STH/Q SET UP INSTRUCTIONS

FOR ADDITIONAL REFERENCES SEE H431 AND Q431

ISO 9001

SAFETY INSTRUCTIONS

Before using any Fluid Metering, Inc. product read the following safety instructions as well as specific product specifications and operating instructions.

Warning! Fire, electrical shock or explosion may occur if used near combustibles explosive atmosphere, corrosive air, wet environment or submerged in fluid.

- Turn off the electrical power before checking pump for any problems.
- Connect motor, speed controllers, or any other electrical devices based on Fluid Metering Inc. specifications. Any unauthorized work performed on the product by the purchaser or by third parties can impair product functionality and thereby relieves Fluid Metering, Inc. of all warranty claims or liability for any misuse that will cause damage to product and/or injury to the individual.
- Power cables and leads should not be bent, pulled or inserted by excessive force. Otherwise there is a threat of electrical shock or fire.
- Replace any inline fuses only with fuse rating as specified by Fluid Metering, Inc.
- When pump/drive is under operation, never point discharge tubing into face or touch any rotating components of pump. In a power down thermal overload cut-in condition, unplug or turn off power to pump. Always allow a cool down period before restarting: otherwise, injury or damage may occur.
- For 30 seconds after power is removed from pump/drive: do not touch any output terminals. Electrical shock may occur because of residual voltage.

Caution! Fire, electrical shock, injury and damage may occur if not used in accordance with Fluid Metering, Inc. specifications and operation instructions.

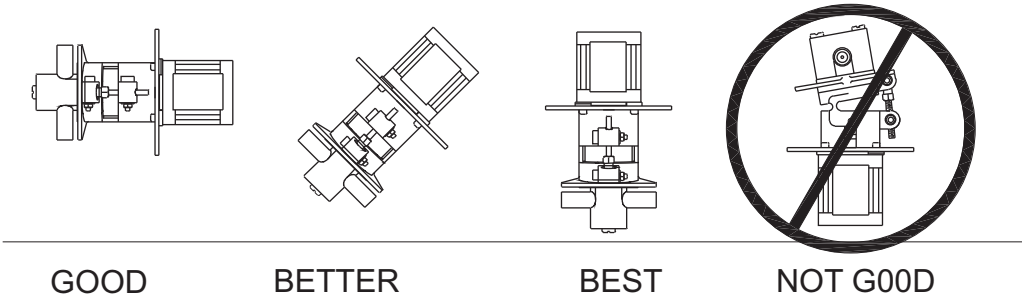
- Do not put wet fingers into power outlet of unit.
- Do not operate with wet hands.
- Do not operate drive assemblies that require a hard mount (to be bolted down) unless they are mounted per Fluid Metering, Inc. specifications, if not injury may occur and/or damage to unit.
- Do not touch any rotating pump or motor components: injury may occur.
- Do not run pump dry, unless designed for that service. Running dry is harmful to the pump, and will cause excessive heating due to internal friction.
- Check pump rotation and inlet/outlet pump port orientation before connecting power to pump. If not injury may occur.
- When pulling out cords from outlets do not pull cord, grasp plug to prevent plug damage or electrical shock.
- Fluid Metering, Inc. Drive Motors become HOT and can cause a burn. **DO NOT TOUCH!**

REQUIRED TOOLS:

1. Analytical Pan Balance
2. Hex Key Driver for Adjusting Stroke Length:
   STH: 3/32" Hex Driver
   STQ: 7/32" Hex Driver
3. A removable wicking thread lock (loctite 290)

1.0 PUMP MOUNTING: For optimum pump performance it is recommended that your FMI pump be mounted in a vertical position with the pump head down in a 6:00 o'clock position and the motor at 12:00 o'clock.This orientation will allow air bubbles that enter the pumping chamber to directly exit through buoyancy assistance. **Figure A**

Figure A



2.0 GENERAL SET-UP

2.1 Setting Dispense Stroke Rate

Strokes Per Minute (spm): For fluids of 500cps viscosity or less a stroke rate of 120-350 spm max is ideal. For fluids with greater than 500cps a slower rate is recommended.

2.2 Fluidics:

Inlet (Suction) Tubing: To avoid cavitation use the most resilient tubing possible with the largest inside diameter (I.D.)

Outlet (Dispense) Tubing: For best dispense performance use rigid Teflon tubing (to reduce peristaltic action) with an equal or smaller I.D. than the inlet (suction) tubing.

2.3 Step Motors:
FMI STH and STQ standard pumps are supplied with a 23 frame, 1.8°/ step, hybrid 8 lead step motor. For wiring diagram and detailed motor specifications see **Figure F**

2.4 Rotational Sensor: FMI STH and STQ standard pumps are supplied with an LED rotational sensor. For wiring diagram and sensor details see **Figure G .**

2.4.1 For sensor use with FMI SCST-01 Step Motor Controller
see SCST-01 instructions.

3.0 CALIBRATION AND TESTING

3.1 Flush the system: clean with alcohol or other suitable cleaning/wetting agent before using the hydraulics and pump for the first time. Prime pump with fluids to assure system is free of air bubbles.

3.2 Place pump in the standard "home" position with the piston-flat perpendicular to the inlet port.The inlet port will be on the left when the motor rotates clockwise (see **Figure B** for the STH pump and **Figure C** for the STQ pump).

3.3 Check the pump's dispense volume by cycling the pump for one complete 360° revolution (one complete rotation). Dispense onto an analytical pan balance and observe the volume. **See Figure D.** Readjust as necessary.

REMARK: When dispensing water-like solutions assume 1 ml = 1 gram. A correction factor will be required for other fluids.

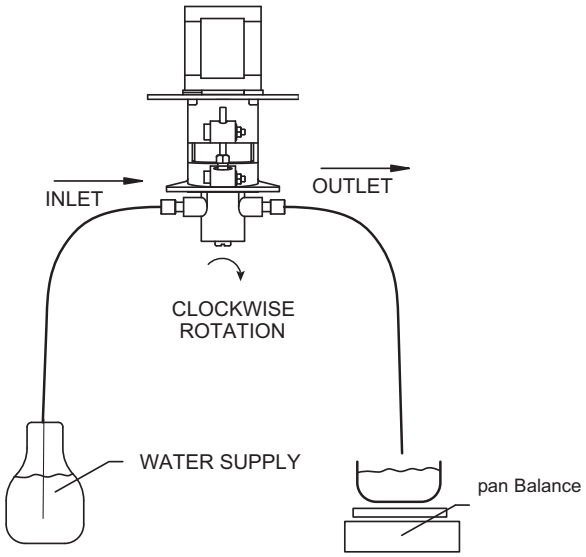


Figure D

STH PISTON FLAT - SENSOR / FLAG
RELATIONSHIP TO INLET AND OUTLET PORTS

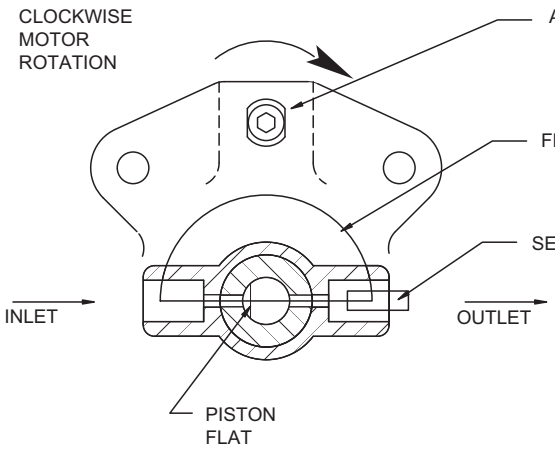


Figure B

STQ PISTON FLAT - SENSOR / FLAG
RELATIONSHIP TO INLET AND OUTLET PORTS

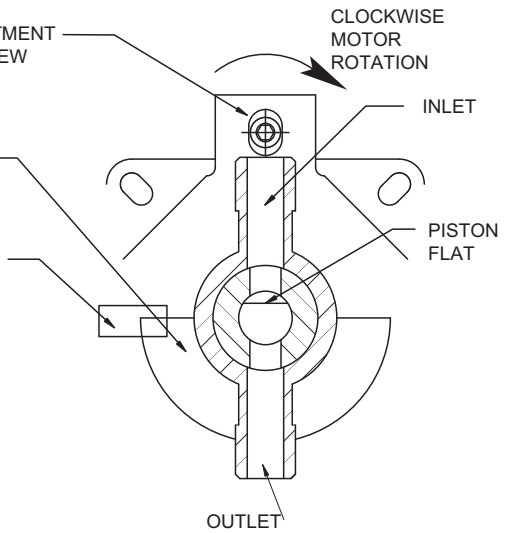


Figure C

3.4 Dispense Volume Values for FMI STH/STQ Pumps:

MODEL	ML/REV MIN	ML/REV MAX
STH00	0.002	0.025
STH0	0.005	0.050
STH1	0.010	0.100
STQ0	0.008	0.080
STQ1	0.032	0.320
STQ2	0.072	0.720
STQ3	0.128	1.280

NOTE: To assure the best performance set the pump displacement volume as large as possible. **FMI pumps are calibrated at the factory to the maximum value.** Both STH and STQ pumps can be factory adjusted down to as little as 10% of the rated flow.

3.5 Adjusting Dispense Volumes:

To fine adjust dispense volumes rotate the stroke-length adjustment screw using the appropriate hex driver (see Required Tools on page 1). To increase the flow, turn the screw counter-clockwise. To decrease the flow, turn the screw clockwise

CCW=Increase, CW=Decrease.

CAUTION: DO NOT LOOSEN THE HEX LOCK NUT WHEN ADJUSTING THE STROKE RATE. IT IS SET AT THE FACTORY AND SHOULD NOT BE TAMPERED WITH. See Figure E

3.6 Lock setting: Once the pump is calibrated apply a drop of removable wicking thread lock between the lower pivot pin and the adjustment screw threads. **See Figure E.**

CAUTION:
DO NOT ATTEMPT TO LOOSEN "LOCK NUT", THIS WILL RESULT IN BREAKING THE ADJUSTMENT SCREW.

3.7 Dispensing Hints:

1) **Speed** - Optimum results for fluids 500 cps or less is between 120-350 rpm.
2) **Cavitation:** Use the largest suction tubing you can to avoid cavitation.
3) **Splashing** can usually be avoided by modifying dispense tip to larger I.D.and/or decreasing dispense speed.
4) **Hanging drop at dispense tip can be avoided by:**
   a) Use of rigid discharge tubing
   b) Small dispense tip
   c) Increasing speed
5) **High viscosity dispensing requires:**
   a) Large suction tubing
   b) Pressurizing suction reservoir
6) **Bubbles in discharge**
   a) Suction fitting leak
   b) Cavitation
7) **Need Help? Call, fax, or email us… We can help solve almost any fluid control problem.**

3.8 SPECIAL MOTORS AND CONTROLLERS

FMI offers a complete variety of stepper motors and stepper motor controllers from simple quick start control to complex application specific stepper motor control. Our standard step motor controllers are:

SCST General Purpose Stepper Motor Control for quick start control of FMI STH and STQ pumps.

ICST Intelligent Stepper Motor Controller which includes an embedded microprocessor for custom programming of FMI stepper motor pumps to meet specific application operations.

IDS 2000 Industrial Dispenser/Pump which includes the SCST and FMI pump head integrally mounted in a rugged stainless steel enclosure.

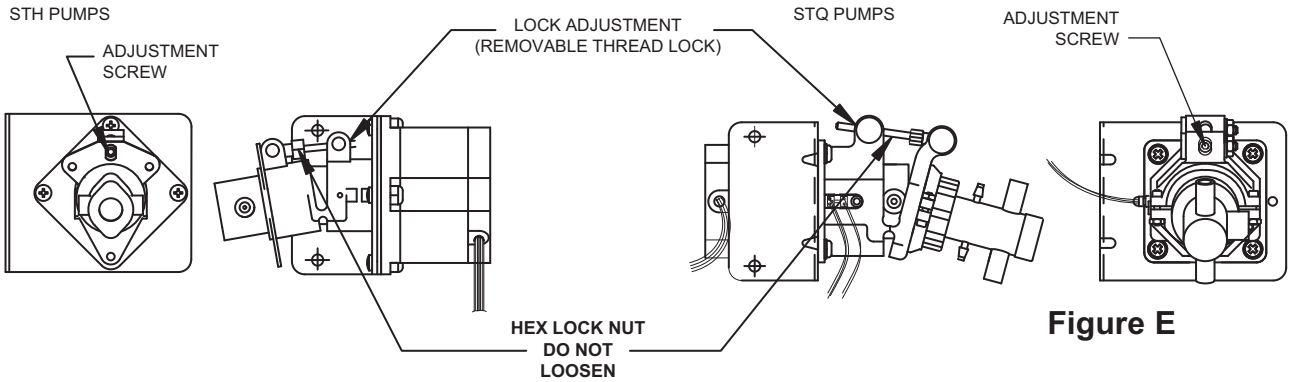
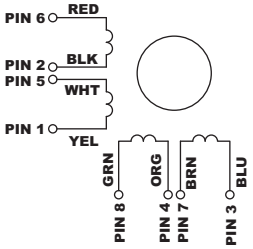


Figure E

NOTE:FOR ADDITIONAL REFERENCES SEE H431 AND Q431

FMI STEP MOTOR 23 FRAME PART NO. 110746



MOTOR VALUE DATA ALL VALUES TYPICAL AT 40° C UNLESS OTHERWISE NOTED		UNITS	4-LEAD BIPOLAR SERIES	4-LEAD * BIPOLAR PARALLEL	UNIPOLAR 6-LEAD
IC RATED CONT. CURRENT/PHASE IN AMPS	(2)	AMPS	1.75	3.5	2.5
Ke VOLTAGE CONSTANT/PHASE		Vpk/RAD/SEC	0.412	0.206	0.206
Rp RESISTANCE: 25°C		OHMS	2.12	0.53	1.06
Lp PHASE INDUCTANCE	(3)	mH	9.2	2.3	2.3
Th HOLDING TORQUE (2-PHASE ON)	(1)	OZ_IN (Nm)	116 (0.82)	116 (0.82)	82 (0.58)
Tr LOW SPEED RUNNING TORQUE	(1)	OZ_IN (Nm)	89 (0.63)	89 (0.63)	63 (0.44)
Td DETENT TORQUE		OZ_IN (Nm)		4.0 (0.028)	
Jm ROTOR INERTIA		OZ-IN-SEC^2 (KG-M ^{2}10 $^{-1}$)		0.0017 (0.012)	
RTH THERMAL RES , WINDINGS TO AMBIENT	(2)	DEGREES C PER WATT		5.5	
STEP ANGLE		DEGREES OF ROTATION		1.8	

8-LEAD CONFIGURATION

CONNECTION	PIN	LEAD COLOR	DRIVER CONNECTION
4-LEAD BIPOLAR SERIES	6	RED	A
	1	YEL	A
	8	GRN	B
	3	BLU	B
	2 & 5	BLK & WHT	COMMON
	4 & 7	ORG & BRN	COMMON
4-LEAD BIPOLAR PARALLEL	6 & 5	RED & WHT	A
	1 & 2	YEL & BLK	A
	8 & 7	GRN & BRN	B
	3 & 4	BLU & ORG	B
6-LEAD UNIPOLAR	6	RED	A
	1	YEL	B
	8	GRN	C
	3	BLU	D
	2 & 5	BLK & WHT	+V
	4 & 7	ORG & BRN	+V

DRIVER CONNECTION (5)

STEP	A	A	B	B
1	+	-	-	+
2	-	+	-	+
3	-	+	+	-
4	+	-	+	-
1	+	-	-	+

CW ↓ CCW ↑

BIPOLAR FULL STEP PHASE SEQUENCING

DRIVER CONNECTION (5)

STEP	A	B	C	D
1	GND	0	GND	0
2	0	GND	GND	0
3	0	GND	0	GND
4	GND	0	0	GND
1	GND	0	GND	0

CW ↓ CCW ↑

UNIPOLAR FULL STEP PHASE SEQUENCING

AMP CONNECTOR P/N 641653-8

+ = POSITIVE CURRENT FLOW
- = NEGATIVE FLOW
O = OFF OR OPEN
GND = GROUND

NOTES:
(1) WITH RATED CURRENT APPLIED.
(2) WINDINGS AT 130°C MOTOR UNMOUNTED IN STILL AIR AT 40°C (AMBIENT).
(3) SMALL SIGNAL INDUCTANCE AS MEASURED AT WITH IMPEDANCE BRIDGE @ 1 KHZ, 1 AMP.
(4) SUGGESTED MATING CONNECTOR AMP# 640620-8 OR EQUIVALENT.
(5) INDICATED DIRECTION WHEN VIEW FROM MOTOR DRIVE SHAFT END.

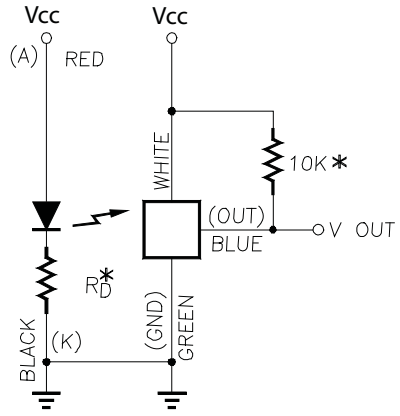
*** USE FOR BEST PERFORMANCE**

Figure F

Absolute Maximum Rating (T_A=25ºC Unless otherwise noted)

Supply voltage, V(not to exceed 3sec.).....18 V
Input diode power dissipation.....100 mW (1)
Output power dissipation.....200 mW (2)
Total device power dissipation.....300 mW (3)
Voltage at output lead (open collector output).....35 V
Diode foreword D.C Current.....40 mA
Diode reverse D.C Voltage.....2 V

Note:
1. Derate linearly 2.22mW / ºC above 25ºC
2. Derate linearly 4.44mW / ºC above 25ºC
3. Derate linearly 6.66mW / ºC above 25ºC
4. The optical switches are terminated with 24 inches of 26 A.W.G.,UL 1492 wire on each terminal.
   Insulation colors and function are as follows:
   Red-Anode, Black-Cathode, White-Vcc, Blue-Output, Green-Ground
5. Normal application would be used with light source blocked, simulated by I_F=0mA
6. All parameters tested using pulse techniques.



INVERTED OPEN COLLECTOR OUTPUT

* NOT SUPPLIED WITH OPTICAL SENSORS
See suggested Rd values table below.

Suggested R_D Values	
Vcc (VDC)	R_D (Ω)
5	180
12	470
15	620

Figure G

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