V21 Chemical Feed Pump consists of a controller, motor, gearbox and peristaltic pump.



1.1 Safety

In the interests of safety, this pump and the tubing selected should only be used by competent, suitably trained personnel after they have read and understood this manual, and considered any hazard involved. Any person who is involved in the installation or maintenance of this equipment should be fully competent to carry out the work.

Maintenance and repair should be performed by qualified personnel only. Make sure that no voltage is applied while work is being carried out on the pump or motor. The motor must be secured against accidental start up.

1.2 Receiving

Inspect all cartons for damage, which may have occurred during shipping. Carefully unpack equipment and inspect thoroughly for damage or shortage. Report any damage to carrier and/or shortages to supplier. All major components and connections should be examined for damage and tightness, with special attention given to PC boards, plugs, knobs and switches.

1.3 Customer Modification

Flomotion Systems, Inc., its sales representatives and distributors, welcome the opportunity to assist our customers in applying our products. Many customizing options are available to aid in this function. Flomotion Systems, Inc. cannot assume responsibility for any modifications not authorized by its engineering department.

1.4 Information for Returning Pumps

Equipment that has been contaminated with, or exposed to, body fluids, toxic chemicals or any other substance hazardous to health must be decontaminated before it is returned to Flomotion Systems or its distributor.

Please contact Flomotion Systems for a Return Authorization number and instructions for returning the pump.

1.5 Warranty

Flomotion Systems, Inc. warrants all Flomotion Systems pumps against any defects that are due to faulty material or workmanship for a period of two years from date of shipment. In the event that a defect is discovered during the warranty period, Flomotion Systems, Inc. agrees that, at its option, it will repair or replace the defective product. Any product repaired or replaced under this warranty will be warranted only for the remainder of the original product warranty period. This warranty does not apply to consumable components of a product such as, but not limited to, hose, tubing, rollers, and fuses.

Contact Flomotion Systems, Inc. or your distributor to initiate warranty support. Products may not be returned without authorization from Flomotion Systems, Inc. All returns shall be freight prepaid.

Limitations

This warranty does not cover:

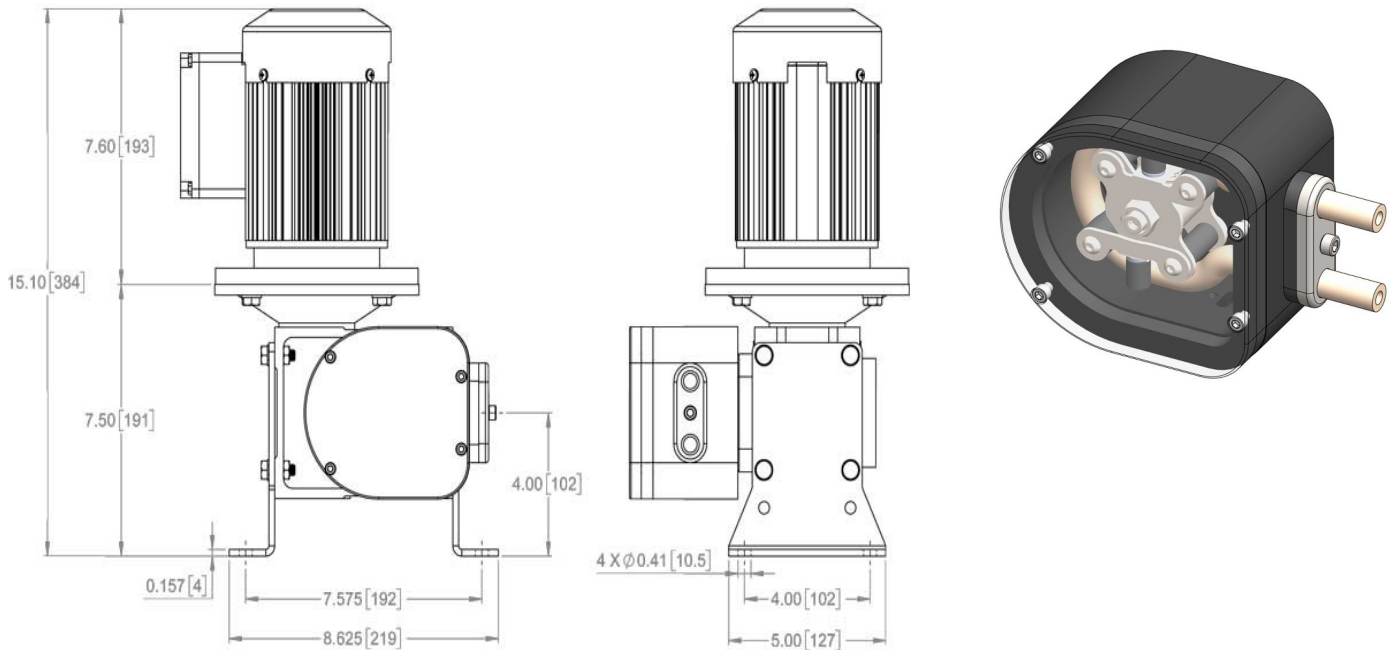
- Damage caused by acts of God, natural disaster, labor unrest, acts of war (declared or undeclared), terrorism, civil strife, acts of any governmental jurisdiction or any other cause beyond the seller's control
- Damage caused by misuse, neglect, accident or improper application or installation
- Damage caused by any repair or attempted repair not authorized by Flomotion Systems, Inc.
- Any product not used in accordance with the instructions furnished by Flomotion Systems, Inc.
- Any product not paid in full in agreed upon terms.
- Modifications performed on this product by person(s) not authorized by Flomotion Systems, Inc.
- Freight charges to return merchandise to Flomotion Systems, Inc.
- Freight charges on expedited or express shipment of warranted parts or product
- Travel fees associated with on-site warranty repair

This warranty contains the sole express warranty made by Flomotion Systems, Inc. in connection with its products. All implied warranties, including with limitation, the warranties of merchantability and fitness for a particular purpose, are expressly disclaimed.

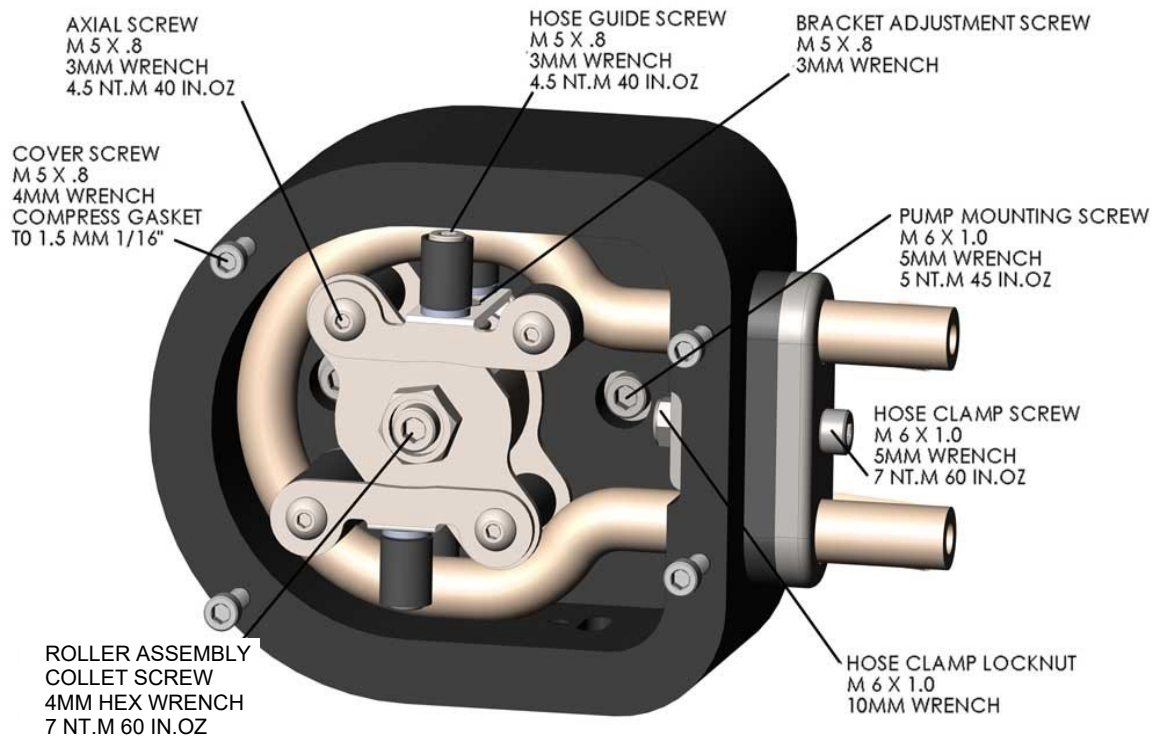
Some states within the United States do not allow the disclaimer of implied warranties and if this is true in your state the above limitation may not apply to you. This warranty gives you specific rights, and you may also have other rights that vary from state to state.

This warranty constitutes the final, complete, and exclusive statement of warranty terms and no person is authorized to make any other warranties or representations on behalf of Flomotion Systems, Inc.

2.0 – V21 Series Pump and Pumphead



The V21 Series pumphead has two spring-loaded working rollers, which automatically compensate for minor variations in tubing wall thickness, giving extended tube life.



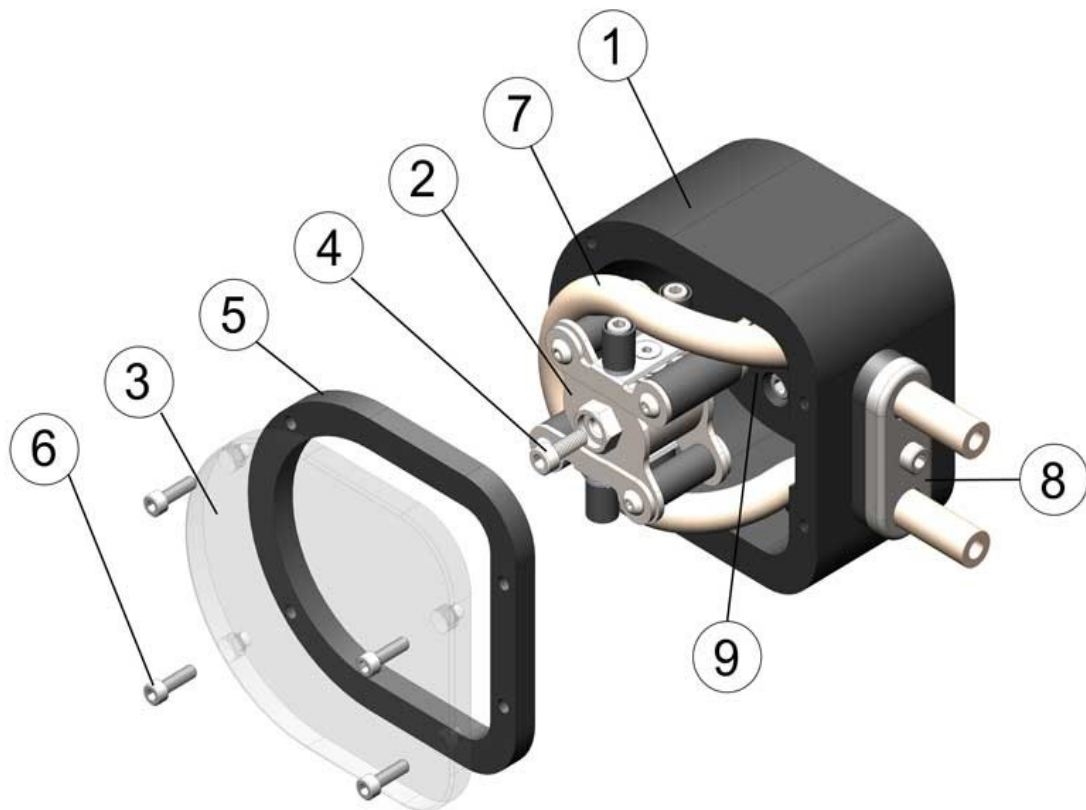
IMPORTANT: The V21 Series is equipped with a pump cover for safety and protection against chemical spills. The cover must be installed whenever the pump is in use.

2.1 Tubing, Spindle and Cover Installation

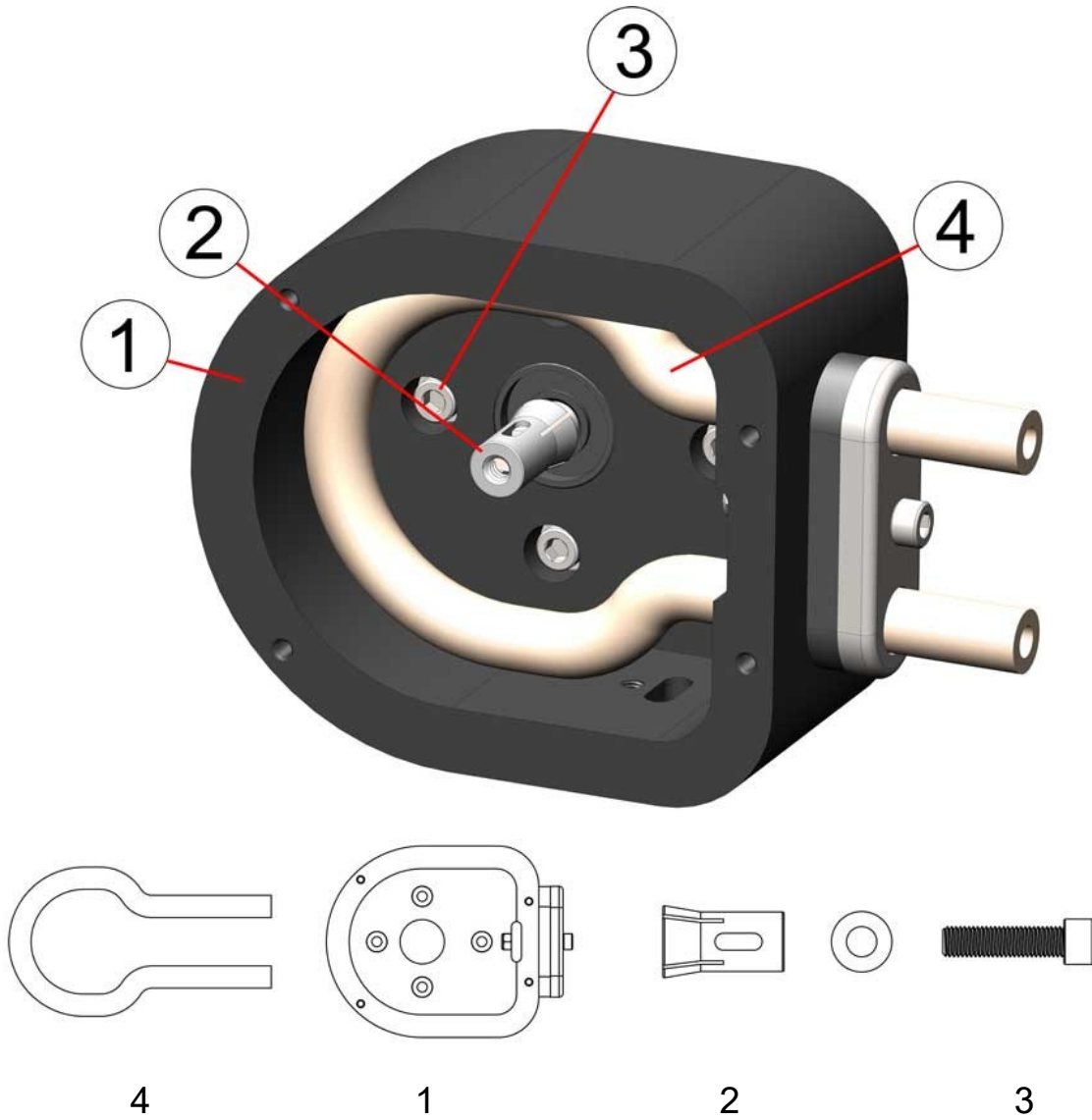
! IMPORTANT: Disconnect pump controller from power supply BEFORE changing tubing!

Item No.	Qty	Part No.	Description
1	1	PHSS-R	Pump Housing, Rear
2	1	RA-01	Roller Assembly
3	1	PHC01	Cover
4	1	100324	Collet Screw
5	1	100305C	Cover Gasket
6	4	100307C	Cover Screw
7	1	n/a	Tube
8	1	Varies with tubing selection*	Tube Seal
9	1	Shaft Seal 10x28x7	Shaft Seal

*Tube Seal PN	TS16	TS32	TS48	TS64	TS80	TS96
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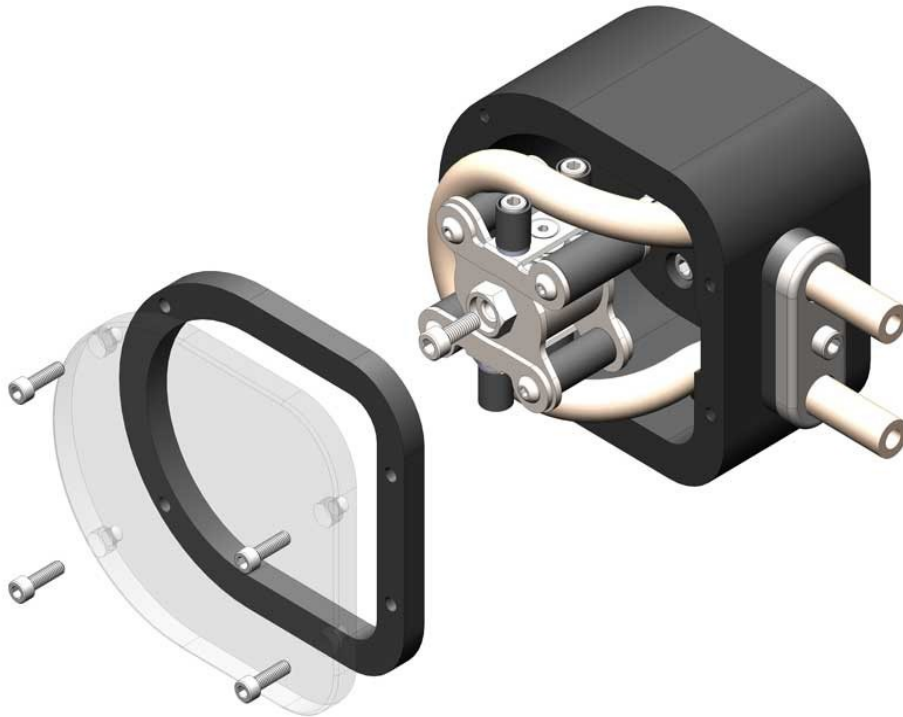
2.2 Mounting Pump on Gearbox, Installation of Collet



Item No.	Qty	Part No.	Description
1	1	PHSS-R	Pump Housing, rear
2	1	100306	Collet
3	2	100330	Pump Mounting Screws
4	1	NA	Tubing

2.3 Pump Mounting and Collet Installation Procedure

1. To install the pump housing on the gearbox, slide it over the central pilot on the gearbox adapter plate. Next install and torque the mounting screws to 5 NT.M (45 in. oz).
2. Next install the collet on the gearbox shaft. There is a slot in the collet that the flat drive tang on the gearbox shaft must slide into. Orient the collet to allow the drive tang to slide into the slot and push the collet completely onto the gearbox shaft. When the collet bottoms out it is in the correct position.



Tubing is shown bent forward out of the pump housing to illustrate the correct tubing and roller assembly position, prior to sliding the tubing and roller assembly into the housing and over the collet.

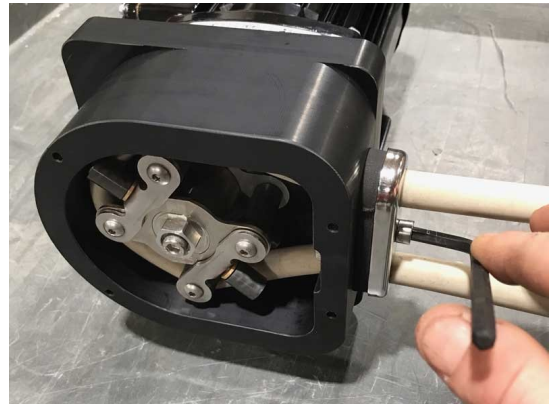
***! IMPORTANT: Disconnect pump controller from power supply BEFORE changing tubing!
! IMPORTANT Make sure pump suction and discharge lines are completely drained and isolated. Note that the tubing hose seal size must match the selected tubing size.***

Disassembly

1. Remove four (4) 4mm pump cover screws.



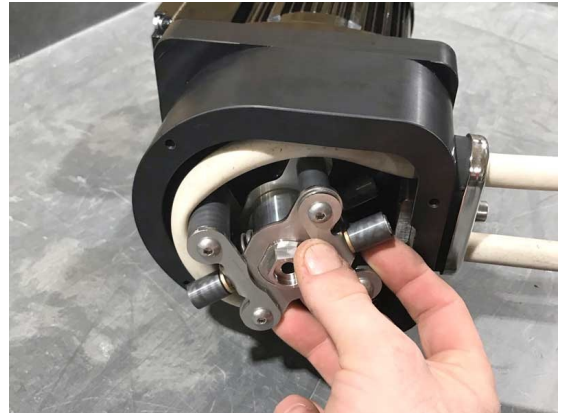
2. Loosen Tube Seal Clamp Screw with 5mm hex wrench.



3. Remove 5mm collet screw.



4. Remove the roller assembly.



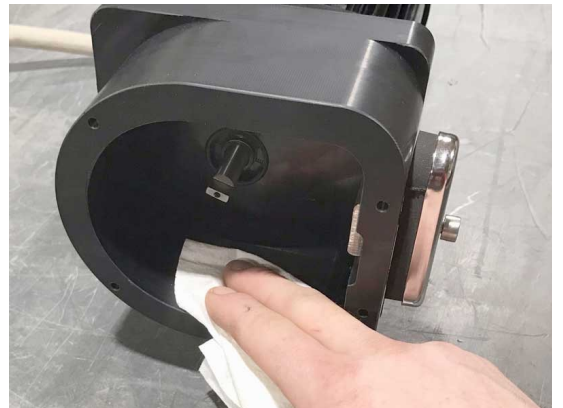
5. Remove worn pump tubing from pumphead.



6. Remove and inspect collet for wear. Note that the collet may remain in the roller assembly when the roller assembly is removed from the pump shaft.



7. Clean inside of pump housing with damp rag or an appropriate cleaning solution to remove any chemical or tubing residue.



Reassembly

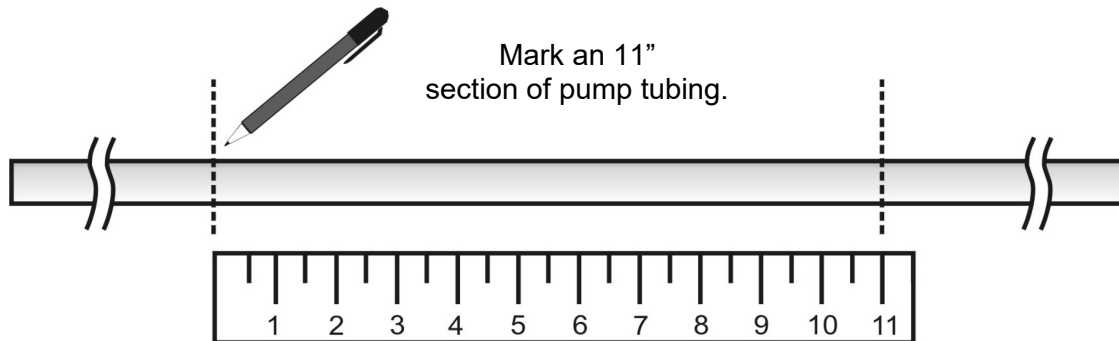
1. Reinstall the collet onto the pump shaft.

! IMPORTANT: There is a slot in the collet that the flat drive tang on the gearbox shaft must slide into.

Orient the collet to allow the drive tang to slide into the slot and push the collet completely onto the gearbox shaft. When the collet bottoms out it is in the correct position.



2. Mark an 11" section of tubing, which will be the portion, contained within the pump. Leave sufficient excess on the suction and discharge sides of the pump for the desired connections. If you leave the excess intake tubing in a coil near the pump it will make it easy to feed a new section of tubing through the rollers when the section in the pump becomes worn.



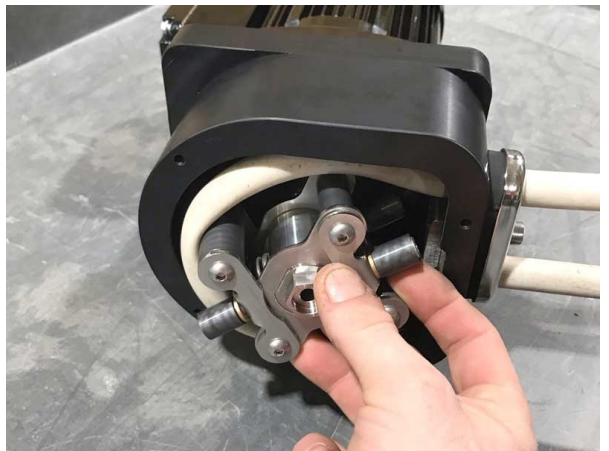
3. Install tubing into the pumphead.

Note: during tubing installation the loop of tubing may develop a twist. Examine the tubing for this condition and if needed turn one end of the tubing where it exits the tubing clamp to eliminate the twist. Correctly adjusted the tubing loop will be flat and parallel to the front face of the pump housing.

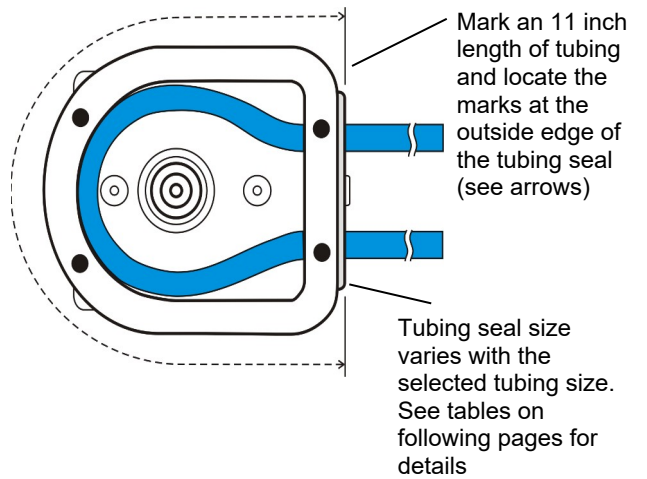




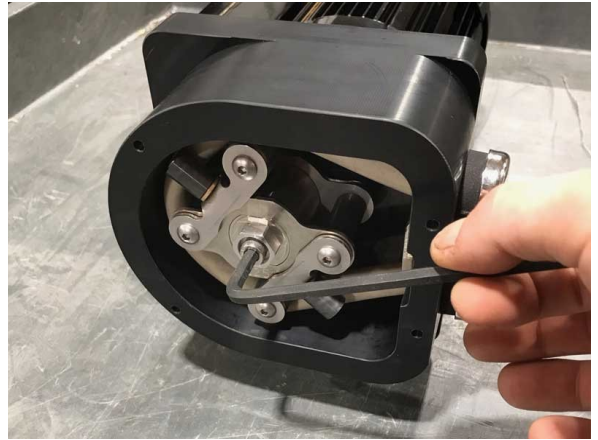
4. Loop tubing around roller assembly between guides as shown. Remove slack in tubing while rotating roller assembly and sliding onto collet.



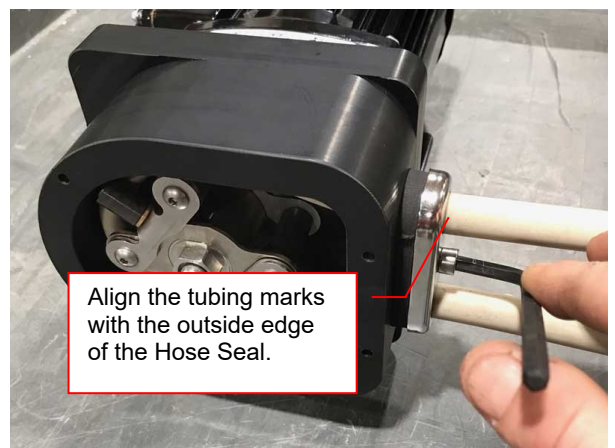
5. Align marks on tubing with outside edge of the tubing Clamp.



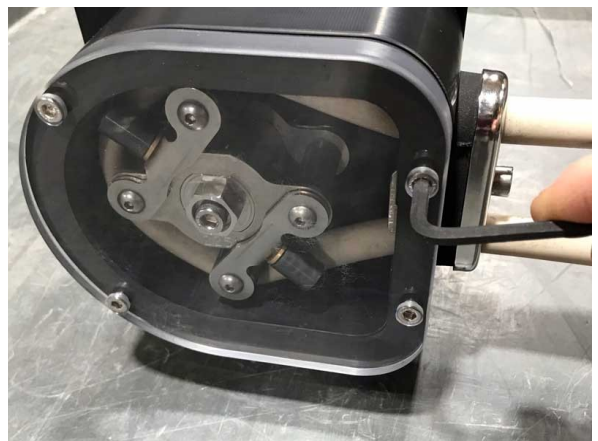
6. Reinstall collet screw firmly.



7. **! IMPORTANT Tighten tubing seal clamp screw. Be sure to tighten firmly to prevent “tubing walk.” Tubing walk can occur when the tubing seal is the wrong size or is not sufficiently tight to keep the rollers from pulling the tubing through the pump as it rotates.**

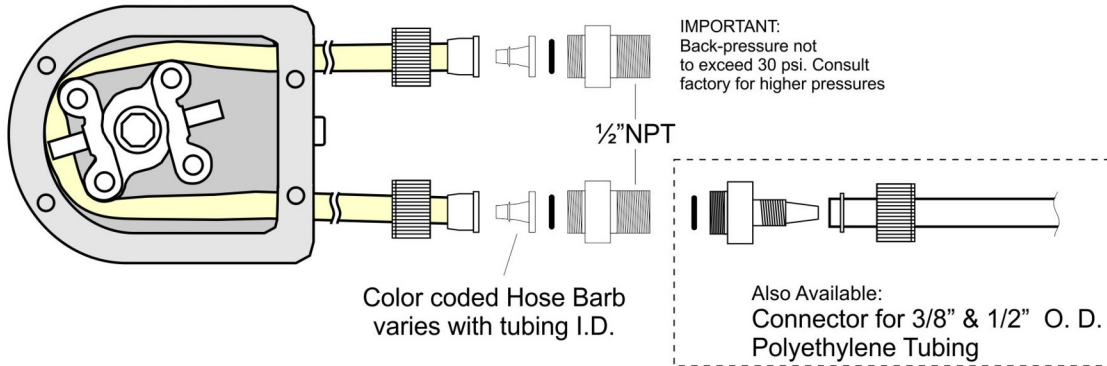


8. Inspect pump cover gasket. Replace if damaged. Reinstall pump cover gasket and cover.



2.5 Tubing & Connections

Tubing connectors are available for many configurations. See the drawing below for details.



V21 SERIES ESTIMATED PUMPING CAPACITY*						RPM Range: 1.5 - 240
Tubing Size	1.6mm bore (1/16")	3.2mm bore (1/8")	4.8mm bore (3/16")	6.4mm bore (1/4")	8mm bore (5/16")	9.6mm bore (3/8")
Max Pressure (psi)	100	100	80	60	30	30
ml/rev	0.4	1.7	4.1	6.5	10.8	13.6
Flow Range (GPH)	0.01 - 1.5 (0.6 - 96 ml/m)	0.03 - 6.5 (1.9 - 408 ml/m)	0.09 - 15.6 (5.7 - 984 ml/m)	0.2 - 24.7 (12.6 - 1560 ml/m)	0.2 - 41.1 (12.6 - 2,592 ml/m)	0.3 - 51.7 (18.9 - 3,262 ml/m)
Continuous Duty Up To:	0.6 (40 ml/m)	2.7 (170 ml/m)	6.5 (410 ml/m)	10.3 (650 ml/m)	17.1 (1,080 ml/m)	21.6 (1,360 ml/m)
Medium Duty Up To:	1.1 (70 ml/m)	4.7 (297 ml/m)	11.4 (719 ml/m)	18.0 (1,136 ml/m)	30.0 (1,893 ml/m)	37.7 (2,378 ml/m)
Light Duty Up To:	1.5 (96 ml/m)	6.5 (408 ml/m)	15.6 (984 ml/m)	24.7 (1,560 ml/m)	41.1 (2,592 ml/m)	51.7 (3,262 ml/m)
Hose Barb - PVC Color / PN	Black HBC16P	Gray HBC32P	White HBC48P	Black HBC64P	Gray HBC80P	White HBC96P
Hose Barb - PTFE Color / PN	White HBC16T	White HBC32T	White HBC48T	White HBC64T	White HBC80T	White HBC96T
Tube Seal PN	TS16	TS32	TS48	TS64	TS80	TS96
Pump Tubing FLOPRENE	FLO16N	FLO32N	FLO48N	FLO64N	FLO80N	FLO96N
Pump Tubing VITON	VIT16	VIT32	VIT48	VIT64	VIT80	VIT96

*Recommended Use for Optimal Performance

Continuous Duty Cycle: 24/7/365 100rpm max. Run time- No limit continuous max speed.
 Medium Duty Cycle: 12/7/365 175rpm max. Run time- 6 hour continuous max speed/twice per day.
 Light Duty Cycle: 1/7/365 240rpm max. Run time- 1 hour continuous max speed/once per day.
 Note: Above outputs based on water at no back pressure. Actual flow rates may vary.

3.0 – V21 Series Gearbox

3.1 Run-in Period

The maximum efficiency of worm reducers is obtained after a “Run-In” period. The length of time required will depend on the load applied and may be two to four hours at rated load and will be considerably longer at lighter loads. During Run-In a slightly higher than normal current and temperatures along with lower efficiency and output torque can be expected. The gear box is sealed and does not require additional lubrication.

3.2 V21 Series Motor Wiring

- Motor Type: Permanent Split Capacitor or 3-Phase Inverter Duty
- Rotation: Reversible.
- Insulation: Class B minimum
- Finish: Powder-coat gloss black.



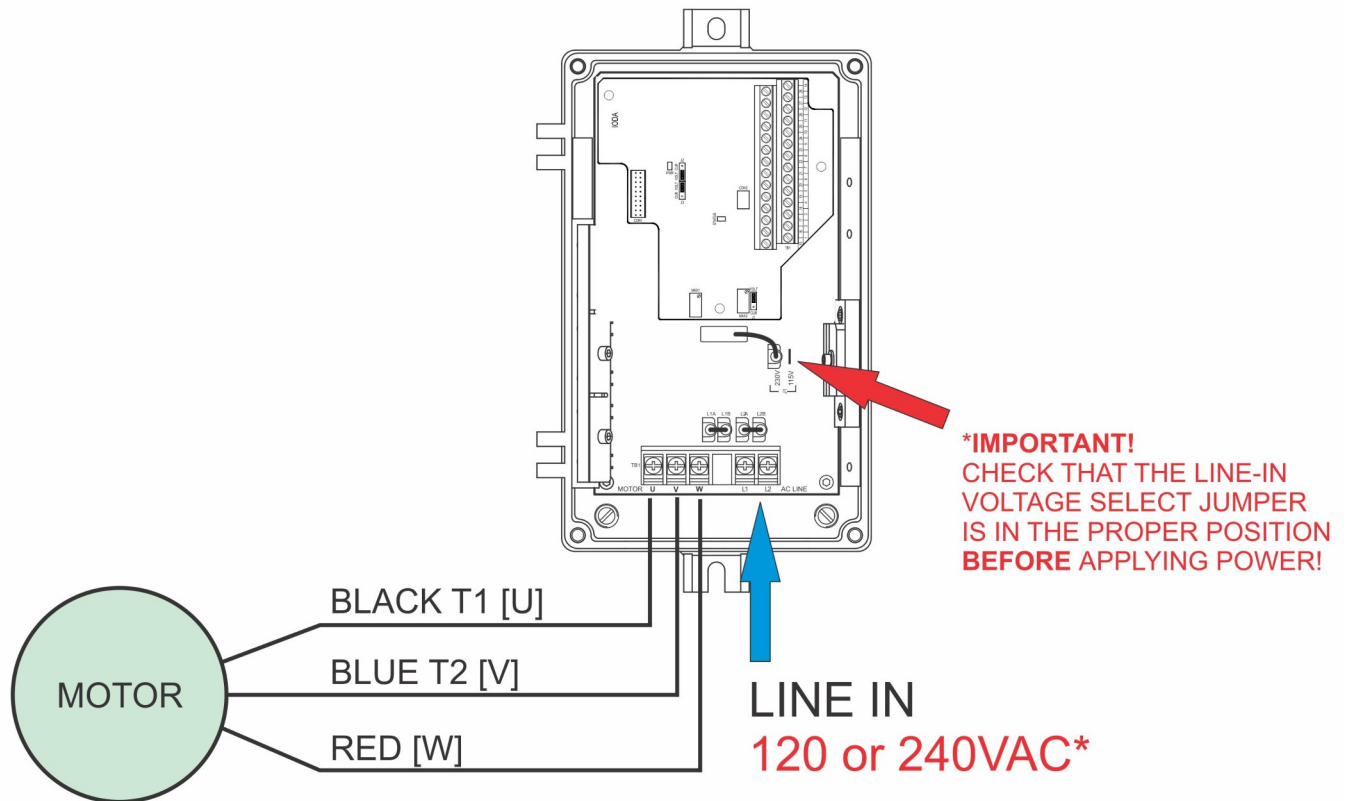
4.0 – K4 Pump Controller

CAUTION!

The K4 VFD Controller has been tested and configured using 120VAC line power and may not be configured for your line voltage.

CHECK THE POSITION OF THE LINE VOLTAGE SELECT JUMPER ON THE MAIN BOARD PRIOR TO APPLYING POWER! Failure to do so may cause permanent damage to the VFD.

K4 Drive/Controller



4.1 Operation and Wiring

For complete details about the motor drive controller please refer to the included K4 SERIES Operating Instructions booklet.

IMPORTANT: Make sure the Mains voltage jumper is in the correct location for the supplied voltage. See the K4 drive operating instructions booklet for details.

Shown here are program settings specific to the operation with the V21 Peristaltic Pump.

4.2 Making Programming Changes

1. Press the Stop key to make sure the pump is stopped. Display will read Stop.
2. Press the Program key.
3. Using the arrow keys, enter the parameter number you would like to change and then press Enter.
4. Using the Arrow keys, enter the desired settings.
5. Press the Program key when all changes have been made.
6. Press the Run key for pump operation.

4.3 K4 Programming Defaults

MENU VALUE	DEFAULT SETTING	DESCRIPTION
0.01	Varies	Set to the motor nameplate rating in Amps . Factory Setting is the drive rated output current.
0.04	0000	GFCI Operation . Set to 0000 if power to VFD is not connected to a GFCI (default). Set to 0001 (standard GFCI) or 0002 for a sensitive GFCI.
1.00	0001	Remote Start/Stop input enabled when using 4-20mA speed control (CHANGE TO 0000 to use 4-20 with manual start/stop)
1.05	0003	Automatically restarts the pump after a power fail or when a fault is cleared (except a short circuit fault).
2.00	0003	Use an analog 4-20mA signal to control pump speed . Uses Analog Input #2 on pins 21(+) and 22(-) of the terminal strip.
2.01	0001	Initiate a manual speed change immediately w/o having to press the Enter key.
2.02	0002	Enable External Local/Remote switching
3.02	80 Hz	Upper Frequency Limit is the max speed for manual control and also corresponds to the 20mA value when using Analog Input speed control. Adjust this value down to control dosing. Consult factory prior to increasing above default value. See the Draw Down/Calibration procedure on following pages to help set this value
3.03	5 sec	Acceleration Speed . Number of seconds to go from stop to set speed.
3.04	5 sec	Deceleration Speed . Number of seconds to go from set speed to stop.
3.10	7 sec	Current Limit trip time in seconds. Increase value a little at a time for situations where current draw briefly exceeds rated motor value while pumping. Example: when pumping into higher pressures or with viscous liquids.
4.00	0002	Display preference . Set to 0000 to display speed in Hz. Set to 0002 to use custom units (GPH).
4.01	Varies	When using GPH setting in 4.00 enter the whole number of your maximum GPH here (GPH at full speed of pump). Example: If full speed GPH is 25.5GPH enter 255 here. Set the decimal place in 4.02 below.
4.02	Varies	When using GPH setting in 4.00 enter the number of decimal places for the value in 4.01 above. Example: If full speed GPH is 25.5GPH enter 255 in step 4.01 above then enter 0001 here so value displayed will be 25.5.
4.03	0001	Determines what is displayed when in Stop Mode : 0000 = last run setting, 0001 = "STOP" (Default), 0002 = "0000".
5.00	0000	Main board RUN relay operation . Set to 0000 to enable relay closure when pump is running. See K4 manual for other choices.
7.03	0010	N.O. Start Start/Stop Input . Terminals 16 & 4 default.

7.04	0013	N.O. Remote/Local Select Input . Terminals 5 & 20 default.
7.05	0008	N.O. Enables External Fault Input . Terminals 7 & 8 default.
8.01	0010	N.O. Fault Status Output . Terminals 24 & 25 default.
8.02	0013	N.O. Remote Status Output . Terminals 26 & 27 default.
8.09	0000	Analog Output type . Set to 0002 When speed feedback 4-20ma output is connected. Use pins pins 17(+) and 18(-)
9.07	20	Analog Input Offset . Set to 20 to scale input to 4-20mA.

4.4 Calibration Procedure for Maximum Pump Output in GPH

A 30-second graduated calibration cylinder should be used to perform a draw-down of actual chemical and including typical system injection pressure to establish the maximum pump output during normal operating conditions.

Using the pump to fill the cylinder, make sure the K4 Drive/VFD is set to the highest possible speed using the 'up' arrow on the keypad. Since there is a short ramp-up time for the pump to reach maximum speed, it is recommended to over-fill the calibration cylinder for higher accuracy. After filling the calibration column, make sure the appropriate valves are open to allow the pump to draw from the calibration column only.

4.5 Draw Down Procedure:

At the same time start the pump and the stop watch. If you slightly over-filled the calibration cylinder, start the pump and then start the watch when the chemical reaches the "0" point on the calibration cylinder.

Once the stopwatch reaches 30 seconds stop the pump.

Review the graduated markings on the calibration cylinder to find out how much liquid was pumped in 30 seconds.

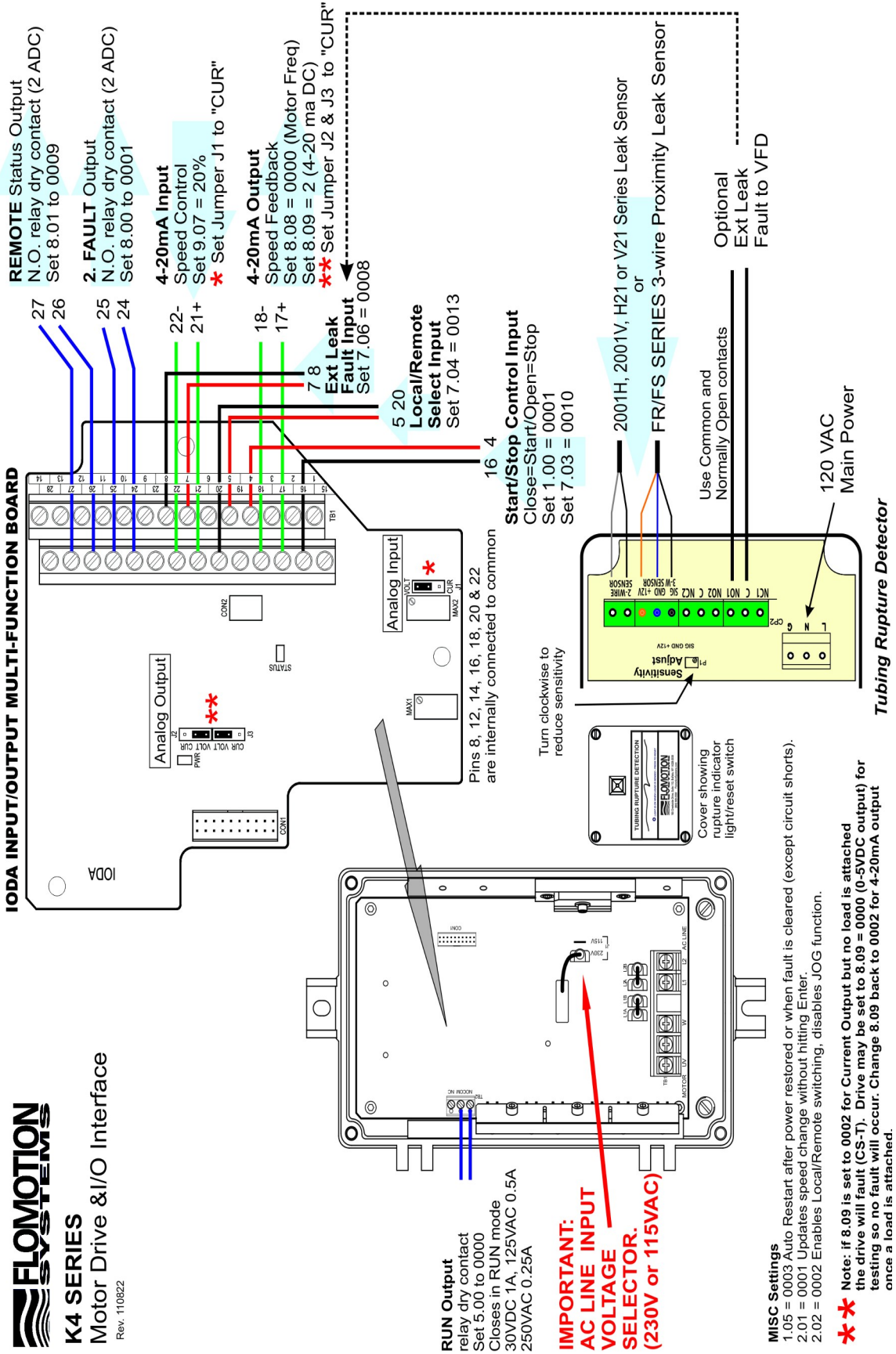
See menu settings 4.00 through 4.03 above for setting the GPH value to be displayed.

The full K4 SERIES Drive Operating & Programming manual may be downloaded from our web site at www.flomotionsystems.com/support

4.6 Important Program Settings for Special Conditions

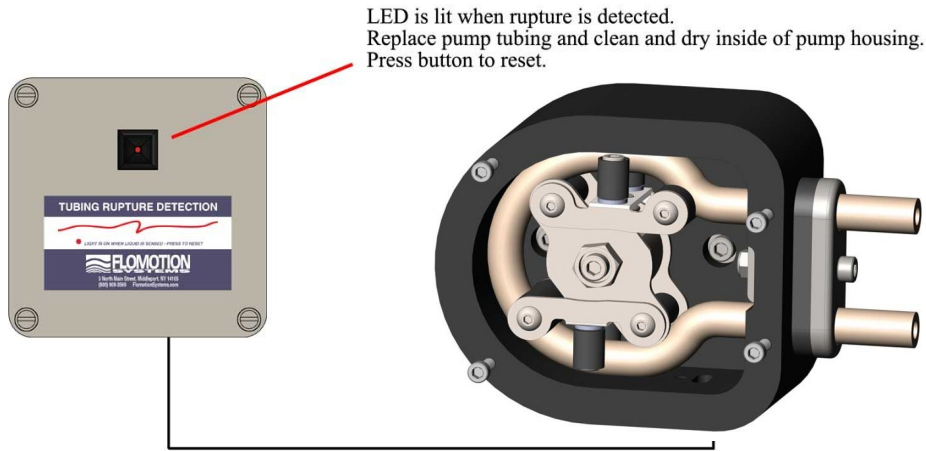
- **CS-T Fault**
Set 8.09 = 0000 to avoid CS-T fault when 4-20mA Output is disconnected (when not using 4-20mA output). This sets the analog output to voltage instead of current which stops the error.
- **Manual speed control with remote start/stop**
set 2.00 to 0000 (keypad speed control)
- **Pump powers back up in manual mode when using auto-restart after power failure**
Set 7.04 to 0000 if using auto-restart after power failure or else it powers back on in manual mode and does not restart running.
- **For remote (4-20ma) speed control with keypad start/stop**
Set 1.00 to 0000
- **Large hose pumps struggle to start at low speed**
Increase Boost Value in menu 3.11 one number at a time until startup is achieved
- **Remote Start/Stop not working.**
Make sure menu 7.00, 7.01, 7.02 and 7.06 are set to defaults (0, 1, 2 & 4)
7.00 = 0000
7.01 = 0001
7.02 = 0002
7.06 = 0004
- **GFCI trips when pump starts running**
Set menu 0.04 = 0001 for typical GFCI or to 0002 for extra sensitive GFCI
(some additional noise from the drive is normal)

4.7 Controller Wiring Examples



5.0 - Tubing Rupture Detector

Rupture Detector System Overview



5.1 Alarm Causes

A rupture alarm is triggered by the presence of a conductive fluid in the pump. When the fluid bridges the two stainless steel electrodes in the LIQUID SENSOR in the pump the alarm is triggered.

5.2 What to do in an alarm condition

To clear the alarm, first stop the pump and disconnect power from the pump controller. Remove the pump cover and remove the ruptured pump tubing. Clean the inside of the pump with a soft rag. Remove any liquid or tubing debris from the inside of the pump and the area around the LIQUID SENSOR. Inspect rollers and clean if necessary.

5.3 Resuming Service

Install a fresh tubing insert and the pump is ready to resume service.

5.4 Resetting the alarm

Press the pushbutton (Red LED leak indicator and reset switch) on the front of the Tubing Rupture Detector to reset the alarm.

! IMPORTANT: Resetting the Tubing Rupture Detector will cause the pump to resume turning !
! ALWAYS reinstall the pump cover BEFORE resetting the tubing rupture detector !

***The full Tubing Rupture Detector manual is online at
www.FlomotionSystems.com/support***

6.0 Troubleshooting Guide

Pump does not power up.

No Power to the pump.

Verify the pump is plugged into a powered receptacle and the electrical circuit breaker is in the "ON" position.
Verify the motor and drive power connections for proper wiring.

Pump/Roller Assembly does not rotate.

Roller Assembly was reinstalled incorrectly.

Verify that the roller assembly collet is properly installed/seated and secured on the motor shaft.

Low output capacity

Bad roller adjustment.

Readjust the rollers.

Air leak at the inlet of the pump.

Check the tightness of the tubing connectors at the inlet piping.

Valve closed or partly closed at inlet.

Fully open the valve.

Excess wear of the tubing.

Replace with correct tubing size.

Excess wear of rollers.

Replace with roller assembly spare parts kit, #RK-01.

Product too viscous or pump speed too high compared to the product viscosity.

Ask for advice from your FLOMOTION distributor.

Piping blocked or partly blocked at inlet.

Unblock piping at inlet and make sure there is good flow of the product.

Tubing life is too short.

Incompatibility of the tubing with the pumped product.

Contact your FLOMOTION distributor to verify compatibility.

Discharge pressure and temperature too high.

Verify the discharge pressure and temperature do not exceed the maximum ratings of the pump tubing.

Verify the outlet piping is not blocked up and that all appropriate valves are fully opened.

Check that the pressure relief valve is properly working.

Pump speed too high.

Reduce the pump speed.

Bad roller adjustment.

Check the adjustment.

7.0 Recommended Spare Parts

Select correct size from Page 15.

- Pump Tubing.
- Hose Barb and Collar (2 per pump).
- Tube Seal
- Roller Assembly Spare Parts Kit. #RK-01.