FLUID METERING, INC.

Valveless Metering Pumps & Dispensers

Solutions for...

- Analytical
- Laboratory
- Process
- Industrial
- Instrumentation
- Medical
- OEM

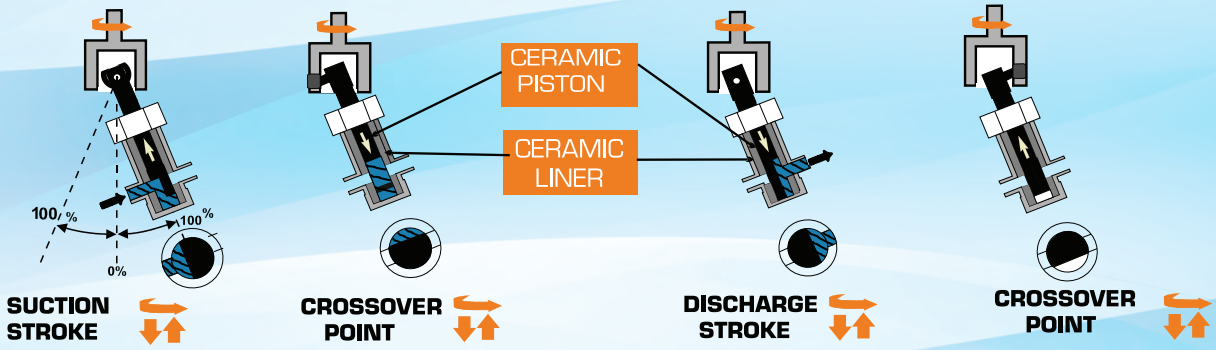
www.fmipump.com / 800-223-3388

401-2013

Valveless Ceramic Dispensers & Metering Pumps Since 1959!

- No Valves, Drift-Free Operation.
- One Moving Part.
- Precision Dispensing - CV of 0.5% or better.
- Flow Rates from Microliters to 4600 ml/min.
- Positive Displacement up to 200 psig.
- Viscosity Independent - Unaffected by Viscosity of Fluids.
- Millions of Maintenance-Free Cycles.
- Inert, Corrosion Resistant Fluid path - Ceramic & Fluorocarbon Standard.
- Self-priming to 15 Feet, Vertical Lift.
- Instant Reversibility While Running.
- Large Selection of Drives - Fixed, Variable, Pneumatic, Stepper, Hazardous Duty and OEM.

The valveless pumping function is accomplished by the synchronous rotation and reciprocation of the ceramic piston in the precisely mated ceramic cylinder liner. One complete piston revolution is required for each suction /discharge cycle as shown. The piston always bottoms for maximum fluid and bubble clearing.

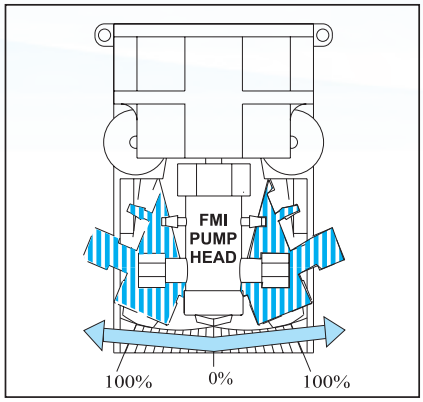


The piston rotates and reciprocates. As the piston is pulled back and the piston flat opens to the inlet port, suction is created and fluid fills the pump chamber. As the piston reaches the highest point in the reciprocation cycle, the pump chamber is now at its maximum volume capacity. Continuing the rotation, the inlet port is then sealed and crossover occurs. As the inlet port is sealed and the pump chamber is full, the outlet port opens up. ***Only one port is open at any time and at no time are both ports interconnected.*** Continuing the rotation and reciprocation, the piston is forced down and the piston flat opens to the outlet port. Discharge is created and fluid is pumped out. The piston bottoms for maximum fluid and bubble clearing. Continuing the rotation, the outlet port is then sealed and crossover occurs. As the outlet port is sealed and the pump chamber is empty, the inlet port opens to start another suction stroke. ***Only one port is open at any time and at no time are both ports interconnected.***

For a video annimation of how FMI pumps work Visit www.fmipump.com

Easy Flow Rate Adjustment

- Moving the pump head position changes the piston stroke length and, in turn, the flow rate.
- Infinite fine flow adjustments between zero and 100% flow rate.
- Flow rate Dial Indicator Kit Q485 for the "Q" line provides accurate and simple linear calibration (See page 30)
- Flow rate can be changed while pump is operating or at rest.



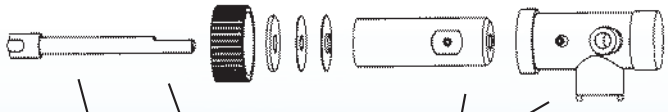
- On the "Q" line this is done by turning the Flow Control Knob which moves the flow rate indicator along a fixed 20 unit scale linearly calibrated "10-0-10". The "10" equals 100% flow rate in that direction, "0" equals zero flow.
- The "RH" line flow adjustment is accomplished by turning an easy-grip Flow Control Ring graduated in 450 divisions from 0 to 100% flow.

Pump Head Codes & Materials

The table below provides codes and prices for all available Pump Head Modules (PHM). After selecting the appropriate Pump Drive Module and Piston Size Code, (refer to Drive Section, pages 6-17) select a PHM and available options below. FMI pump heads are made from various materials of construction for use in most applications. All FMI pumps are modular in design.

The Pump Head Modules can be easily removed for cleaning or replaced with a spare pump head for use with different fluids. Some customers have separate pump heads for use with each fluid handled or flow rate desired. When ordered together, Pump Drive Modules, Pump Head Modules, and options are mounted, tested and shipped as one unit.

Pump Head Materials Configuration



RH LAB PUMP JR.
PISTON SIZE
00 = 1/8" DIA.
0 = 3/16" DIA.
1 = 1/4" DIA.

Q PUMP
PISTON SIZE
0 = 1/8" DIA.
1 = 1/4" DIA.
2 = 3/8" DIA.
3 = 1/2" DIA.

1 — **C** — **K** — **C** — **W**

OPTIONS
(See options page for more information)

- **W** = Isolation Gland (Q1, Q2 & Q3)
- **WT** = Isolation & Temp Gland (Q1 & Q2)
- **TC** = Sanitary Flange
- **LF** = Low Dead Volume Heads- 50 ml/min Max
- **R479** = Low Flow Adaptor Kit (pg 30)
- **S** = All Stainless Steel Pump Head Carrier ("Q"Only)

PISTON MATERIAL
C = CERAMIC (alumina)
S = 316 Stainless Steel
SAN = Sanitary (CSC) (pg 26)

CYLINDER CASE MATERIAL
K = FLUOROCARBON (PVDF)
S = 316 Stainless Steel
SAN = Sanitary (CSC) (pg 26)
T = Tefzel

CYLINDER LINER MATERIAL
C = CERAMIC (alumina)
Y = Carbon (sintered)
SAN = Sanitary (CSC) (pg 26)

PHM (PUMP HEAD MODULE)

Piston Size Code	Materials of Construction								
	CKC	CKY	CSC	CSY	SAN	SKY	SSY	STY	CTC
RH00	■					■		■	■
RH0	■								■
RH1	■								■
Q0						■	■		■
Q1	■	■	■	■	■	■	■		■
Q2	■	■	■	■	■	■	■		■
Q3	■								■
Wetted Parts	Ceramic PVDF	Ceramic PVDF Carbon	Ceramic 316 SS	Ceramic 316 SS Carbon	Ceramic Teflon	316 SS PVDF Carbon	316 SS Carbon	316 SS Tefzel Carbon	Ceramic Tefzel
MAX.Temp	212º F	212º F	350º F	350º F	350º F	140º F	140º F	140º F	212º F
Options	(add Option Code & cost to Pump Module for complete price and part number)								
LF (pg.29)	N/C	N/C				N/C		N/C	N/C
W (pg.25)	■		■						■
WT (pg.25)			■						
TC (pg.24)			■		■				
R479 (Pg.29)			■	■	■	■	■		
S ("Q" Only)	■	■	■	■	■	■	■		

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Selection Guide for FMI's Pump Heads

QCKC

QCKC Ceramic & PVDF Fluid Path

- Excellent for general use with acids, caustics and most solvents (not recommended for MEK, Acetone, & Methylene Chloride).
- Rated to 212°F (100 C) operating, 60 psig (4.1 bar), Autoclavable (non-operating) to 240°F (116°C)

QCKC-W

QCKC -W Flush Gland version of QCKC

- Ideal for air sensitive, crystal forming solutions such as saline.
- Isolates main pump fluid from seals and atmosphere.

QCSC

QCSC 316SS Ceramic & PTFE Fluid Path (standard)

- Excellent Chemical Resistance
- Rated to 350°F (177 C), 100 psig (6.9 bar)

QCSC -W

QCSC-W Flush Gland version of QCSC

- Ideal for air sensitive, crystal forming solutions such as saline.
- Isolates main pump fluid from seals and atmosphere.

QCSC-WT

QCSC-WT "Hi Temp Gland" Pump Heads

- Designed for applications, which require temperature control of the pump head.
- Accepts two standard 1" x ¼" cartridge heaters & a 1/8" dia. thermocouple. Pump head also includes an isolation gland.
- Rated to 350°F (177 C), 100 psig (6.9 bar)
- 316SS, Ceramic, & PTFE fluid path.

QCSC-200

QCSC-200

- 200 PSI high pressure version of QCSC
- For Prep/Flash Chromatography

QSANS

QSANS Sanitary Design

- Ideal for food, biotech and pharmaceutical applications.
- 316SS, Ceramic and PTFE wetted path for excellent chemical resistance.
- Easy disassembly for cleaning, no internal threads for ¼ " or 3/8" id tubing

QSAN-TC

QSAN-TC Tri-clamp version of SAN

- Quick connect 1" flange for ¼ to 1" tubing sizes

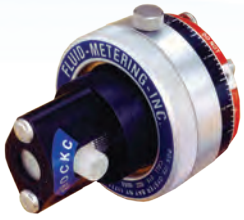
QCV

QCV For water treatment chemicals such as Sodium Hypochlorite and caustic Soda 100°C at 125 psig

RH

RH Small displacement, self contained pump for ¼ O.D tubing using compression fittings for 0 to 100ul/stroke to 360 ml/min.

- Excellent chemical compatibility. Ceramic and PVDF wetted path.
- Fully adjustable zero to max
- 212°F 100 C, autoclaved up to 240° F(116 C) (non-operating), and pressure to 100 psig
- Flow Path: Ceramic and PVDF standard - other materials available. (RH00SKY, RH0CKC, RH1CKC)



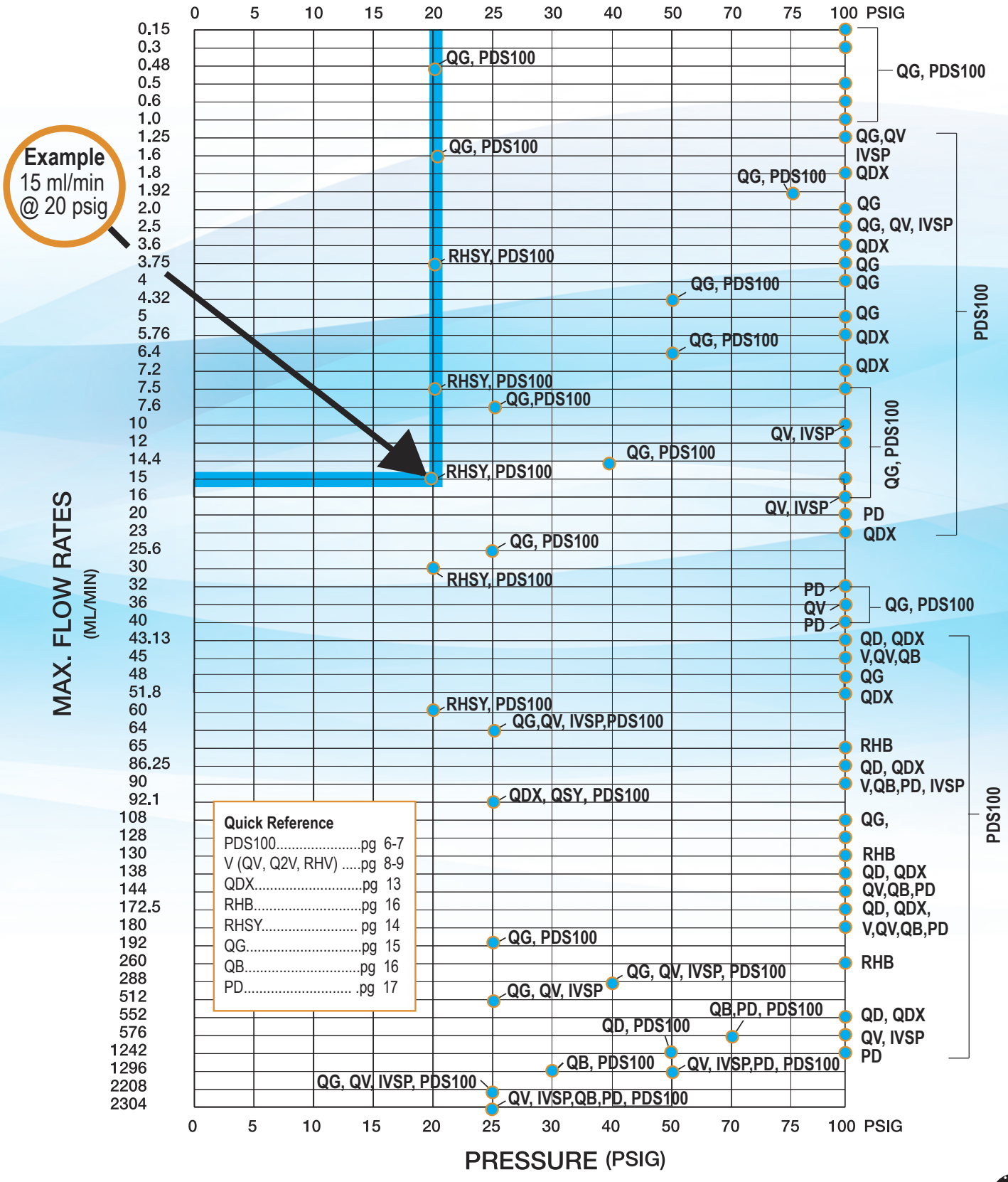
RHLF

RHLF "Low Flow", Low Dead Volume pump. Female ¼-28 port version of RH.

Have questions? Chat live with an FMI Application specialist at www.fmipump.com

Select-A-Pump

- Select the flow and pressure closest to your requirements.
- Refer to the pages indicated for information on available models.
- Flow rates shown are maximum milliliters per minute.
- All FMI pumps are infinitely adjustable from zero to their maximum flow rate.



"PDS100" Programmable Dispenser

Valveless, Programmable, Dispensing & Metering System

The PDS-100 is a precision system capable of dispensing or pumping fluids ranging from 2.5 uL per dispense or 8 uL/min continuous (Single RH00LF) up to 1536 mL/min (Dual Q3) into pressures ranging from 10 psi to 100 psi (RH).

- All models feature FMI's Patented CeramPump® No-Valve Fluid Control Technology
- Intuitive menu-driven programming uses front panel membrane switches with 2.75" x 1.5" LCD display.
- Pump heads are integrally mounted to control unit, which includes precision stepper motors, drivers and programmable electronics housed in a rugged, anodized, aluminum enclosure.
- Available in single and dual pump head configurations in all FMI pump head sizes.
- Universal Power Input accepts 100-240 VAC 50/60 Hz.
- Ideal for process & production single and dual channel dispensing & filling.
- Dual pump head configurations can be programmed for independent pump control, great for proportional flow or dilutions.

Selectable RS485, 4-20 mA, 0-5 VDC, & 0-10 VDC input for automatic control.

LCD Menu Display & Membrane Switches

	Speed (RPM) Standard		Dispense Volume/Revolution		Dispense Rate mL/min (Maximum Stroke)				Pressure (PSIG)	
					Single		Dual - Pumps In Phase		Single	Dual - 2 Independent "Solo" pumps each
Piston Code	Min	Max	Min Dispense (mL/rev)	Max Dispense (mL/rev)	Min (@ Minimum Speed)	Max (@ Maximum Speed)	Min (@ Minimum Speed)	Max (@ Maximum Speed)	Maximum	
RH00	6	750	0.003	0.025	0.0180	18.75	0.036	37.5	100	
RH0			0.003	0.050	0.0180	37.50	0.036	75.0		
Q0		600	0.004	0.080	0.0240	48.00	0.048	96.0	40	
RH1		750	0.005	0.100	0.0300	75.00	0.06	150.0	100	
Q1		600	0.016	0.320	0.0960	192.00	0.192	384.0	40	
Q2			0.036	0.720	0.2160	432.00	0.432	864.0	20	
Q3			0.064	1.280	0.3840	768.00	0.768	1536.0	10	

1) Minimum Flow Rates for RH and Q Pump Heads calculated at 6 RPM.
2) Maximum Flow Rates for RH Pump Heads calculated at 750 RPM.
3) Maximum Flow Rates for Q Pump Heads calculated at 600 RPM.

"PDS100" Programmable Metering Pump

Dispense, Pump, Mix, Dilute, or Proportion

RH

2RH

STQP

2STH

PDS100

Dimensions:
11 3/4" x 5 1/8" x 6 1/4" wide
(300 x 128 x 159 mm)

Electrical:
RS485, 4-20mA, 0-10V, 0-5V interface for connection to process sensors, PLC and PC controllers.

Shipping weight :
7.5 lb. (3.41 kg)

2STQ

STH

Foot Pedal

"V" Variable Speed

Variable Flow Rate to 2300 ml/min

"QV/QVG50/Q2V"

- Adjustable from 5 - 50 strokes per minute for QVG50 and 90 - 1800 strokes per minute for the QV,Q2V and RHV.
- Quick connect to V300 Controller (included).
- Q2V Ratio-Matic® duplex for proportional metering using a single drive with two pump heads.
- Q2V Ratio-Matic® duplex reduces pulsation by 50%

QV/QVG50

Dimensions:
QVG50: 11" x 5" x 5 3/4" wide
(279 x 127 x146 mm)
QV: 10" x 4 5/8" x 4 7/8" wide
(254 x 117 x 124 mm)

Shipping weight:
QV : 10 lb (4.5 kg)
V300: 5 lb (2.25 kg)
QVG50 10 lb (4.5 kg)

RATIO:MATIC®

Q2V

Dimensions:
15" x 4 7/8" x 5 1/8"wide
(381 x 124 x 130 mm)

Shipping weight:
Q2V: 15 lb (6.75 kg)
V300: 5 lb (2.25 kg)

How to Order Drive + Pump Head = Complete pump
QVG50 + Q3CKC

"RHV" Low Flow

(0 -180 ml/min)

- Drift-free flow ranges up to 180 ml/min, pressures from -10 to 100 psig.
- Easy grip displacement control ring graduated in 450 divisions.

RHV

Dimensions:
8" x 3"x 3" wide
(181 x 76 x 76 mm)
Shipping weight:
RHV: 7 lb (3.15 kg)
V300: 5 lb (2.25 kg)
Electrical:
1800 RPM, TENV.

RHV Pumps (Includes V300)

MAX. Flow/Pressure			Wetted Parts	MAX. Fluid Temp	Complete Pump
ML/MIN	PSIG	BAR			
45	100	6.90	316 SS/PVDF/Carbon	140° F	RHV00SKY
90			Ceramic / PVDF	212° F	RHV0CKC
180					RHV1CKC
45			Ceramic / Tefzel	212° F	RHV00CTC
90			Ceramic / Tefzel	212° F	RHV0CTC
180					RHV1CTC

"V" Variable Speed

Ideal for Automated Process Control

"V300" Variable Speed Controller QV, QVG50, RHV and Q2V Pump Drive Modules

- Membrane Switches for manual Flow Rate settings and Start / Stop functions.
- Selectable 4-20 mA, 0-5 VDC, & 0-10 VDC Input for Automatic Control.
- Start, Stop & Reverse Flow while maintaining flow settings.
- Rugged, Anodized, Aluminum Enclosure designed for both bench-top & wall mounting.

Selectable 4-20 mA, 0-5 VDC, & 0-10 VDC input for automatic control for QV, QVG50, RHV & Q2V Pump Drive Modules.

Digital LCD Flow Display

How to Order

Drive + Pump Head = Complete pump

QV + Q3CKC

QV/QVG50/Q2V PDM (Includes V300)

MAX. Flow		Pressure		PDM	Piston Code
ML/MIN	GAL/HR	PSIG	BAR		
1.25	.019	100	6.90	QVG50	RH00
2.50	.039				RH0
4.00	.063				Q0
5.00	.079				RH1
16.00	.252				Q1
36.00	.568				Q2
64.00	.998	25	1.72		Q3
45	.71	100	6.90	QV	RH00
90	1.4				RH0
144	2.2				Q0
180	2.8				RH1
576*	9.1				Q1
1296*	20.4	50	3.45		Q2
2304*	35.9	25	1.72		Q3
90	1.42	100	6.90	Q2V	RH00
180	2.8				RH0
288	4.4				Q0
360	5.6				RH1
1152*	18.2				Q1
2592*	40.8	50	3.45		Q2
4608*	71.8	25	1.72		Q3

Drive Options
Mounting Base (pg.15) Part # -MB
Dial Indicator (pg.30) Part # -Q485

V300

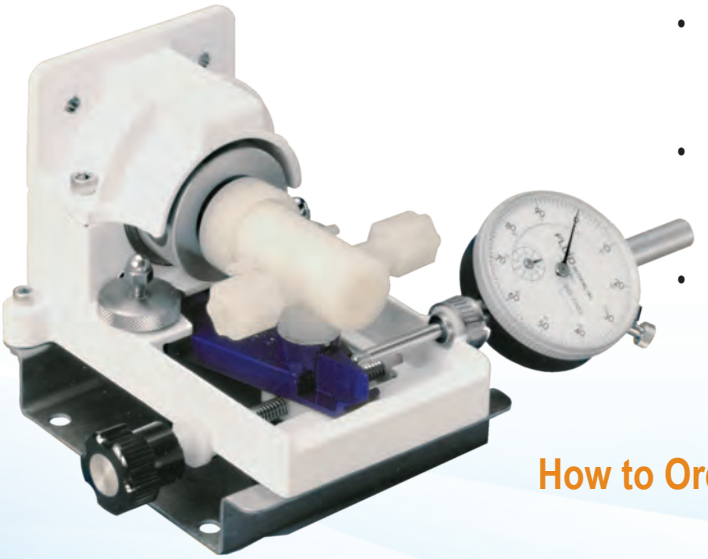
Dimensions:
7 1/4" x 5 1/8" x 6 1/4" wide
(182 mm x 128 x 159 mm)
Shipping weight:
Q2V: 15 lb (6.75 kg)
V300: 5 lb (2.25 kg)
Electrical:
Universal Power Input accepts 100-240 VAC 50/60 Hz.

Have questions?
Chat live with an FMI application specialist at www.fmipump.com

*See General Specifications note (pg 35)

"QP" Motorless Pedestal

High Flow - Rugged Duty



- Typically driven by belt, chain or shaft coupling connected to your special motor drive, e.g. air, hydraulic, stepper, etc. maximum speed 1800 RPM.
- Used extensively in laboratory, industrial, and OEM applications for both dispensing & metering up to 2300 ml/min continuous flow.
- Minimal torque requirement of 35 inch ounces.

How to Order Drive + Pump Head = Complete pump
QP + Q1CKC

QP

Dimensions:
6 3/8" x 4 3/8 x 5 1/8"
(162 x 111 x 130 mm)
Shaft extension:
5/16" dia. x 1 3/16"
(8 mm dia. x 30 mm)
Shipping weight:
5 lb. (2.25 kg)

QP PDM (PUMP DRIVE MODULE)

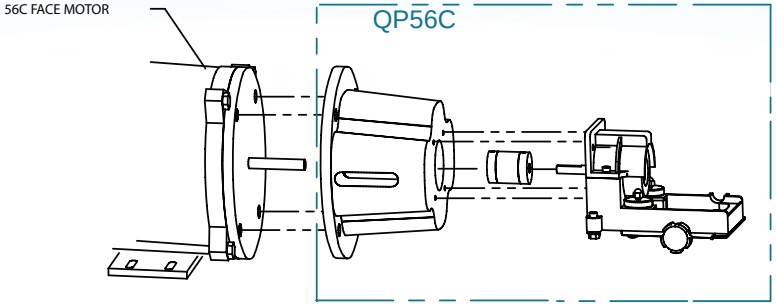
MAX. Flow/Pressure			PDM	Piston Code
ML/stroke	PSIG	BAR		
.025	100	6.90	QP	RH00
.05				RH0
.08				Q0
.10				RH1
.32				Q1
.72				Q2
1.28	25	1.72		Q3

Drive Options
Dial Indicator (pg.30) Part # Q485
P56C Face Adapter (pg. 29) Part # - P56C
Masterflex™ Adapter (pg. 29) Part # - RH/M

"QP56C" Use your own 56C Motor

QP56C

- Use your own 56C Motor (5/8" shaft diameter)
- Maximum speed 1800 RPM



"RH" Miniature Motorless

Low Flow - High

- 0 to100 microliters per stroke.
- Precision stroke to stroke = 0.5% or better.
- Pressures from -10 to 100 psig.
- Needs only 17 inch ounces of torque.
- Requires only 2 1/4" panel space.
- Accommodates standard 1/4" O.D. tubing or 1/4-28 low flow fittings.
- 0 to 100% stroke length adjustment for maximum flow rate flexibility while running or at rest.
- Linear speed vs. flow rate from 0 to 3600 RPM (360 ml/min).
- Ceramic and PVDF standard wetted materials - also available in Tefzel®.

Actual Size

RHLF

RH-LF features integrally molded ¼-28 female low dead volume ports. This allows for quick connections to 1/16" & 1/8" O.D. micro bore tubing and fittings (FMI Q661 pg. 28).

Dimensions:
2 1/4" O.D. x 3 1/2"
(57 O.D. x 89 mm)

Shaft Extension:
5/16" dia. x 3/4" long
(8 mm dia. x 19 mm long)

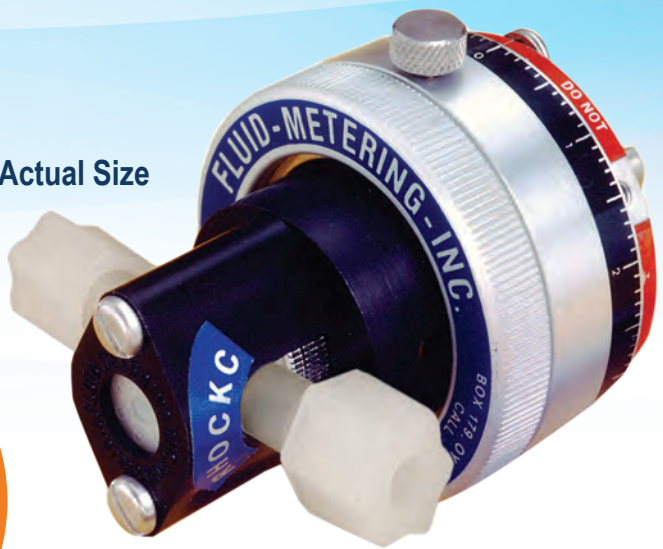
Shipping weight: 2 lb (0.9 kg)

RH Pumps

MAX. Flow/Pressure			Wetted Parts	Complete Pump Assembly
ML / Stroke	PSIG	BAR		
0 - .025	100	6.90	316 SS/PVDF/Carbon	RH00SKY
0 - .025			316 SS /E-TFE Carbon	RH00STY
0 - .025			Ceramic / E-TFE	RH00CTC
0 - .05			Ceramic / PVDF	RH0CKC
0 - .10			Ceramic / PVDF	RH1CKC

Drive Options
Masterflex Adapter (pg. 29) Part #: - RH/M
Adapter for Q (PDM) (pg. 29) Part #: - RH/Q
Low Dead Volume Pump Head (pg. 28) Part #: - LF for 1/4-28

Actual Size



RH

RH features integrally molded compression fittings sized for standard 1/4" O.D. tubing

"RH/Q" Adapter
See page 29

OEM Version
See page 21

"QD" High Speed - High Flows

For General Lab and Industrial Use

- Flow rate infinitely adjustable from 0 to 2208 ml/min in either direction.
- No Valves to clog, hang up or service.
- Ceramic and fluorocarbon standard wetted materials.
- Drift-Free Performance.
- Convenient multi-position tilt stand for wall or counter mounting.
- Rugged, long life, fan cooled, thermally protected, ball bearing motor.

How to Order Drive + Pump Head = Complete pump
QD + Q3CKC

QD

Dimensions:
9 3/4"x 4 3/4" x 5 3/8"
(248 x 121 x 137mm)
Shipping weight:
10 lb (4.5 kg)

Electrical:
115 VAC, 60Hz, 1Ø, 1.25 amps,
1/25 HP, 1725 RPM, shaded
4 pole, TEFC, sparkless,
thermally protected with 3 prong
power cord.
Motor is UL recognized

QD/IVSP/QDX PDM (PUMP DRIVE MODULE)

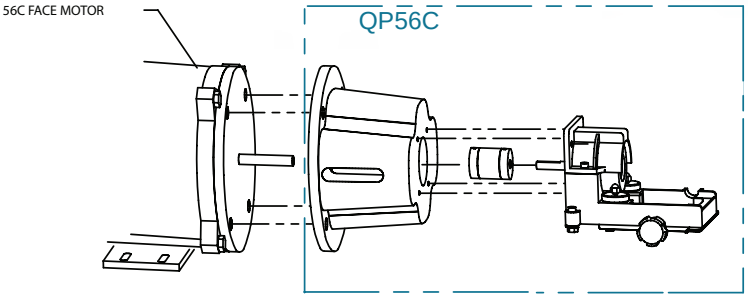
MAX. Flow/Pressure				PDM	Piston Code
ML/MIN	GAL/HR	PSIG	BAR		
43.13	0.681	100	6.90	QD	RH00
86.25	1.3				RH0
138.0	2.1				Q0
172.50	2.7				RH1
552*	8.6				Q1
1242*	18.9	50	3.45		Q2
2208*	30.0	25	1.72		Q3

*See General Specifications note (pg 35)

Drive Options
230 VAC (50/60 Hz)* Part # -2
Mounting Base (pg.15) Part # -MB
Dial Indicator (pg.30) Part # Q485
Hazardous Duty (pg.13) Part #: QDX

"QP56C" Use your own 56C Motor

- Use your own 56C Motor
- Max 1800 RPM



QP56C

"IVSP" Industrial Variable Speed Pump

- Flow Rates from 0 to 2300 mL/min at pressure up to 100 PSI.
- Remote Speed Control: 0-20 mA, 4-20 mA, 0-10 VDC.
- Multi-function I/O connector for forward, reverse, jog, emergency stop, & reset.
- Local Keyboard & Remote Control.
- Rugged, 1/4 HP, High Torque Motor, ideal for viscous fluids.
- Complete System includes Q pump, drive motor, variable speed controller, & cables.
- Motor is UL, CE, and CSA listed.

Note: See QD pg for flow rate and pressure details

FM50 variable speed controller
The FM50 is a Space-Saving, DIN Mount Controller ideal for process control panels. The FM50 controller is powered by 115 VAC or 220 V, 1 phase. UL, CE, and CSA listed.

IVSP

Dimensions:
17 3/4" x 6 7/8" x 8 1/2" wide
(451 x 175 x 216 mm)

Shipping weight:
43 lb (19.35 kg)

Electrical:
Controller:
Input: 115 VAC, 220V, 1Ø, 50/60 Hz.
Speed adjustment - max 1800 RPM
0 to 20 mA
4 to 20 mA
0 to 10 VDC

"QDX" Hazardous-Duty Drive

- Flow rate infinitely adjustable from 0 to 2208 ml/min variable in either direction 100 PSI.
- High Flow Hazardous-Duty motor Class I,Group C, D Class II, Group E, F, G
- Rugged, long life, fan cooled, thermally protected, ballbearing motor.
- Fixed Speed

Electrical:
115/230 VAC, 60 Hz, 1Ø, 1/3 hp, ball bearing, UL listed & CSA certified motor, 1725 RPM, pigtail leads for conduit connection. Motor is totally enclosed, fan cooled. 6.6 amps @ 115 VAC and 3.3 amps @ 230 VAC.

QDX

Dimensions:
17 3/4" x 6 7/8" x 8 1/2" wide
(451 x 175 x 216 mm)

Shipping weight:
43 lb (19.35 kg)

Small Solutions

"RHSY" Synchronous Pumps

The Ultimate in Low Flow Metering Accuracy

- Compact design "RH" pump with synchronous motor assembly.
- Drift-Free Performance independent of load variations or fluctuations in line voltage.
- Micrometer-like fine adjustment using an easy grip flow control ring graduated in 450 divisions.
- Choice of 150, 300, and 600 RPM through a simple and safe belt arrangement change.
- Forward-Off-Reverse switch for instant flow direction control.

RHSY

Dimensions:
5" x 5" x 4" wide
(127 x 127 x 102 mm)
Shipping weight:
4 lb (1.8kg)
Electrical:
115 VAC, 60 Hz, 1Ø, .08 amps, with 3 prong power cord.

RHSY Pumps

MAX. Flow @150 RPM ml/min	MAX. Flow @300 RPM ml/min	MAX. Flow @600 RPM ml/min	Wetted Parts	MAX. Fluid Temp	Complete Pump
3.75	7.5	15	316 SS/PVDF/Carbon	140º F	RHSY00SKY
7.5	15.0	30	Ceramic / PVDF	212º F	RHSY0CKC
15.0	30.0	60			RHSY1CKC

Drive Options
230 VAC (50Hz., .04 amp) * Part # -2

Note: Flow Rates are reduced approximately 18% when Pump Drive Module is operating on a 50 Hz electrical supply.

"PIP" Precision Dispenser

Pipetting, Syringing and Diluting

- Ideal for repetitive and volumetric dispensing of acids, solvents and aqueous solutions.
- Can act as a single shot dispenser using the hand/foot switch or as a single metering pump in the continuous mode.
- Using a combination of forward and reverse modes, dilutions can easily be accomplished.

PIP

Dimensions:
5" x 5" x 4" wide
(127 x 127 x 102mm)
Shipping weight:
5 lb (2.25 kg)
Electrical:
115 VAC, 60 Hz, 1Ø, .08 amps, 150, 300, 600 RPM with 3 prong power cord.

PiP Pumps micro π-petter®

MAX. Dispense Rates Microliters / Revolution	Complete Pump Assembly
0 - 25 µl	PiP00SKY
0 - 50 µl	PiP0CKC
0 - 100 µl	PiP1CKC

Drive Options
Low Dead Volume Pump Head (pg. 28) Part # - LF for 1/4-28

"QG" Low Speed - Low Flows

For General Lab and Industrial Use

- A choice of five different drive speed models.
- Ceramic and fluorocarbon standard wetted materials.
- Long-life, fan cooled, thermally protected, ball bearing gear motors.
- Convenient multi-position tilt stand for wall or counter mounting.
- Can be combined with all RH and Q Pump Head Modules.
- Flow rate infinitely adjustable from 0 to maximum in either direction.

How to Order

Drive + Pump Head = Complete pump
QG + Q3CKC

QG PDM (PUMP DRIVE MODULE)

MAX. Flow		Pressure		PDM	Piston Code
ML/MIN	GAL/HR	PSIG	BAR		
0.15	.002	100	6.90	QG6	RH00
0.30	.004				RH0
0.48	.007	20	1.38		Q0
0.60	.009	100	6.90		RH1
1.92	.030	75	5.17		Q1
4.32	.068	50	3.45		Q2
7.68	.119	25	1.72		Q3
0.50	.007	100	6.90	QG20	RH00
1.00	.015				RH0
1.60	.025	20	1.38		Q0
2.00	.031	100	6.90		RH1
6.40	.101	50	3.45		Q1
14.40	.227	40	2.76		Q2
25.60	.399	25	1.72		Q3
1.25	.019	100	6.90	QG50	RH00
2.50	.039				RH0
4.00	.063				Q0
5.00	.079				RH1
16.00	.252				Q1
36.00	.568				Q2
64.00	.998	25	1.72		Q3
3.75	.059	100	6.90	QG150	RH00
7.50	.118				RH0
12.00	.189				Q0
15.00	.237				RH1
48.00	.758				Q1
108.00	1.706	50	3.45		Q2
192.00	2.995	25	1.72		Q3
10.00	.158	100	6.90	QG400	RH00
20.00	.316				RH0
32.00	.505				Q0
40.00	.632				RH1
128.00	2.022				Q1
288.00*	4.550	50	3.45		Q2
512.00*	7.987	25	1.72		Q3

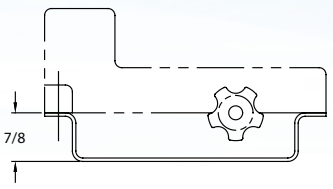
Note: Flow Rates are reduced approximately 18% when operating on a 50 Hz electrical supply.
*See General Specifications note (pg 35)

Drive Options
230 VAC (50/60 Hz)* Part # -2
24 VAC (50/60 Hz)* Part # -3
Mounting Base (pg.15) Part # -MB
Dial Indicator (pg.30) Part # Q485

PD-60-LF
Pulse Dampener Accessory
(see pg 30) for more info.

QG

Dimensions:
10 3/4" x 4 7/8" x 5 3/4"wide
(273 x 124 x 146 mm)
Shipping weight:
10 lb (4.5 kg)
Electrical:
115 VAC, 60 Hz, 1Ø, 1 amp, 6, 20, 50, 150, 400 RPM, shaded 2 pole, enclosed ventilated, thermally protected ,135°C with 3 prong power cord



"Q" Fixed Mounting Base KIT MB
Sturdy mounting base accessory for "Q" Line metering pumps.
The "Q"mounting base allows pumps to be firmly bolted to surface in horizontal or vertical operating position.
Hardware for attaching base to pump and instructions included.

"RHB/QB-" Direct Current Pumps

For Mobile, Remote & Instrumentation

- 12, 24, and 90 VDC motors with close-coupled RH/Q Pump Heads.
- Widely used to inject discrete quantities of additive fluids into main discharge lines of tank trucks and pest control vehicles.
- Ideal for environmental sampling & injection.
- Offers the advantage of mechanical adjustment of stroke length, plus electrical control of stroke rate by voltage variation.
- Extended motor shaft accepts FMI HES/PRS Rotational Sensors or user supplied rotational sensor (see page 28 for more info).

RHB

Dimensions:
8" x 3" x 3" wide
(203 x 76 x 76 mm

Shipping weight:
7 lb (3.15 kg)

Electrical:
12 VDC, 4 amps, 2600 RPM, totally enclosed, with 6" pigtail leads. Shaft extension: 5/16" dia. x 1" long with flat.

RHB Pumps

MAX. Flow	Pressure		Wetted Parts	MAX. Fluid Temp	Complete Pump
ML/MIN	PSIG	BAR			
65	100	6.90	316 SS/PVDF/Carbon	140° F	RHB00SKY
130			Ceramic / PVDF	212° F	RHB0CKC
260					RHB1CKC

+

Drive Options
24 VDC (3 amps) for RHB Part # -4
90 VDC (0.41 amps) for RHB Part # -5

How to Order Drive + Pump Head = Complete pump
QB + Q1CKC

QB

QB PUMPS: Rated at 1800 RPM (or approximately 8 volts for 12 VDC models.)

Dimensions:
10 1/2"x 5"x 4 1/2" wide
(267 x 127 x 114 mm)

Shipping weight:
8 lb (3.6kg)

Electrical:
12 VDC, 4 amps; 24 VDC, 3 amps; 90 VDC, 0.41 amps, totally enclosed with 6" pigtail leads.
Shaft extension:
5/16" dia. x 1" long with flat

QB PDM (PUMP DRIVE MODULE)

MAX. Flow/Pressure			PDM	Piston Code
ML/MIN	PSIG	BAR		
45	100	6.90	QB	RH00
90				RH0
144				Q0
180				RH1
576*	70	4.38		Q1
1296*	30	2.07		Q2
2304*	25	1.72		Q3

*See General Specifications note (pg 35)

+

Drive Options
Mounting Base (pg.15) Part # -MB
Dial Indicator (pg.30) Part # Q485
24 VDC (3 amps) Part # -4
90 VDC (0.41 amps) Part # -5

"QBG" Low Current DC

Ideal for Battery Operation

- Ideal for extended 12/24 VDC battery operation in remote locations.
- Rated 60 RPM at 12 VDC and 120 RPM at 24 VDC (60 to 120mA).
- Ideal for Rhodamine Dye and Morpholine remote sampling

QBG PDM (PUMP DRIVE MODULE)

MAX. Flow/Pressure			PDM	Piston Code
ML/MIN	PSIG	BAR		
1.5	60	4.1	QBG	RH00
3.0				RH0
4.8				Q0
6.0				RH1
19.2	30	2.07		Q1
43.2	20	1.38		Q2
76.8	10	0.70		Q3

+

Drive Options
Mounting Base (pg.15) Part # -MB
Dial Indicator (pg.30) Part # Q485

Note: Flow rates shown for QBG are based on 12 VDC, 60 RPM operation. (60 rpm at 12 VDC 120 rpm at 24 VDC)

QBG

Dimensions:
9 3/4" x 5 1/4" x 6 3/4" wide
(246 x 135 x 171 mm)
Shipping weight:
7 lb (3.15kg)
Electrical:
12/24 VDC, 60-120 mA
(depending on load), with 6" pigtail leads.

"PD" Pneumatic

For Non-Electric Operation

- Provides a compact, variable speed, air powered drive.
- Ideal power alternative when electrical power source not available.
- SPD up to 1800 RPM.
- GPD up to 400 RPM (See page 15 QG400 for flow rate data).

How to Order Drive + Pump Head
SPD + Q1CKC = Complete pump

SPD PDM (PUMP DRIVE MODULE)

MAX. Flow/Pressure			PDM	Piston Code
ML/MIN	PSIG	BAR		
45	100	6.90	SPD	RH00
90				RH0
144				Q0
180				RH1
576*	70			Q1
1296*	50	3.45		Q2
2304*	25	1.72		Q3

*See General Specifications note (pg 35)

+

Drive Options
Dial Indicator (pg.30) Part # -Q485
Pulse Suppressor (pg.31) Part # 58003

PD

Dimensions:
8" x 3" x 3" wide
(203 x 76 x 76 mm)
Specification:
SPD: Air requirements
9-10 CFM at 40 psig.
Air Inlet size: 1/8" (F) NPT.
GPD: Heavy-duty gear box
Air requirements:
14-16 CFM at 40 psig.
Air Inlet size: 1/8" (F) NPT
Shipping weight:
9 lb (4.05 kg).

Solutions for All Your OEM Applications

Production-OEM-LAB

One Dispenser / Pump For All Your Applications

Valveless Syringing Aspirate & Dispense

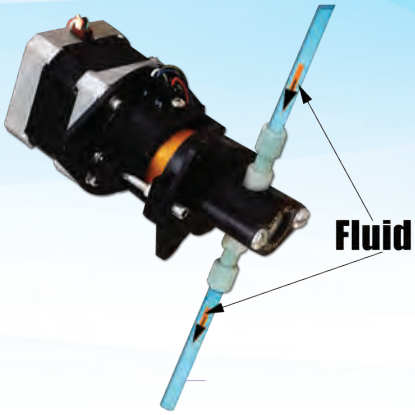
Fast Prime Flush & Wash

0-2,000 ml/min

Continuous Dispensing

Precision % CV of 0.5% or better

Continuous Metering



0-2,000 ml/min

Production-OEM-Lab

"STRH" Adjustable Low Flow Stepper Pump

STRH

- Meter, Dispense, Aspirate, Flush.
- Precision RH adjustable pump with stepper motor.
- Valveless, Reversible, Self priming.
- Ceramic and fluorocarbon, low dead-volume fluid path.
- Ideal for Prototyping.
- Optical Sensor.

MAX. Dispense Rates Microliters / Revolution	Wetted Parts	Complete Pump Assembly
0 - 25 µl	Ceramic PVDF	STRH00CKCLF
0 - 50 µl		STRH0CKCLF
0 - 100 µl		STRH1CKCLF

"STQP" Adjustable High Flow Stepper Pump

STQP

- Precision, variable displacement "Q" Pump with integral stepper motor.
- Accommodates all "Q" style pump heads and RH pump heads (with RH/Q adaptor).
- Ideal for OEM applications where accurate & frequent displacement changes are expected.
- Available in ST2QP Duplex Ratio:Matic® configurations.
- Ideal for prototyping.
- Can be driven by FMI's ICST-02, or a variety of commercially available stepper driver boards.

"ICST-02" Stepper Control

ICST-02

- Programmable Control for All FMI Stepper Pumps.
- Extensive Dispense & Metering Capabilities.
- Multiple Input and Output Connections.
- RS 232 Serial Port for PC Connection.
- MS Windows® Programming Software Included.
- Compact Size: 2.0" x 3.1" x 1.6" high (51 x 79 x 41 mm).

OEM Dispensers/Pumps

High Precision Stepper Motor Pumps for OEM Applications

- No Valves to clog, hang up or service.
- One Moving Part - Piston.
- Drift-Free performance.
- Precision % CV of 0.5% or better.
- Ceramic and fluorocarbon fluid path.
- Displacement of 0 to 1280 microliters (1.28 ml) per revolution.
- 1.8º stepper motors with opto sensors.
- Excellent chemical resistance.
- 6 standard models and custom models.
- Special OEM pricing available upon request.

Model as Shown with
17 frame motors

STH

Low Flow "STH"

MAX. Dispense Rates Microliters / Revolution	Wetted Parts	Complete Pump Assembly
0 - 25 µl	Ceramic PVDF	STH00CKCLF
0 - 50 µl		STH0CKCLF
0 - 100 µl		STH1CKCLF
0 - 200 µl		STH2CKC

High Flow "STQ"

MAX. Dispense Rates Microliters / Revolution	Wetted Parts	Complete Pump Assembly
0 - .32 ml	Ceramic PVDF	STQ1CKC
0 - .72 ml		STQ2CKC
0 - 1.28 ml		STQ3CKC

STQ

"Intelligent" Programmable Pump

- FMI's STH Stepper Pump with integral programmable driver
- Driver provides servo control of a stepper pump
- 5 Programmable inputs, 2 programmable outputs
- Multiple programming platforms including Visual Basic, C/C++, Delphi, Lab VIEW
- Analog 0-5V, RS-232 serial , CANopen protocol supported
- Resonance-free, quiet operation
- EtherCAT (with optional module)

OEM Dispensers/Pumps

STF

"STF" Fixed Displacement Pump

Ideal for waste, wash, and flush fluid control in medical instrumentation.

- Economical design with fixed displacement link.
- Displacement link can be customized for individual requirements.
- Precision stepper motors with opto sensors.
- Used extensively to recirculate dialysate in hemodialysis equipment.
- Available in 25µl, 50µl, 100µl, & 200µl versions or custom.
- Isolation Gland available for crystallizing fluids.

STH2

"STH2" 200µl STH Pump

Ideal for reagent dispensing in clinical chemistry applications.

- Extended dispense and flow range in a compact OEM design.
- Precision, high-torque stepper with opto sensor.
- High performance, extended-life, seal configuration.

H-W

"H-W" Isolation Gland Pump

Miniature OEM Pump with Isolation gland ideal for low volume fluid control of crystal forming fluids.

- Easily handles saline, slurries, particulates and abrasives.
- Isolates main process fluid from seal area & atmosphere
- Barbed fittings provide quick connections to gland ports.

Have questions?
Chat live with an FMI application specialist at www.fmipump.com

Ratio:Matic® Duplex Stepper Pumps

For Proportional and Dual Channel Dispensing and Metering

"ST2RH" Low Flow Adjustable

Ideal for high throughput production dispensing in the manufacture of disposable medical components.

- Dual, variable displacement RH pumps with integral stepper motor.
- Each pump head is independently adjustable using easy-grip flow control ring.
- Ideal for precision low volume dispensing of solvents, adhesives, lubricants, electrolytes, and more.
- Ratio:Matic® proportional dispensing of ratios up to 100:1.

ST2RH

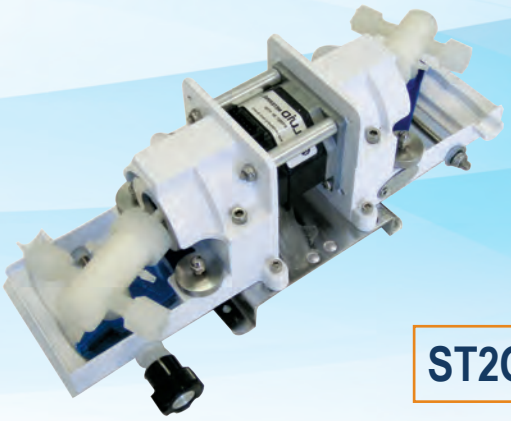
"ST2H" Low Volume Fixed Displacement

Compact, dual channel fluid control ideal for OEM Medical & Analytical Instrumentation.

- Fixed displacement for dual channel or proportional fluid control.
- Proportional fluid control ideal for mixing and diluting.
- Each pump head individually factory calibrated to your specifications.
- Accommodates all combinations of "H" piston sizes for dispense ratios up to 100:1.

ST2H

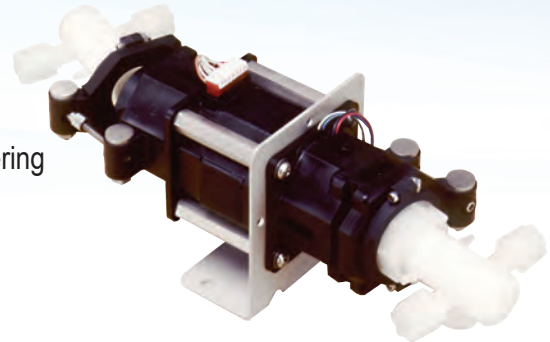
"ST2QP" High Flow Adjustable



- Dual, STQ high flow pump heads for proportional metering using a single stepper motor.
- Each pump head displacement is independently field adjustable.
- Accommodates all combinations of "Q" pump sizes

ST2QP

"ST2Q" Fixed Displacement



- Dual, STQ high flow fixed displacement pump heads for proportional metering using a single stepper motor.
- Each pump head displacement is factory calibrated.

ST2Q

Specialty Pumps

"CL1, CL2" CHLORITROL

Valveless Hypochlorite Injection

The Pump that Never Loses Prime!

The Chloritrol is the solution for Sodium Hypochlorite injection. Totally new patented technology & field tested, perfect for high and low demand applications, including Ultra Low Volume.

- No Valves or Diaphragms to Service.
- No Loss of Prime... Ever!
- Ability to Prime Against 125 psi Line Pressure.
- Months of "no touch" service = fast payback.
- Low Energy Consumption.
- Protective Enclosure, Space-Saving Wall Mount Design.
- **"C100A"** Variable Speed DC Controller accepts 4-20 mA control signal.

CL1,CL2

Dimensions:
15 1/2" x 13 3/8" x 6 3/4"

Shipping weight:
18.6 lbs. (8.4 kg.
Electrical: 0-90 VDC

"VMP OEM" Electronic Variable Displacement & Variable Speed Dispense System

- Independently control both stroke rate and displacement volume.
- Forward, Reverse, Suck-back, & Quick Prime all adjustable.
- Up to 100 customer-designed programs let you change setups on the fly for different applications.
- RS232 and RS485 interface enables simultaneous computer or PLC control of up to 128 pump modules.
- FMI's Patented CeramPump® No-Valve Design.
- **"TSI"** Touch Screen Interface provides quick and easy programming of VMP products and can control up to 16 individual VMP Pump drives. Accommodates up to 100 customer-designed programs.

VMP OEM

Dimensions:
8.97" x 3.0" x 4.44"
(228 x 76 x 113 mm)

Shipping weight:
4 lbs

TSI

Specialty Pumps

"PDS100" Smooth-flo

Valveless Pulse-Free Dispensing & Metering System

The Smooth-flo PDS100 is a unique valveless dispensing and metering system which utilizes dual FMI pumps, precisely synchronized, to eliminate pulsation typically present in other piston pump designs.

- Pulse-Free fluid delivery down to 15 µl/min continuous flow.
- Precision dual stepper control, factory calibrated for your flow range.
- RS485, 4-20 mA, 0-5 V, 0-10 V electronic control interface for connection to process sensors, PLC and PC control systems.
- Rugged, anodized aluminum enclosure is suitable for wall mounting or bench top installations.
- Includes tubing, fittings, and configuration instructions for Smooth-flo operation.
- Universal Power Input accepts 100-240 VAC 50/60 Hz.

PDS-100 SF Smooth-flo

Dispensing (mL/Rev.)	Metering (mL/min.)	MAX. Flow/Pressure		PDM	Piston Code
Min.[1] - Max.[2]	Min.[3] - Max.[4]	PSIG	BAR		
.0025 - 0.050	0.015 - 10	60	4.12	PDS-100 SF	RH00
0.005 - 0.10	0.03 - 20				RH0
0.008 - 0.160	0.048 - 32	20	1.38		Q0
0.01 - 0.20	0.06 - 40	60	4.12		RH1
0.032 - 0.64	0.192 - 128	20	1.38		Q1
0.072 - 1.44	0.432 - 288				Q2
0.128 - 2.56	0.768 - 512				Q3

1) Minimum dispense volume per rev. is the total output for 2 identical pumps set at 5% of maximum displacement.

2) Maximum dispense volume per rev. is for 2 identical pumps set at maximum displacement.

3) Minimum continuous flow rate is the total output for 2 pumps set at 5% of maximum displacement operating at 6 RPM.

4) Maximum Flow Rate is for 2 identical pumps set at maximum displacement at 200 RPM.

Pulsation reduced 92 - 96% for Q Pump Heads and 93 - 96% for H Pump Heads.
Example: Pulsation for a PDS-100 with Q1 Pump Heads at 150 RPM is reduced by 97%.

PDS100 SFSTH

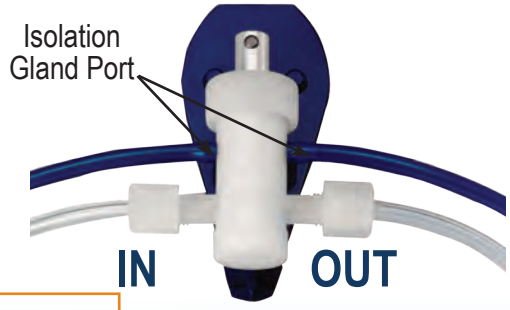
Dimensions:
7 1/4" x 5 1/8" x 6 1/4" wide
182 mm x 128 x 159 mm

Electrical:
RS485, 4-20 mA, 0-10V, 0-5V interface for connection to process sensors, PLC and PC controllers

PDS100 SFSTQ

Have questions?
Chat live with an FMI application specialist at www.fmipump.com

Pump Heads



CKCW

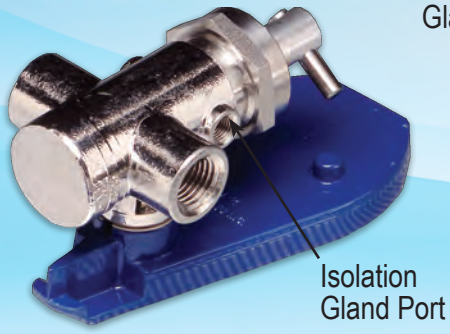
"W", "WT" Isolation Gland Pump Heads

- For saline, slurries, abrasives, particulates, anaerobics, and crystal forming fluids. For temperature to 212° F.
- Isolates main pumped fluid from seal area and atmosphere.
- 2 extra ports for Gland "Barrier" liquid or gas.
- For Q1/Q2CKC, Q3CKC, & CSC Pump Head Modules.

H-W

"H-W" Isolation Gland Pump Heads

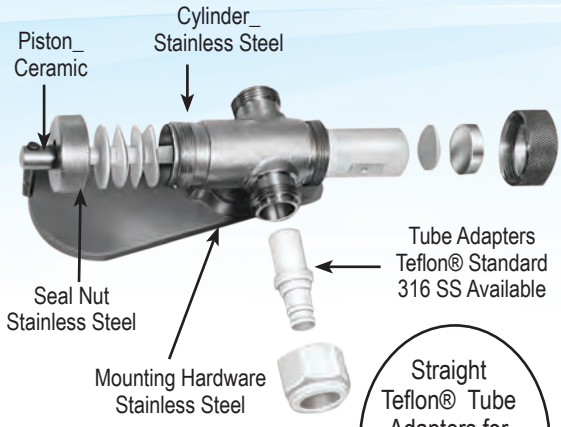
- Easily handles saline, slurries, particulates and abrasives.
- Isolates main process fluid from seal area & atmosphere
- Barbed fittings provide quick connections to gland ports.



CSC-W

"CSC-W" Stainless Steel

- Gland Design temperature to 350° F.
- Pressure to 100 psig.
- Ceramic piston and liner in 316 SS case.
- Main flow 1/4" NPT female; Gland Ports: 10-32 female



SAN-S

"SAN" Sanitary Pump Heads

- Ideal for accurate and dependable handling of discrete fluid streams in sanitary applications.
- No internal threads or blind holes to harbor bacterial growth.
- Easily dismantles for scrubbing, brushing, & sterilization.
- 316 SS and Teflon® fluid surfaces highly resistant to chemical & biological attack.
- Ideal for Food, Dairy, Brewery, Pharmaceutical, & Biotech applications.
- Tri-Clamp" Flange Kit (see page 29 for more info)

DESIGNED FOR QUICK DISASSEMBLY
FOR MAXIMUM CLEANING

ALL STAINLESS STEEL VERSION AVAILABLE WITH SS PORT NUTS, TUBE ADAPTERS & CARRIER -"SAN-S"

Pump Heads

"SAN-TC" Tri-Clamp Sanitary Pump Head

- "SAN" Type Sanitary Pump Heads with 316SS Tri-Clamp flange fittings.
- Tri-Clamp fittings are an industry standard for applications which require "quick-connect" fittings for easy sanitizing and/or sterilization.
- 1" Flange will accommodate both ½" and ¾" standard tube sizes.
- Ideal for food, beverage, biotech, and pharmaceutical process applications.

SAN-TC

"Q1CSC-200" 200 PSI "Q" Pump

- Increases the operating pressure up to 200 PSI for applications requiring flow rates up to 500 mL/min (Consult factory for drive selection)
- Ideal for Medium Pressure Liquid Chromatography.
- New, high performance, extended-life seal configuration.

Q1CSC-200

"CSC-WT" High Temperature

- For maintaining process fluid temperatures and pumping viscous fluids
- High temperature to 350°F
- Accepts 2 standard 1/4" x 1" cartridge heaters & thermocouple.
- Pressure to 100 psig.
- Ceramic piston and liner in 316 SS cylinder case.
- Main flow 1/4" NPT female ports; Gland Ports 1/8" NPT female.

CSC-WT

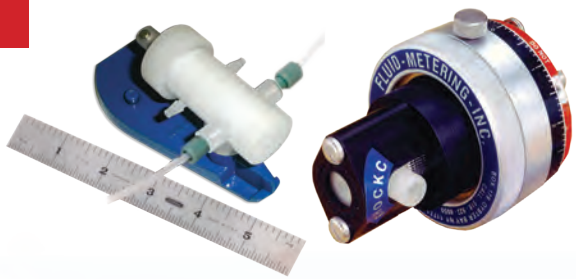
"Q1CV & Q2CV" PVC Pump Head

- Offers superior chemical resistance for metering concentrated water treatment chemicals.
- Extended pressure range of 100 psi.
- Wetted parts of ceramic and PVC.

Q1CV, Q2CV

Options

"LF" 1/4-28 Low Flow pump Heads



Q-LF RH-LF

- For low flow (under 50 ml/min), and Zero Dead Volume Applications.
- Direct connection to 1/4-28 low flow fittings.
- RH-LF & Q-LF* pump heads feature integrally molded 1/4-28 female low dead volume ports. This allows for quick connections to 1/16" or 1/8" O.D. micro bore tubing and fittings such as FMI Q661.
- Add suffix "LF" after Pump Head configuration.

* polypropylene case

"Q661" Small Bore Tubing Kit

Q-661

- Ten (10) 1/4-28 Fittings Delrin® or TFE, Tefzel® Ferrules
- Flangeless design that assures leak-free, zero dead-volume connections.
- Tefzel® and Teflon® wetted surfaces.

Kit Q661A Delrin (Black) - 1/16" | **Kit Q661B Delrin (Green) - 1/8"** | **Kit Q661C TFE (white) - 1/8"** | **Kit Q661 Delrin - 1/16" & 1/8"** Contains both Q661A & Q661B

Hall Effect Sensor

Hall Effect Electrical Specification

PART NO.	Supply Voltage (VDC)	Supply Current (mA max.)	Output Type	Output Voltage (V)	Output Current (Max.)	6" Leadwires
HES-6	4.5 TO 24	10.0	Sink	0.4	40mA	22 gauge teflon insulated

Life: Indefinite

Order : HES-6

Proximity Type Rotational Sensor

PART NO.	FORM	CONTACT RATING	MAX RPM
PRS-1	SPST-N.O.	10 Watts, Max.	1000

Life: 50 Million Operations at 5 VDC, 10 mA

Order : PRS-1

Accessories

"QP/M" & "RH/M" FMI Masterflex® Kits

Enhance your Existing Masterflex Pump Drives

QP/M

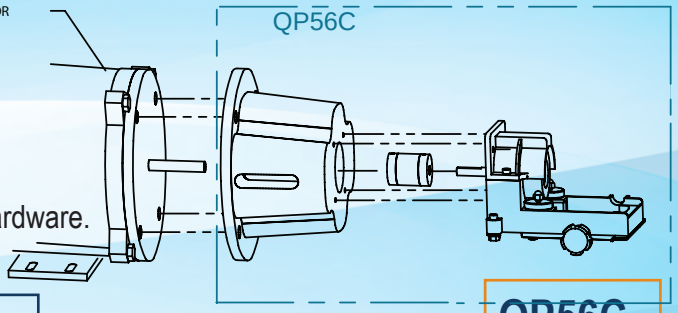
- Move to state-of-the-art valveless piston technology.
- Extend operating pressure to 100 psig.
- Improve your long term Performance.
- Add precise mechanical flow adjustment to your L/S™ drives.
- Ceramic and fluorocarbon standard wetted materials.
- Installs in minutes to your L/S™ standard pump head, L/S™ EASYLOAD™ pump head, or directly to any L/S™ drive.
- Flow rates from microliters to 768 ml/min.

Masterflex- Reg TM of Cole-Parmer Instrument Co.
L/S - Reg TM of Cole-Parmer Instrument Co.
EASY-LOAD - Reg TM of Cole-Parmer Instrument Co.

Order : KIT # QP/M or RH/M

RH/M

"QP56C" Adapter Kit

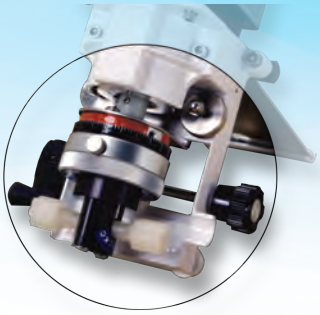


- Adapter Kit for easy hook-up to your NEMA 56C FACE Foot Mount motor.
- Kit includes Pump Drive Module QP, adapter, coupling and hardware.

Order : KIT # QP56C

QP56C

"RH/Q" Adapter



- Adds versatility to your RH pump head by adapting it to any "Q" pump drive.
- Simple installation of adapter to RH pump head using only 3 screws.
- Pump assembly can easily be slipped onto the Drive Module in seconds without tools.

Order : KIT # RH/Q

RH/Q

"Tri-Clamp" Sanitary Pump Heads

- Easily changes barbed fittings supplied with "SAN" to "SAN-TC" type.
- 1" Flange will accommodate both ½" and ¾" standard tube sizes.
- Kit consists of 316SS Tri-Clamp flange and Teflon port seal.

Order KIT # 400577

Accessories

"R479" Low Flow Isolation Kit

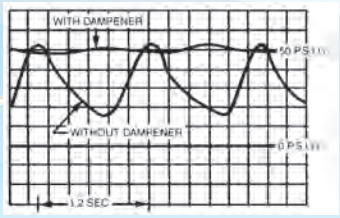
- Low flow adapter for stainless steel "Q" pump heads (except SAN).
- Isolates stainless steel cylinder case from process fluid for maximum chemical inertness.
- 1/4-28 female thread provides minimal system dead volume.
- Typically used with FMI "Q661" Small Bore Tubing Kit.
- Ideal for chromatography applications when used with "PD-60-LF" Pulse Dampener (max 65 psi) .
- For flows up to 50 ml/min and pressures to 100 psig.

R479

R479 Kit for LOW FLOW APPLICATIONS (Replaces R412, when used)

Kit #R479 Consisting of four ferrules, two adapters & assembly/removal tools

#R478 Consists of ten spare ferrules



Actual Recorded Pulse Pattern of an FMI LAB PUMP with and without the PD-60-LF

PD-60-LF

"PD-60-LF" Pulse Dampener

- Provides pulseless flow for low flow metering applications
- Suppresses approximately 90% of pulse magnitude.
- Corrosion resistant 316 SS and Teflon® wetted surfaces.
- Excellent reduction of baseline drift & noise in feeding low pressure LC systems.
- For flows up to 50 ml/min & stroke rates up to 150 RPM against head pressures of 10 to 65 psig.
- Accepts standard 1/4-28 low flow tubing accessories.
- Includes isolated pressure gauge.

Q485

"Q485" Dial Indicator Kit

- Ultra-precise flow adjustment for "Q" pumps.
- Responds to the slightest adjustment of the "Q" pump adjusting knob.
- Each increment on direct reading dial represents 1/1000 of maximum flow.
- Easily attaches to all "Q" Pump bases.
- Can be ordered with pump or separately.

Kit # Q485

Accessories

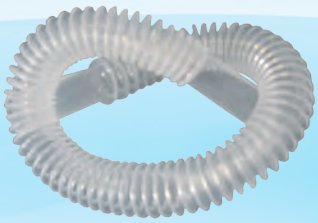
"PD-HF" In-Line Pulse Suppressor
(For High Flow Applications)

- For high flow systems of 50 ml/min or greater and stroke rates higher than 150 rpm against head pressures of 10 to 65 psig.
- Unique encapsulated polyethylene bellows design that eliminates tubing vibrations and cavitation problems.
- Easy to connect 1/4" compression fittings.
- Best results when installed on both suction and discharge lines.

PD-HF

Corrugated Teflon® Tubing Pulse Suppressor
(For High Flow Applications)

- Highly flexible no-kink tubing for high flow, (50 ml/min or greater), high pressure (100 psig) applications.
- Eliminates cavitation and mechanical stress.
- Best results when used on both suction and discharge lines.
- Slips over 3/8" barbed fitting. 3/8" I.D. x 12" long



 # 58003

Tubing Adapters
(For Plastic Case Pump Heads)

The integrally molded port fittings on the standard FMI Type K pump heads accept all 1/4" O.D. tubing. For other tubing arrangements, special port adapters are required.

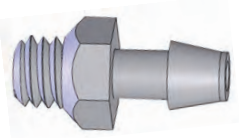
#R412-0K	Adaptor for 1/8" I.D. tubing
#R412-1K	Adaptor for 1/4" I.D. tubing
#R412-2K	Adaptor for 3/8" I.D. tubing
#R412-6K	Adaptor for 1/2" I.D. tubing
#R412-5K	Adaptor for 1/4-28 ferrule fittings
#H476K	Adaptor for 1/8" O.D. tubing
#110949	Adaptor for 6 mm O.D. tubing

Low Flow Barb Adapters for 1/16" & 1/8" I.D. Tubing

Threaded 1/4-28 UNF fitting to PVDF barb bottom sealing, rotating adapters consisting of a white nylon 1/4-28 fitting with 5/16" hex nut and PVDF (fluid path) insert barb.

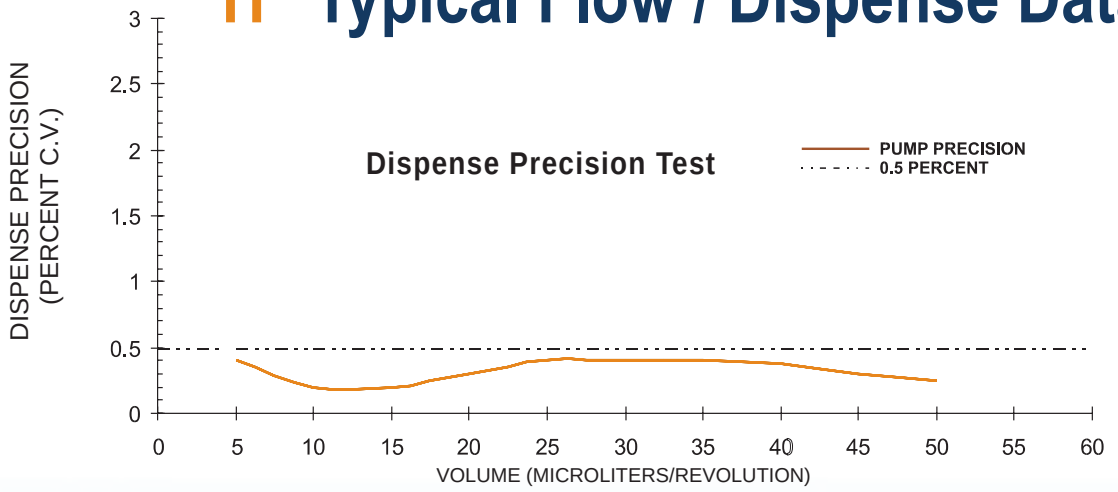
#110873A for use with 1/8" (3.2 mm) I.D. tubing. Pkg. of 10

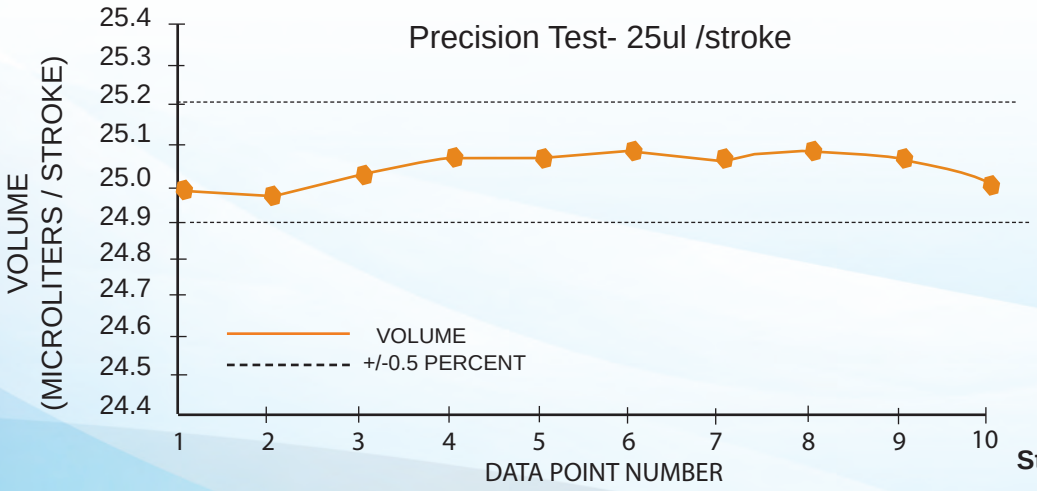
#110874A for use with 1/16" (1.6 mm) I.D. tubing. Pkg. of 10



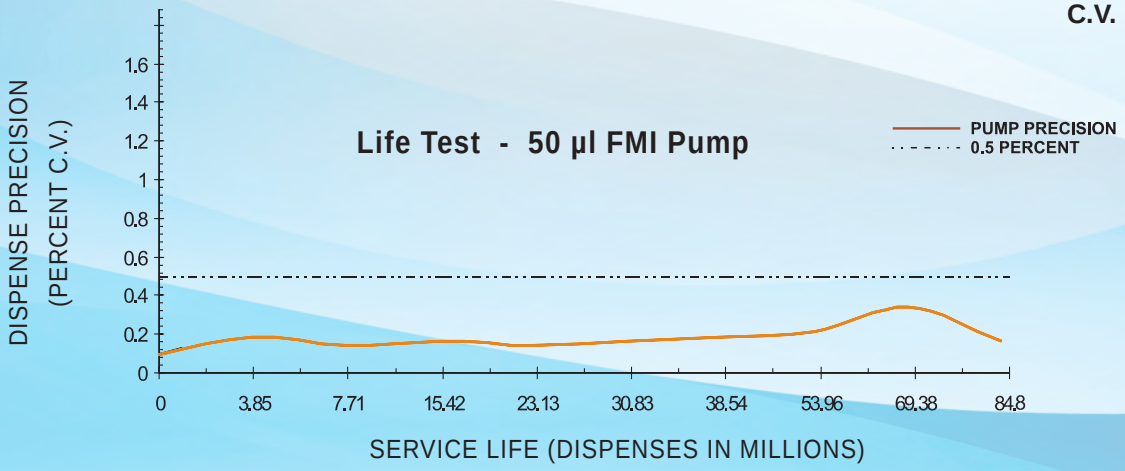
#110847-01 for use with 1/8" flexible tubing connection to isolation gland stainless steel "Q" Pumps

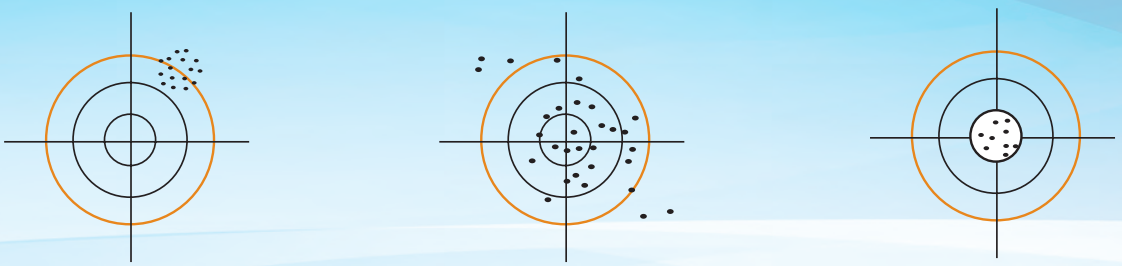
"H" Typical Flow / Dispense Data





1	24.98
2	24.97
3	25.02
4	25.07
5	25.06
6	25.08
7	25.06
8	25.08
9	25.06
10	24.99
Total	**250.37**
Avg:	**25.04**
Std.Dev.:	**0.04**
C.V.	**0.17**





Precision
Repeatability and degree of variation of a set of values

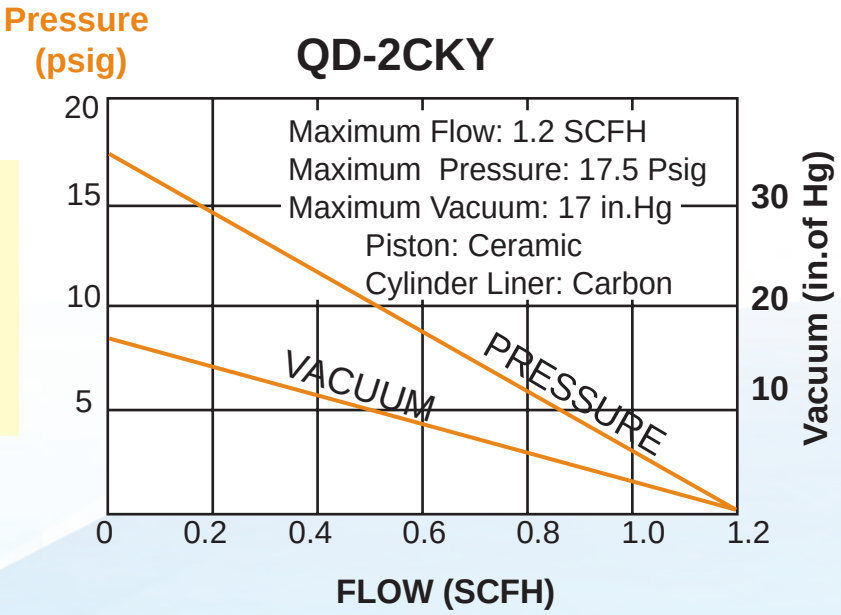
Accuracy
How close the average value is to the true value

FMI Pumps
Accurate & Precise

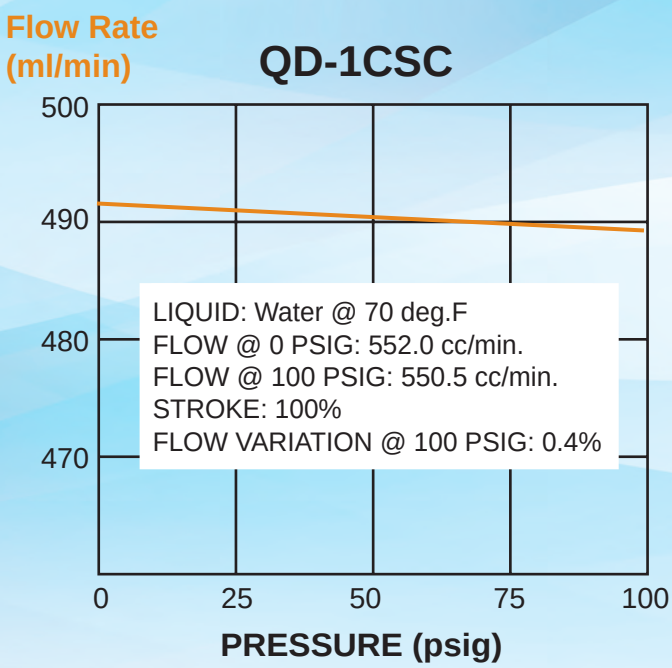
"Q" Typical Performance Curves

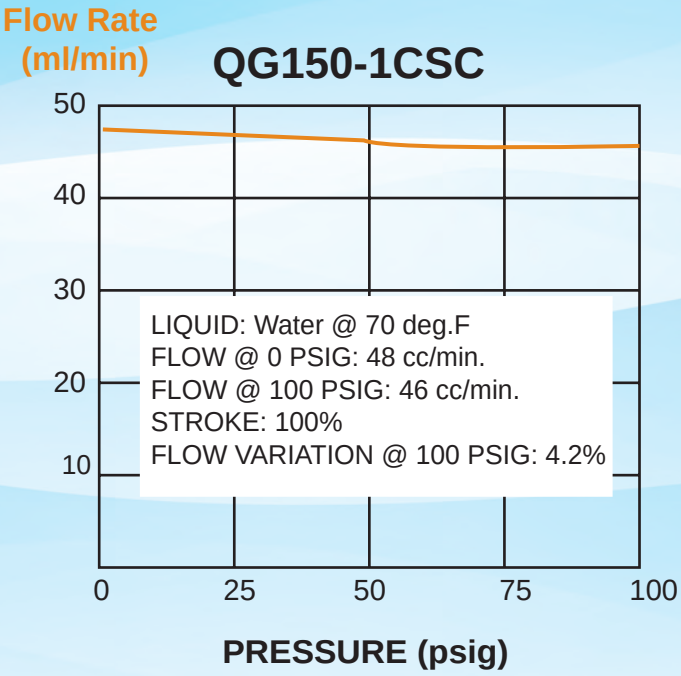
Performance curves shown below are applicable to the "Q" line of metering pumps.

Performance Curve shown represents a test run on an FMI LAB PUMP handling ambient air at 70°F with CKY Pump Head Module.



PERFORMANCE FLOW CURVES: Typical flow "curves" for FMI LAB PUMPS with "CSC" pump heads handling water at a pump setting of 100% full stroke. Internal fluid slip (decrease in flow with increased pressure) is lowest at 100% stroke and increases as stroke displacement is decreased. Always select a pump with maximum output nearest your actual requirement.





Materials of Construction

FMI fluid contact components are fabricated of carefully selected materials. Each one has discrete characteristics of physical strength, abrasion resistance, and dimensional stability under varying conditions of pressure, temperature, and resistance to attack by certain chemicals. Since no one material possesses all of the characteristics required to handle all chemicals under all possible conditions, FMI offers a selection of materials of construction for each pump component that fluids contact during the pumping process. These components and materials are identified below by code designation, common usage names and trade names. General Characteristics are as follows:

C — Ceramic*

Ceramic is used in most of the pumps for piston and/or cylinder liners. Ceramic pistons may be used with ceramic and carbon cylinder liners. Ceramic cylinder liners can only be used with ceramic pistons. Sapphire hard, fused crystalline Ceramic Al2O3, excellent chemical resistance, thermal stability and mechanically resistant to common abrasives.

Z — Zirconia*

YTZP pistons for H00 ceramic liners in very low dispense/flow apps . Max fluid temp 80 deg C (176 deg F)

***Caution:** Subject to binding or freezing when stored after improper cleaning - brittle and subject to fracture under sudden impact loading -not suitable for very “dry” fluids such as hexane.

K — Fluorocarbon PVDF

Fluorocarbon PVDF, is used for some cylinder cases and tubing fittings. Autoclavable @ 240ºF maximum. Good chemical tolerance to most fluids. Caution: Sensitive to degrading effects of some organic solvents, esters, and ketones.

S — Stainless Steel 316

Stainless Steel 316 is used for some pistons, cylinder cases and/or tube fittings. Not to be used as piston with ceramic cylinder liner. Excellent chemical, and physical strength characteristics.

Caution: Subject to attack by some halides, strong acids, and bases - subject to surface abrasion and wear in piston application.

Y — Carbon

Carbon is used for some cylinder liners. Suitable for use with stainless steel and ceramic pistons.

Hard crystalline stage, ingot sintered, pure carbon chemically resistant to most commonly used fluids.

Caution: Sensitive to strong oxidants and all abrasive materials.

T — Tefzel, Dupont.

Fluoropolymer E-TFE - Used for cylinder cases in some FMI Pump Head Modules. Excellent chemical resistance to most acids, bases and solvents. Autoclavable @ 240ºF maximum.

Rulon®AR, Saint-Gobain
Fluorocarbon, filled PTFE - Used for lip seals in some FMI pump heads. Excellent chemical resistance, - physically soft, resilient and wear resistant - abrasive to soft metals and should therefore not be used with “S” pistons in high stroke rate applications.

Rulon®J, Saint-Gobain
Fluorocarbon, filled PTFE - Used for lip seals in some FMI pump heads. Good chemical resistance, sensitive to some organic solvents, strong acids and bases - physically soft, resilient and non-abrasive.

Teflon®, Dupont Co.
Fluorocarbon PTFE - Used for seals and fittings in some FMI pump head modules - excellent chemical resistance characteristics - soft, pliable, easily cut, nonstick surface chemically stable over wide thermal range, dimensionally sensitive to temperature change -not suitable for structural components.

Application Tips

PRESSURE: In most FMI pump models, motor starting torque is the limiting factor in the stated pressure rating. Fluids such as oils, creams and gels that are good lubricants are more easily pumped than aqueous or “dry” fluids and therefore require less motor torque and may be pumped against pressures considerably greater than those given in the rating charts.

All pump head components are designed to withstand backpressures up to 100 psig at room temperatures, though pump heads with fluorocarbon cylinder cases may exhibit some loss of pumping capacity at pressures over 60 psig.

ACCURACY: FMI pump accuracy is based on a simplified positive displacement mechanism. The valveless design provides a presision of better than 0.5% when handling medium viscosity fluids (50 to 500 centipoise). Aqueous solutions and light solvents work well but may exhibit some sensitivity (fluid slip) to variations in discharge head pressure. Gums, gels and non-abrasive semi-solids are handled with a high degree of accuracy... a direct result of the valveless design.

Viscous, tacky solutions, semi-solids and heavy slurries which tend to resist (cavitate) suction flow into a pump head can be handled with ease by selecting an FMI pump employing a relatively slow reciprocation rate.

The principal flow rate deviations of an FMI pump are fluid slip and stroke repetition rate. These two factors in turn are related to load factors such as viscosity, differential pressure, and drive motor voltage. When these two factors are controlled, the FMI pump will handle most fluids with reproducibility of better than 0.5%.

GAS PUMPING: Due to the valveless design of the FMI pump “CKY” and “CSY” pump heads are able to perform accurate gas transfers. With no valves to introduce random compression errors, gas sample flow in bagging, scrubbing and transit operation can be accurately preset based on actual piston displacement.

IMPORTANCE OF CLEAN FLUIDS: While a certain amount of caution must be exercised in the use of abrasive fluids in any metering pump, the “CKC” and ”CSC” tend to be more tolerant of suspended solids than other metering pumps. To assure fluid compatibility, consult the Materials of Construction information above.

FOR BEST PUMPING RESULTS: Select an FMI PUMP having a maximum flow rating as near to the desired flow rate as possible.

How To Order

1. Determine your flow rate in ml/min and your pressure requirements in PSIG.
2. Check that the drive power fits your application, i.e. AC, DC, stepper, etc.
3. Check the Piston Size Code for your flow rate and select a Pump Drive Module plus options.
4. Go to page 3 and select a Pump Head Module (PHM) compatible with your fluid and application.

Example

Q PUMP DRIVE MODULE | Q OR RH PUMP HEAD MODULE | COMPLETE PUMP ASSEMBLY

Pump Drive: QD
+Option(s): Q485
Cost: _____

Pump Head: Q-1CKC
Option(s) W
Cost: _____ = Total Cost:

Pump Drive: _____ $ _____
+ Option: _____ $ _____
Cost: _____ $ _____

Pump Head: $_____
+ Option: $_____
Cost: $_____ = Total Cost: $ _____

Have questions?
Chat live with an FMI application specialist at www.fmipump.com

*GENERAL SPECIFICATION NOTES FOR ALL PUMPS

1. Physical characteristics of your pumped fluid may affect the rating/capacity relationships shown in the performance tables for each FMI pump.
2. The maximum flow rates shown in the tables are for H2O at 2 psig.
3. Flow rates are infinitely variable from zero to maximum capacities shown.
4. Pumping capacities are reduced approximately 18% when the Pump Drive Module is operating on a 50 Hz electrical supply.
5. Fluorocarbon cylinder cases (Q line only) are rated for a maximum pressure of 60 psig or the lower pressure shown in the charts.
6. 3/8" I.D. tubing or greater is required for flows higher than 500 ml/min.
7. 1/2" I.D. tubing or greater is required for flows higher than 1200 ml/min.

FMI Terms & Conditions

FMI LIMITED WARRANTY

FMI products are manufactured to a high level of mechanical precision from materials that are resistant to attack by many corrosive chemicals. These products, however, may be self-destructive when used with non-compatible fluids or when located in physically hostile environments or when operated under non-specification voltage or pressure conditions.

FMI, therefore, warrants only as follows:
Each pump has been test operated with water prior to shipment from the factory. The qualifying performance of each pump is recorded by serial number in a permanent record of the company. The Goods shall be free of liens, are new and unused, and perform in accordance with the published or agreed written specifications and be free from defects in materials and workmanship for a period of one year from FMI's invoice date. Goods not meeting specifications may be returned to FMI, freight prepaid, for repair or replacement at FMI's discretion. Prior to any such return, Customer must request and receive written approval from FMI. If, upon examination, FMI determines that abusive practices, non-compatible fluids or destructive environment of operation or a combination of these factors is responsible for improper performance of the product, all labor and materials costs involved shall be at the expense of the customer. All such returns shall be redelivered Ex Works, Syosset, NY. Warranty returns may not be used to offset amounts owing for past or future deliveries.

FMI is not liable for special, indirect or consequential damages that may result from use, failure or malfunction of the product and any recovery against FMI may not be greater than the purchase price paid for the product.
No person or entity is authorized to change the terms of this warranty

PRODUCT STANDARDS
FMI products are certified and sold to comply with written FMI specifications. Only FMI is authorized to modify product claims and specifications. Products are subject to change without notice.

RETURNS FOR CREDIT
Standard FMI catalog products under most circumstances, may be returned to the FMI factory for credit when still in unused condition, packed in original shipping cartons, and meets current product specifications. All such returns, must have prior FMI customer service authorization before returning. A restocking charge of 15% of original invoice price will be made on each to cover related restocking costs.

PRICES
Prices are subject to change without notice and prior to order confirmation.

QUANTITY DISCOUNTS
Quantity discounts on standard catalog products purchased in units of ten or more are available. Contact FMI sales department for details.

QUOTATIONS
Prices quoted in writing will remain in effect for 30 days or any other time period stated in the written quotation.

MINIMUM BILLING
Minimum billing for FMI products is $25.00 domestic and foreign invoice value per order, net of shipping costs and any applicable discounts regardless of price list value of order.

SHIPMENTS
Catalog products are usually shipped within 24 hours of receipt of order.

ORDERS
Orders placed for Goods cannot be cancelled and will be shipped and invoiced by FMI per the confirmed delivery schedule. FMI is not responsible for delays beyond its control, including but not limited to, component shortages, delays by its vendors, labor disputes, weather delays or military actions.

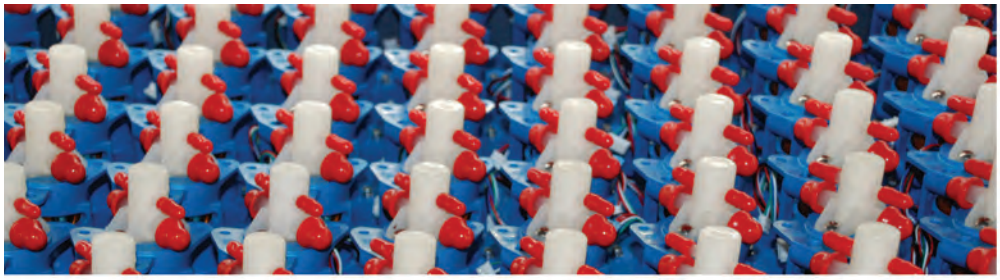
All goods are delivered Ex Works, Syosset, NY at which time title and risk of loss shall pass to the Customer.

FREIGHT POLICY
FMI will assist Customer with arranging transportation via pick-up, prepay and bill, or freight collect. Goods will be packed for domestic shipment unless other packaging arrangements have been mutually agreed upon in writing. All shipping costs and any special packaging are the responsibility of the Customer. Insurance is the responsibility of the Customer. All claims for damaged merchandise should be made with Customer's delivering carrier or insurance company.

PAYMENT TERMS
Open Account terms - 1% 10 days, net 30, International Sales - cash in advance. Credit Card Payments are accepted, Visa, Master Card, AMEX and Discover. Quoted prices are subject to change for payment terms other than those listed above. All bank charges related to wire transfers and ACH payments are the customer's responsibility.

OPEN ACCOUNT PRIVILEGES
Customers may establish an open account status by presenting FMI evidence of prompt payment history including: a) three general credit references, b) one or more bank references, c) Fluid Metering, Inc. reserves the right to obtain a credit report from a national reporting agency.

FMI Customer Service Representatives and Technical Support Staff are available Monday through Friday from 8:00 am to 5:30 pm EST. You can also FAX your specifications 24 hours a day to 516-624-8261 or Email us at: pumps@fmipump.com



Who We Are

FMI pioneered the first patented valveless rotating and reciprocating piston metering pump concept and has been delivering pumping excellence and precise fluid control for over 50 years.

Why FMI?

Ultra-Precise Fluid Control. . . from Microliters to Liters

- **Patented "No-Valve" Design**
  Eliminates problems and errors caused by valves which clog, leak, hang up, and require service.
- **One Moving Part!**
  CeramPump® design utilizes a single, dimensionally stable, chemically inert CERAMIC piston and cylinder ensuring long term, drift free fluid control.
- **Proven Performance!**
  Over 50 years OEM application experience and more than 250,000 OEM pumps in service.
- **Accuracy, Precision, & Reliability**
  Better than ± 1% Measured in millions of "trouble-free" cycles.

Engineering Design & Development

Our Engineering Team incorporates over 50 years of design experience to meet specific customer & application requirements. With the knowledge and the necessary tools, our engineers have developed the most precise and reliable valveless dispensing and metering pumps available.

eSupport (FMI web site)

Need product and technical information immediately? Check our web site at www.fmipump.com and have instant access to product specifications, application information, literature downloads, and an animation of our unique CeramPump® valveless pumping principle.

Also featured in our web site is LiveHelp, which provides a one on one connection between our customers and FMI's application specialists.

Have questions? Chat live with an FMI application specialist at www.fmipump.com

Quality

We take quality seriously and back it up, not only as an ISO 9001:2008 facility, but far beyond! Most products are WEEE & RoHS Compliant.

Our Mission Statement . . . 100% Quality, 100% On-Time Delivery

. . . is supported by our valued OEM supplier awards.

Typical Applications

Analytical Instrumentation
- TOC Analyzer
- Particle Analyzers
- Viscosity Instrumentation
- Titration Equipment
- Liquid Chromatography
- Water & Wastewater Monitoring
- Stack Gas Monitoring
- Ground Water Monitoring

Electronics
- Plating Bath Chemical Control
- PC Board Cleaning Systems
- Battery Manufacturing
- CMP & ECP Wafer Processing
- Flux Addition for Wave Soldering
- Wire Coating for Stators & Armatures
- Semiconductor Chemical Distribution

Industrial
- Agricultural & Pesticide Spraying Systems.
- On-Site Petroleum Additives
- Paints, Dyes, Inks, & Pigments
- Lubricant Dispensing
- Ferrofluid Dispensing for Speaker Mfg.
- Hydrogen Fuel Cell Fluid Control

Medical
- Contact Lens Mfg. - Monomer Dispensing
- Dialysis Systems
- Immunoassays & MicroPlates
- Solvent Welding for Disposables
- Blood Analyzer Sample & Reagent Fluid Control
- Clinical Chemistry Instrumentation

Food, Dairy, & Beverage
- Aseptic Packaging - Peroxide Dispensing
- Preservative Treatment of Meats & Poultry
- Nutrient & Color Addition
- Brewery Additives
- Vitamin Addition for Milk
- Color Addition for Yogurt
- Cottage Cheese Mfg.
- Candy Polishing

FMI 2013/2014 SHOW SCHEDULE

2013	November	20 - 22	Compamed	Düsseldorf, Germany	Booth 1255
	December	10 - 12	CHEM Show	Javits Ctr., NYC	Booth 723
2014	February	11 - 13	MD & M West '14	Anaheim, CA	Booth 2383
	March	02 - 06	PITTCON '14	Chicago, IL	Booth TBA
	March	18- 20	Interphex '14	Javits Ctr., NYC	Booth 1459
	April	15 - 18	CMEF	Shenzhen, China	Booth TBA
	June	10 - 12	MD&M East '14	Javits Ctr., NYC	Booth TBA
	July	29 - 31	AACC '14	Chicago, IL	Booth 2746
	October	29 - 30	MD & M Minneapolis	Minneapolis, MN	Booth TBA
	November	02- 05	PMMI/Pharma Expo	Chicago, IL	Booth 548

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Website: www.fmipump.com