



4001V/VE Series
Peristaltic Chemical Feed Pump

Installation and Operation Manual

4001V/VE Series Peristaltic Chemical Feed Pump

August 10, 2010

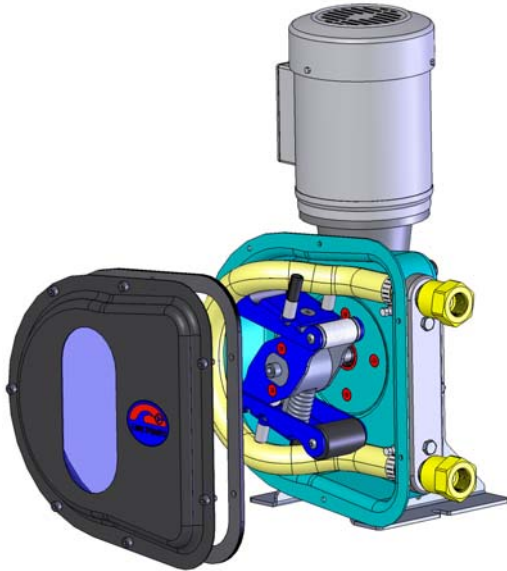
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TABLE OF CONTENTS

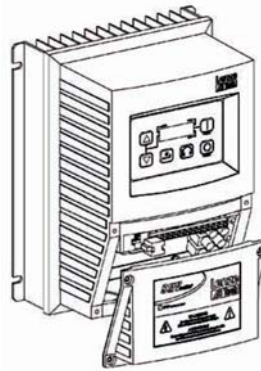
- 1.0 - SYSTEM OVERVIEW 4**
 - 1.1 SAFETY 4
 - 1.2 WARRANTY..... 4
 - 1.3 RECEIVING 5
 - 1.4 CUSTOMER MODIFICATION 5
 - 1.5 INFORMATION FOR RETURNING PUMPS..... 5
- 2.0 INSTALLATION 6**
 - 2.1 INSPECTION 6
 - 2.2 TEMPERATURE CONSIDERATIONS 6
 - 2.3 SET-UP 6
 - 2.4 PIPING 6
 - 2.5 ELECTRICAL CONNECTIONS 6
- 3.0 – 4001V/VE SERIES PUMP AND PUMPHEAD 7**
 - 3.1 PUMP ASSEMBLY & TUBING INSTALLATION..... 7
 - 3.2 PUMP MOUNTING AND COLLET INSTALLATION PROCEDURE 8
 - 3.3 HOSE AND ROLLER INSTALLATION..... 8
 - 3.4 TUBING CONNECTIONS 9
- 4.0 – 4001V/VE MOTOR & GEARBOX 10**
 - 4.1 MOTOR SPECIFICATIONS..... 10
 - 4.2 4001VE MOTOR WIRING..... 10
 - 4.3 4001V MOTOR WIRING 10
 - 4.3 4001V CONTROLLER WIRING..... 11
 - 4.4 GEARBOX SPECIFICATIONS 12
- 5.0 – 4001V/VE DRIVE CONTROLLER 13**
 - 5.1 OPERATION AND WIRING..... 13
 - 5.2 4001V FACTORY DEFAULT PROGRAMMING DIFFERENCES 13
 - 5.3 4001VE FACTORY DEFAULT PROGRAMMING DIFFERENCES 15
 - 5.4 4001VE AUTO / MANUAL SPEED TOGGLE SWITCH..... 15
 - MANUAL SPEED / AUTO SPEED / RESTART TOGGLE SWITCH 15
 - Manual Mode 15
 - Auto Mode..... 15
 - Restart Mode..... 15
- 6.0 - MISCELLANEOUS DIAGRAMS 16**
 - 6.1 ROLLER ASSEMBLY 16
 - 6.2 PUMP ASSEMBLY 17
 - 6.3 TUBING RUPTURE DETECTOR SYSTEM OVERVIEW..... 18
 - 6.3.1 Alarm Causes..... 18
 - 6.3.2 What to do in an alarm condition 18
 - 6.3.3 Resetting the alarm 18
 - 6.3.4 Resuming Service 18
 - 6.3.5 Interfacing 19
 - 6.3.6 Calibration 19
 - 6.3 PRODUCT USE AND DECONTAMINATION DECLARATION 20

1.0 - System Overview

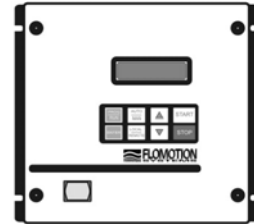
The 4001V/VE Series Chemical Feed Pump consists of a controller, motor, gearbox and peristaltic pump.



4001 Pump & Motor



4001VE Controller



4001V Controller

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 Warranty

Flomotion Systems, Inc. warrants the 4001 Series pumps to be free of defects in material and workmanship for a period of eighteen months from the date of sale to the user, or two years from the date of shipment, whichever ever occurs first. An MC Series control, or any component contained therein, which under normal use becomes defective within the stated warranty time period, shall be returned to Flomotion Systems, Inc., freight prepaid, for examination (contact Flomotion Systems, Inc. for authorization prior to returning any product). Flomotion Systems, Inc. reserves the right to make the final determination as to the validity of a warranty claim, and sole obligation is to repair or replace only components, which have been rendered defective due to faulty material or workmanship. No warranty claim will be accepted for components which have been damaged due to mishandling, improper installation, unauthorized repair and/or alteration of the product, operation in excess of design specifications or other misuse, or improper maintenance. Flomotion Systems, Inc. makes no warranty that its products are compatible with any other equipment, or to any specific application, to which they may be applied and shall not be held liable for any other consequential damage or injury arising from the use of its products. This warranty is in lieu of all other warranties, expressed or implied. No other person, firm or corporation is authorized to assume, for Flomotion Systems, Inc., any other liability in connection with the demonstration or sale of its products.

1.3 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.

1.4 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.

1.5 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.

A certificate included at the rear of these operating instructions, or signed statement, must be attached to the outside of the shipping container.

This certificate is required even if the pump is unused. If the pump has been used, the fluids that have been in contact with the pump and the cleaning procedure must be specified along with a statement that the equipment has been decontaminated.

2.0 Installation

2.1 Inspection

Check for any damage that may have occurred during shipment. In addition, all components should be compared to the order upon receipt of the shipment.

Report any damage or missing components immediately.

2.2 Temperature considerations

Make sure that the pump is located in an area where the ambient temperatures during operation are not lower than 0°F, or higher than +120°F. If ambient temperatures are out of this range please contact the factory for suitability of the specific equipment.

2.3 Set-up

Normal pump installations are for indoor use in an unclassified electrical area. Make sure that the floor surface is level and sufficiently rigid to support the pump. Make sure that there is enough room around the pump to perform maintenance. The hose is serviced thru the front cover! In addition, make sure that the room is adequately ventilated, so that the heat developed by the pump and drive can be dissipated. Open clearance should also be kept between the fan cover of the motor and wall to enable proper cooling.

2.4 Piping

All piping to and from the pump must be independently supported. Undue stress on the pump suction and discharge can cause equipment failure. Locate the supports as close to the pump as possible.

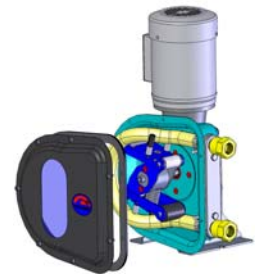
Keep suction line to the pump as short and direct as possible.

Try to limit sharp bends in the piping.

The piping ID should be equal to or greater than the bore size of the pump.

Increase the piping size when the fluid has a high velocity or inertia due to high specific gravity. This will help keep dynamic friction and impulse losses to a minimum.

A pulsation dampener mounted in the discharge and/or an inlet pulse accumulator may be necessary if long piping lengths are unavoidable.



Back pressure valves are not required in peristaltic pump applications. However, a pressure relief valve is recommended to be installed in the discharge piping. This will prevent the possibility of exceeding the maximum working pressure of the pump. Check valves installed in the process piping may increase pulsation and negatively impact hose life.

Install isolation valves and a pipe-drain in the suction and discharge lines to allow fluid isolation and drainage from the pump during maintenance. Flush connections are recommended when pumping slurries in which the solids settle out of suspension when the pump is off. Accumulations of solids in the piping during shutdown can cause plugging.

2.5 Electrical connections

For variable speed operation the pump may be supplied with an AC or DC variable speed controller. Follow all vendor precautions and installation information for both the motor and drive. In addition, your pump may be equipped with an optional Hose Rupture Monitor. Refer to the instructions of this device if required.

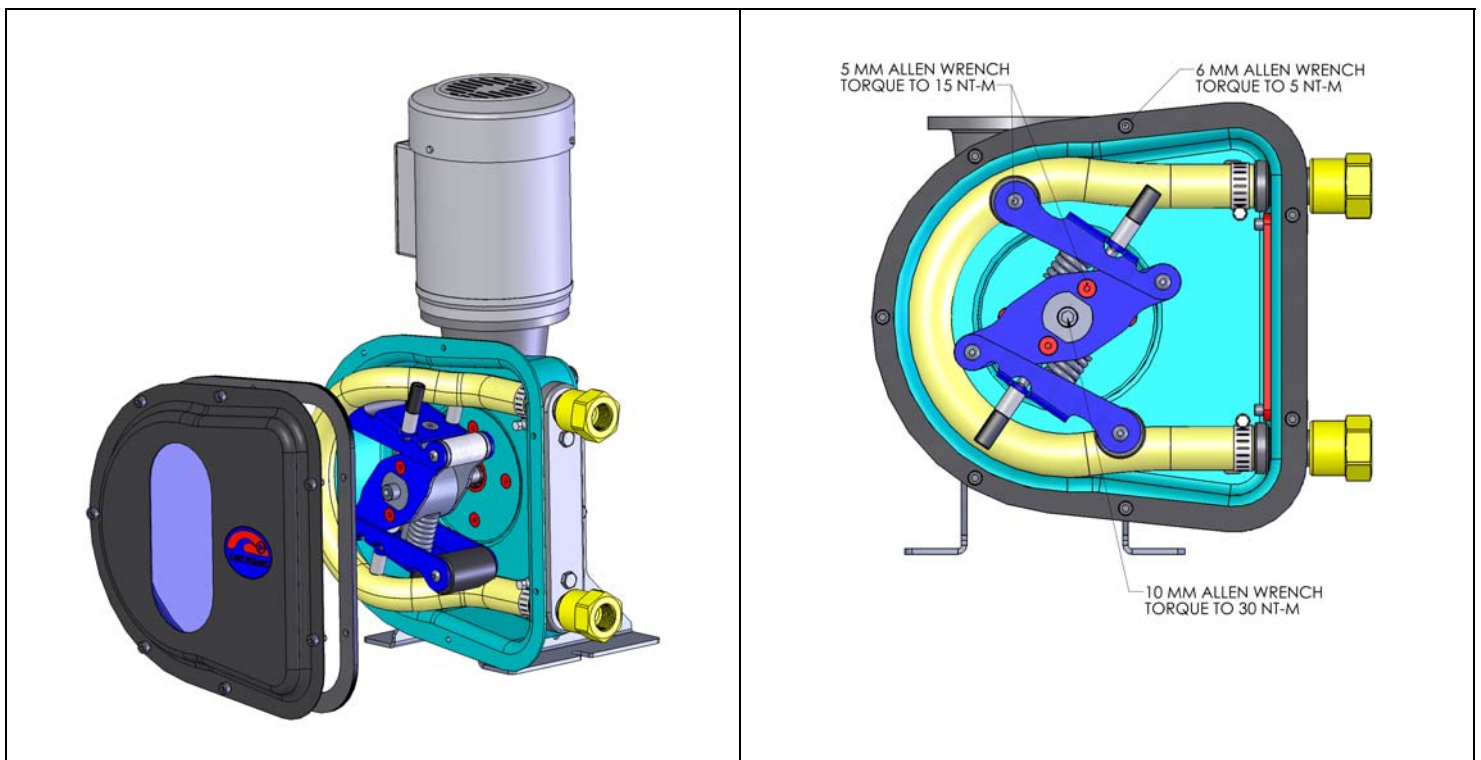
3.0 – 4001V/VE Series Pump and Pumphead

The 4001 H/HE Series pumphead has two spring-loaded working rollers, which automatically compensate for minor variations in tubing wall thickness, giving extended tube life.

IMPORTANT: The 4001 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.

3.1 Pump Assembly & Tubing Installation

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



3.2 Pump Mounting and Collet Installation Procedure

1. To install the pump housing on the gearbox, slide it over the central pilot on the gearbox adaptor plate. See drawing in Section 5.2
2. Next install and torque the mounting screws to 5 NT.M (45 lbf-in).
3. Next install the collet on the gearbox shaft. There is a slot in the shaft where a key is inserted. Orient the collet to allow the key to slide into the slot on the collet and push the collet completely onto the gearbox shaft. When the collet bottoms out it is in the correct position.

3.3 Hose and Roller Installation

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

1. Remove housing cover from pumphead. Loosen and remove the center roller assembly screw.
2. Remove the roller assembly from the gearmotor shaft.
3. Loosen the hose clamps that secure the hose on the inlet and outlet fittings. Carefully remove the old Hose from the pump casing.
4. Place two hose clamps on new hose insert.
5. **IMPORTANT** Install new pump insert making sure no twists occur when working hose onto connectors.



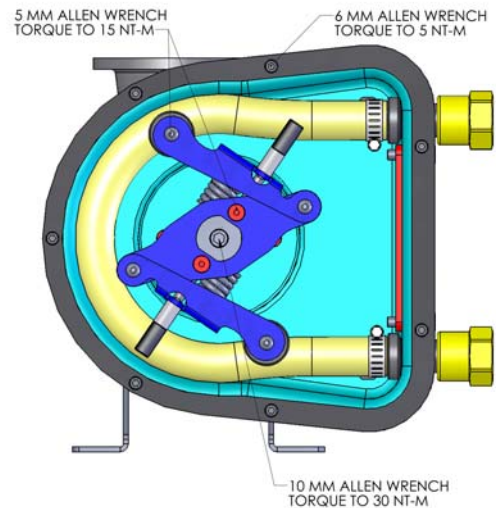
Slide a hose clamp over the end of the hose.



Slide the hose onto the barbed fitting then tighten the hose clamp over the barbed area. Repeat for the second clamp.

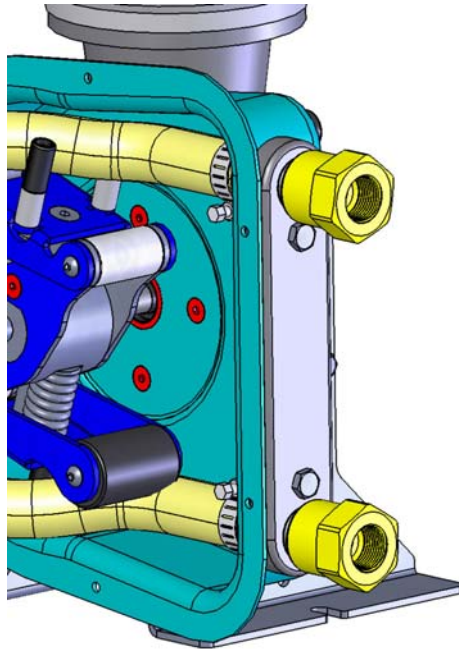
Important: Assure that the hose is not twisted when attaching the second clamp.

6. Note: Flomotion tubing segments are pre-cut to the correct length for installation.
7. Tighten hose clamps securely.
8. Re-install the roller assembly into the pumphead and torque roller assembly screw to 30 NT-M (265 lbf-in) as shown on drawing at right.
9. Spread small amount of non-petroleum silicone grease on inner surface of hose (where rollers contact hose).
10. Reinstall pumphead housing cover.



3.4 Tubing Connections

Tubing or pipe connections are made at the inlet and outlet of the pump using standard 1" NPT fittings. See the drawing below.



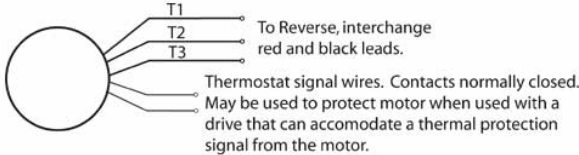
		Estimated Pumping Capacity			
Tubing I.D.		5/16"	1/2"	3/4"	1"
ml/rev*		41	99	171	296
Pressure rating PSI		110	60	30	20
Max Suction Lift (ft)		30	25	10	10
Standard Range	GPH @ 3-70 RPM*	1.9 - 45	4.7 - 109	8.1 - 189	14.1 - 329
	GPH @ 9-120 RPM*†	5.7 - 77	14.1 - 189	24 - 325	42 - 563
Extended Range	GPH @ 0.6 - 70 RPM*	0.40 - 45	0.95 - 109	1.6 - 189	2.8 - 329
	GPH @ 1.2 - 120 RPM*†	0.80 - 77	1.9 - 189	3.2 - 325	5.4 - 563

*Actual flow rates may vary. †Speeds above 70 RPM for intermittent duty.

4.0 – 4001V/VE Motor & Gearbox

4.1 Motor Specifications

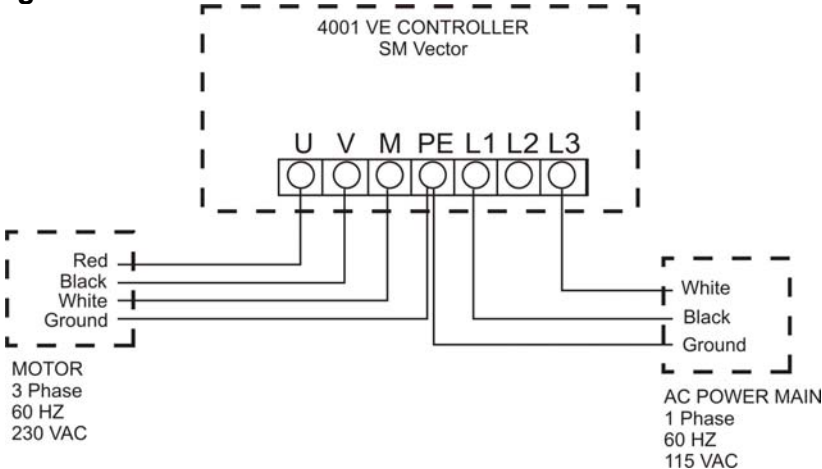
- Motor Type: Permanent Split Capacitor or 3-Phase Inverter Duty
- Rotation: Reversible.
- Insulation: Class B minimum
- Finish: Powder-coat gloss black.



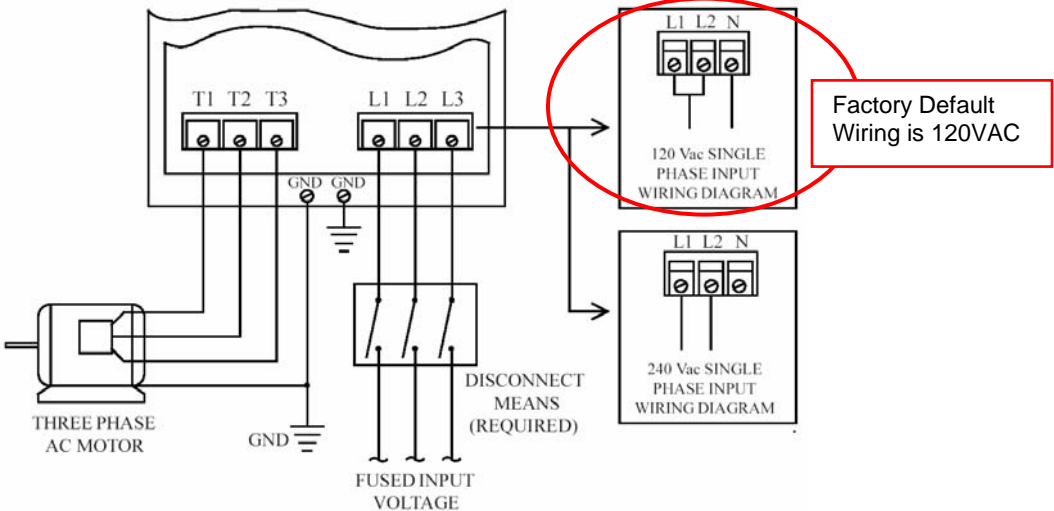
Inverter Duty 3 Phase 230 V
6 to 90 Hz

(Thermostat wires not used)

4.2 4001VE Motor Wiring

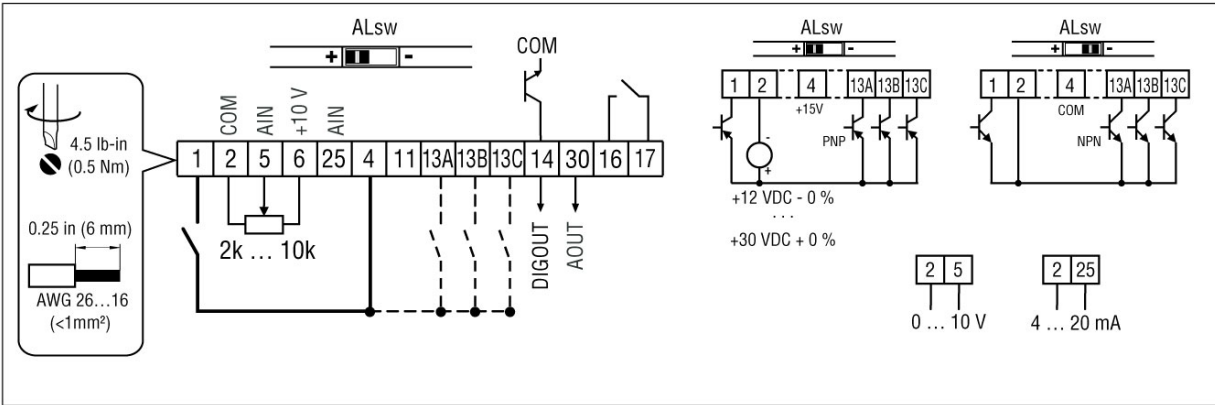


4.3 4001V Motor Wiring



4.3 4001V Controller Wiring

Control Terminal Strip for 0.33 - 10 HP (0.25 - 7.5 kW):



Terminal	Description	Important
1	Digital Input: Start/Stop	input resistance = 4.3kΩ
2	Analog Common	
5	Analog Input: 0...10 VDC	input resistance: >50 kΩ
6	Internal DC supply for speed pot	+10 VDC, max. 10 mA
25	Analog Input: 4...20 mA	input resistance: 250Ω
4	Digital Reference/Common	+15 VDC / 0 VDC, depending on assertion level
11	Internal DC supply for external devices	+12 VDC, max. 50 mA
13A	Digital Input: Configurable with P121	input resistance = 4.3kΩ
13B	Digital Input: Configurable with P122	
13C	Digital Input: Configurable with P123	
13D*	Digital Input: Configurable with P124	
14	Digital Output: Configurable with P142, P144	DC 24 V / 50 mA; NPN
30	Analog Output: Configurable with P150...P155	0...10 VDC, max. 20 mA
2*	Analog Common	
TXA*	RS485 TxA	
TXB*	RS485 TxB	
16	Relay output: Configurable with P140, P144	AC 250 V / 3 A
17		DC 24 V / 2 A ... 240 V / 0.22 A, non-inductive

* = Terminal is part of the terminal strip for the 15-30HP (11-22 kW) Models only.

Assertion level of digital inputs

The digital inputs can be configured for active-high or active-low by setting the Assertion Level Switch (ALsw) and P120. If wiring to the drive inputs with dry contacts or with PNP solid state switches, set the switch and P120 to “High” (+). If using NPN devices for inputs, set both to “Low” (-). Active-high (+) is the default setting.

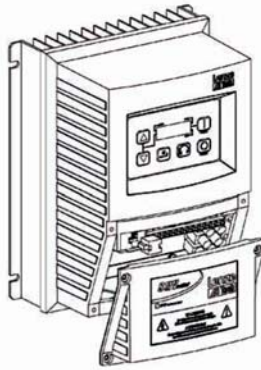
HIGH = +12 ... +30 V

LOW = 0 ... +3 V

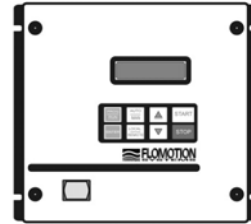
4.4 Gearbox Specifications

- Housing: Precision machined die cast aluminum.
- Lubrication: Lifetime oil bath, sealed and gasketed.
- Shafts: Stainless steel.
- Mounting: Face (any angle) or optional footplate.
- Gearing: AGMA class 9 heat treated steel. 1st stage helical metal, balance spur metal.
- Bearings: Needle with thrust ball.

5.0 – 4001V/VE Drive Controller



4001VE Controller



4001V Controller

5.1 Operation and Wiring

For complete details about the motor drive controller please refer to the included Operating Instructions booklet for the V or VE drive controller. Shown on the following pages are details specific to the operation with the 4001V & 4001 VE Peristaltic Pump operation.

5.2 4001V Factory Default Programming Differences

PARAMETER NAME: USER SETTINGS RECORD			
Parameter Number	Parameter Name	Factory Default	4001V Series Settings*
0	LINE VOLTS	AUTO	-
1	SPEED #1	20 Hz	-
2	SPEED #2	20 Hz	-
3	SPEED #3	20 Hz	-
4	SPEED #4	20 Hz	-
5	SKIP #1	.00 Hz	-
6	SKIP #2	.00 Hz	-
7	BAND WID	1.00 Hz	-
8	ACCEL	30.0 SEC	5 SEC
9	DECEL	30.0 SEC	5 SEC
10	MIN FRQ	.50 Hz	0 Hz
11	MAX FRQ	60.00	75 Hz
12	DC BRAKE	.0 VDC	-
13	DC TIME	.0 SEC	-
14	DYN BRAKE	OFF	-
16	CURRENT	180 %	-
17	MOTOR OL	100 %	-
18	BASE	60.00 Hz	-
19	FX BOOST	(Note 1)	5.3 %
22	TORQUE	CONSTANT	-
23	CARRIER	2.5 kHz	12 KHz
25	START	NORMAL	-

26	STOP	COAST	-
28	AUTO/MAN	A/M LOC	A/M SPD
30	CONTROL	LOCAL	REMOTE
31	UNITS	Sp HERTZ	% Hz
32	HZ MULT	1.00	-
33	UNITS DP	XXXXX	XXX.X
34	LOAD MLT	100 %	-
35	CONTRAST	MED	HIGH
36	SLEEP TH	.00 Hz	-
37	SLEEP DL	30.0 SEC	-
38	SLEEP BW	0%	
39	TB5 MIN	.00 Hz	0%Hz
40	TB5 MAX	60.00 Hz	100% Hz
41	AIN FLTR	0.02 SEC	0.02 SEC
42	TB10A OUT	NONE	-
43	@TB10A	60.00 Hz	NONE
44	TB10B OUT	NONE	-
45	@TB10B	125 %	-
47	TB13A	NONE	4-20 mA
48	TB13B	NONE	-
49	TB13C	NONE	-
50	TB13D	EXT FAULT	-
52	TB14 OUT	NONE	AUTO/MAN
53	TB15 OUT	NONE	-
54	RELAY	NONE	-
55	TB5B LOSS	FAULT	NONE
57	SERIAL	DISABLE	-
58	ADDRESS	30	-
61	PASSWORD	0019	-
63	SOFTWARE	(N/A)	-
64	MONITOR	ON	OFF
65	PROGRAM	RESET 60	MAINTAIN
66	HISTORY	MAINTAIN	-
70	PID MODE	OFF	-
74	PID FB	TB5A	-
75	FB @ MIN	0.00%	-
76	FB @ MAX	100.00%	-
77	P GAIN	5.00%	-
78	I GAIN	0.0 SEC	-
79	D GAIN	0.0 SEC	-
80	PID ACC	30.0 SEC	-
81	MIN ALRM	0.0%	-
82	MAX ALRM	0.0%	-
96	LANGUAGE	ENGLISH	-
99	FAULT HISTORY	(NA)	-

Note 1: See 4.10.3 Description Of Programming Parameters, Step #19.

5.3 4001VE Factory Default Programming Differences

The programming differs from the factory defaults shown in the SM Vector Operating Instruction booklet only in relation to the following parameters:

P104	Acceleration Time	20 sec	5 sec
P105	Deceleration Time	20 sec	5 sec
P121	TB-13A Input	(0) None	(2) AUTO Reference 4-20mA
P162	Analog Input Filter	0.01 sec	0.5 sec
P166	Carrier Frequency	(0) 4kHz	(2) 8kHz
P300	Drive Mode	na	(4) Vector Speed
P302	Motor Rated Voltage	na	230
P303	Motor Rated Current	na	1.8
P305	Motor Rated Speed	1750	1720
P399	Motor Auto Calibration	0	(2) Calibration Complete

5.4 4001VE Auto / Manual Speed Toggle Switch

Manual/Auto/Restart Switch

Manual Speed / Auto Speed / Restart Toggle Switch

The Auto/Manual/Restart toggle switch is located on the right side of the motor drive controller.

Manual Mode

When the switch is placed in the MANUAL (TOP) position the pump speed may be controlled by the up and down arrow keys on the controller.

Auto Mode

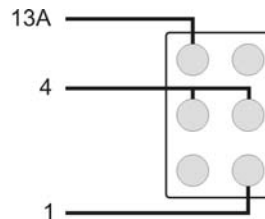
When the switch is placed in the AUTO (CENTER) position the speed is controlled by an external 4-20mA signal applied to pin 2 (-) and pin 25 (+) of the terminal block.

Restart Mode

When the pump is stopped by pressing the STOP button on the front panel or via a stop signal from a remote source such as a PLC or remote stop switch then you must use the Restart Toggle switch to restart the pump. Momentarily press the toggle switch down to restart the pump.

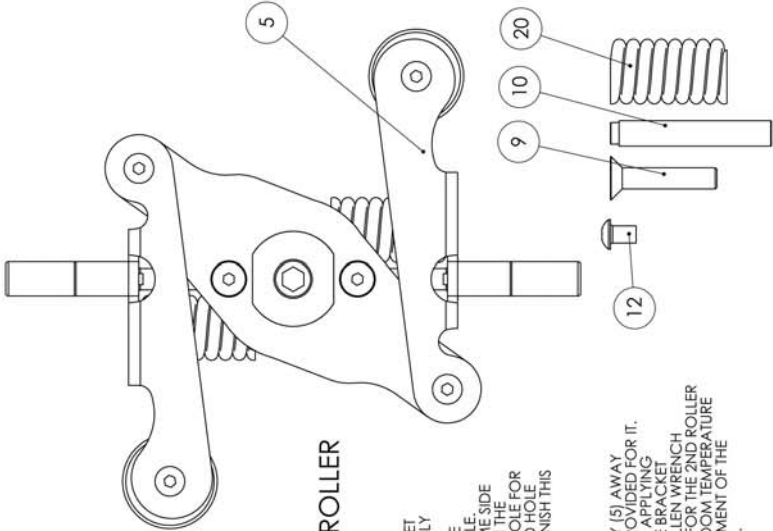
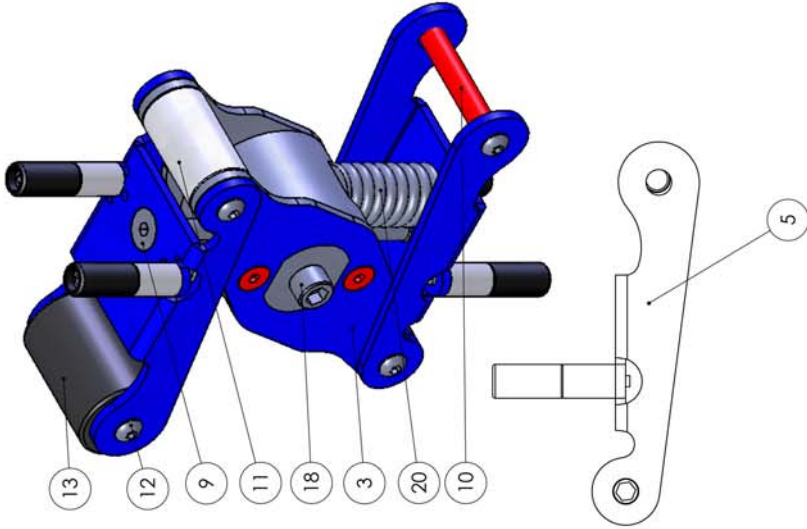


Rear View of Manual/Auto/Restart Switch showing wiring to terminal block.



6.0 - Miscellaneous Diagrams

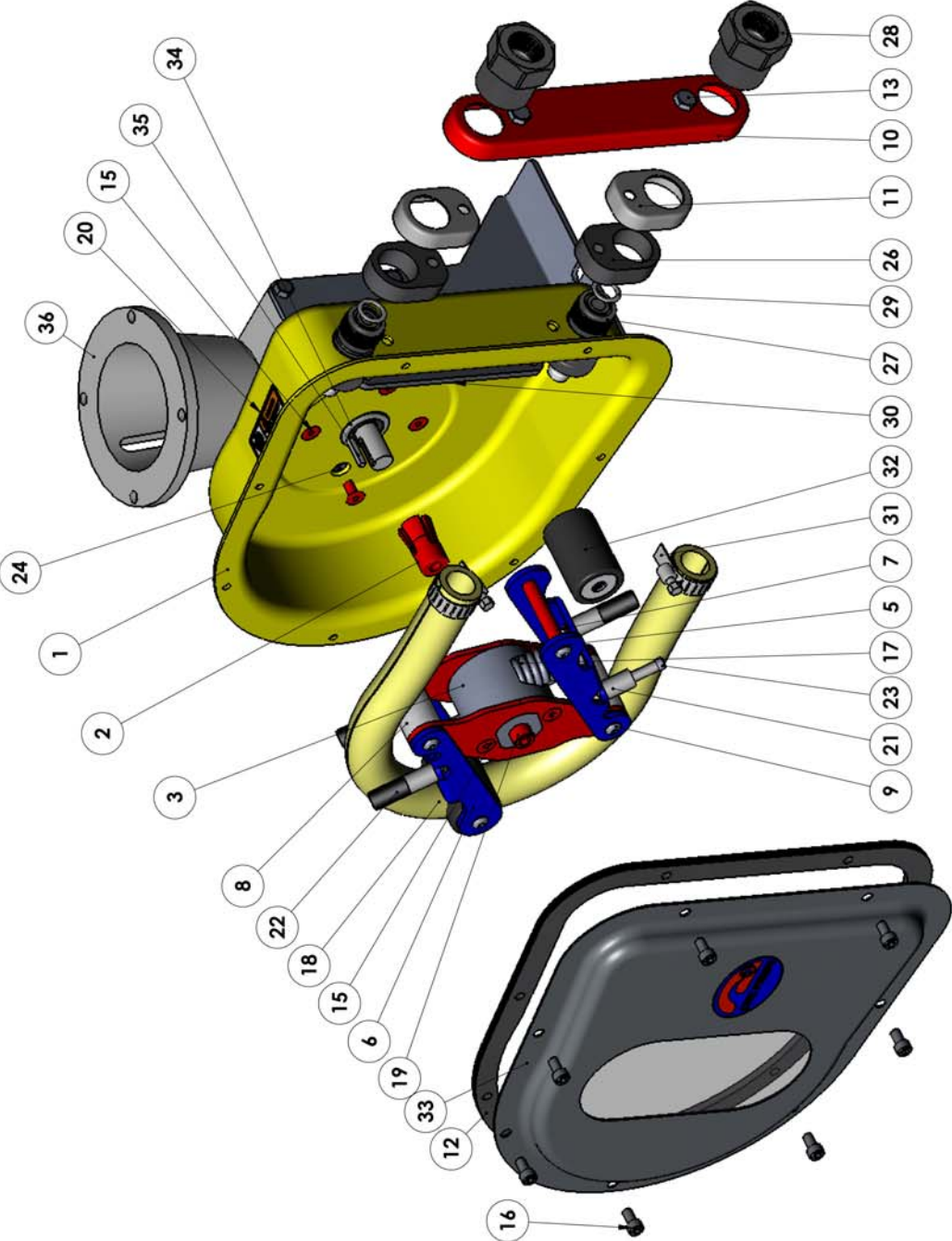
6.1 Roller Assembly



REASSEMBLY PROCEDURE FOR THE PUMP ROLLER

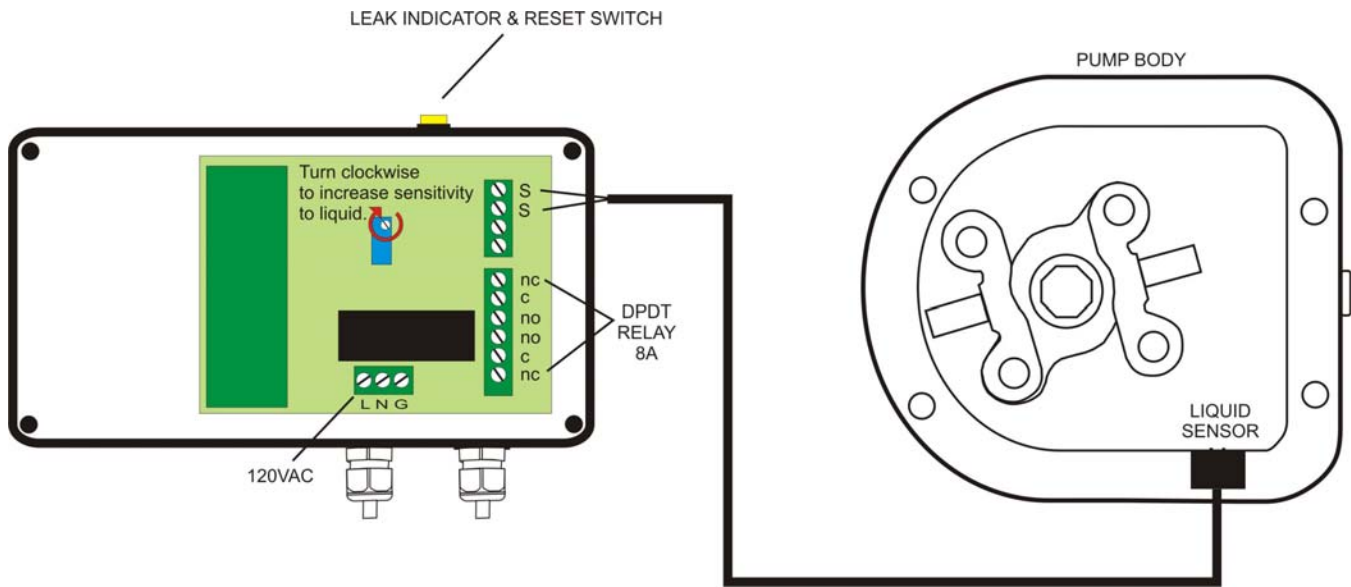
- 1 ASSEMBLE THE PREVIOUSLY BUILT UP ROLLER BRACKET ASSEMBLY (5) TO THE SPINDLE (11) BY SLIDING AN AXIAL (10) THRU THE ROLLER BRACKET ASSEMBLY (5). THE ROLLER ROLLER (12) MUST BE ORIENTED CORRECTLY FOR THE ROLLER BRACKET ASSEMBLY (5) TO BE ORIENTED CORRECTLY WITH THE SPINDLE AT THIS STAGE OR CORRECT ROLLER BRACKET ASSEMBLY IS NOT POSSIBLE AS THE AXIAL SCREW FOR THE COMPRESSION ROLLER (12) ALSO WHEN THE ROLLER BRACKET IS MOVED INTO FINAL POSITION THE COUNTERSINK HOLE FOR THE BRACKET ADJUSTMENT SCREW (9) MUST LINE UP WITH THE THREADED HOLE PROVIDED FOR IT. WHEN BOTH OF THESE ORIENTATIONS ARE CORRECT FINISH THIS STAGE BY INSTALLING THE AXIAL SCREW AND TIGHTENING IT TO XXXXX. REPEAT THIS PROCESS FOR THE 2ND ROLLER BRACKET.
- 2 ASSEMBLE THE SPRINGS (20) BY LIFTING THE ROLLER BRACKET ASSEMBLY (5) AWAY FROM THE SPINDLE (9) AND INSERTING A SPRING (20) IN THE POCKET PROVIDED FOR IT. NEXT BEGIN INSTALLATION OF THE BRACKET ADJUSTMENT SCREW (9) BY APPLYING BLUE LOCTITE TO THE FIRST 12 MM OR 1/2 INCH OF THREADS. INSERT THE BRACKET ADJUSTMENT SCREW (9) THRU THE ROLLER BRACKET (5). USE A 6 MM ALLEN WRENCH TO TIGHTEN THE BRACKET ADJUSTMENT SCREW. REPEAT THIS PROCESS FOR THE 2ND ROLLER BRACKET ASSEMBLY. ALLOW THE LOCTITE TO CURE FOR 6 HOURS AT ROOM TEMPERATURE PRIOR TO INSTALLING THE ROLLER ASSEMBLY IN A PUMP. FINAL ADJUSTMENT OF THE COMPRESSION ROLLERS WILL BE DONE DURING PUMP LEVEL ASSEMBLY.
- 3 THE ROLLER ASSEMBLY IS NOW COMPLETE. REFER TO THE PUMP ASSEMBLY INSTRUCTIONS FOR FURTHER INSTRUCTIONS.
- 4 DURING REPAIRS, INSPECT ALL PARTS AND REPLACE ANY WORN OR DAMAGED PARTS AS REQUIRED.

6.2 Pump Assembly



ITEM NO.	QTY.	PART NO.
1	1	500303
2	1	500306
3	1	500301
4	1	500411
5	1	500412
6	2	500313
7	4	500314
8	2	500317
9	4	500315
10	1	500308
11	2	500400
12	1	500305
13	2	500310
14	2	500319
15	8	500312
16	7	500307
17	2	500323
18	1	500090
19	1	500324
20	1	100340
21	4	500320
22	4	500321
23	4	500322
24	4	500415
25	1	500418
26	2	500410
27	2	500478
28	2	500470
29	2	500469
30	1	500422
31	2	500445
32	2	500455
33	1	500454
34	1	500428
35	1	500030
36	1	500429

6.3 Tubing Rupture Detector System Overview



6.3.11 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 on the LIQUID SENSOR the alarm is triggered.

6.3.2 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.

6.3.3 Resetting the alarm

Press the yellow pushbutton (LEAK INDICATOR & RESET SWITCH) on the top of the Tubing Rupture Detector to reset the alarm.

6.3.4 Resuming Service

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

6.3.5 Interfacing

A dual 8 Amp DC DPDT relay is provided to signal or control an external device during an alarm condition. Connect the Tubing Rupture Detector NC relay contacts to pins 1 & 4 of the SMVector pump controller.

Program the SMVector Pump Controller step P100, changing the value from 0 to 1.

To do this:

1. Press the M key.
2. Enter password 0225 by holding down the UP arrow key then press the M key when done.
3. P100 is shown on the display.
4. Press the M key and change the P100 value from 0 to 1(Terminal Strip), then press the M key to save your change.

The pump is now set to run only when the Tubing Rupture Detector is not in alarm condition.

6.3.6 Calibration

Turn the sensitivity adjusting screw counter clockwise several turns. Apply a wet rag to the LIQUID SENSOR electrodes. Adjust the sensitivity clockwise slowly until the alarm trips.

6.3 Product use and decontamination declaration

Please declare the substances which have been in contact with the product(s) you are returning to Flomotion Systems, Inc. Failure to do so will cause delays in servicing the product. Therefore, please complete this form to ensure that we have the information before receipt of the product(s) being returned. A COPY *MUST BE ATTACHED TO THE OUTSIDE OF THE PACKAGING CONTAINING THE PRODUCT(S)*. You are responsible for cleaning and decontaminating the product(s) before returning them.

Please complete a separate Decontamination Certificate for each pump returned.

RA No: _____ **Serial Number:** _____

Company: _____

Address: _____ City, State, Zip: _____

Tel: _____

Has the Product been used? YES / NO

If yes, please complete all the following Sections.

Description of substances pumped:
Chemical names:

- (1) _____ (3) _____
- (2) _____ (4) _____

I hereby confirm that the only substances(s) that the equipment specified has pumped or come into contact with are those named, that the information given is correct, and the carrier has been informed if the consignment is of a hazardous nature.

Signed _____ Date: _____

Name _____ Position: _____

Precautions to be taken in handling these substances: To assist servicing, please describe any fault condition(s) you have witnessed

- (1) _____
- (2) _____
- (3) _____
- (4) _____

Action to be taken in the event of human contact:

- (1) _____
- (2) _____
- (3) _____
- (4) _____

Cleaning fluid to be used if residue of chemical is found:

- (1) _____
- (2) _____
- (3) _____
- (4) _____

Flomotion Systems, Inc. Buffalo, NY 14228, Tel: 800-909-3569 or 716-691-3941, Fax: 716-691-1253

Notes