

**Fluid** metering, inc.

# Valveless Metering Pumps And Dispensers

Pump Equipment Line

*Fluid Metering Inc. Pumps*

*Over 60 Years of  
Precision Fluid Control*

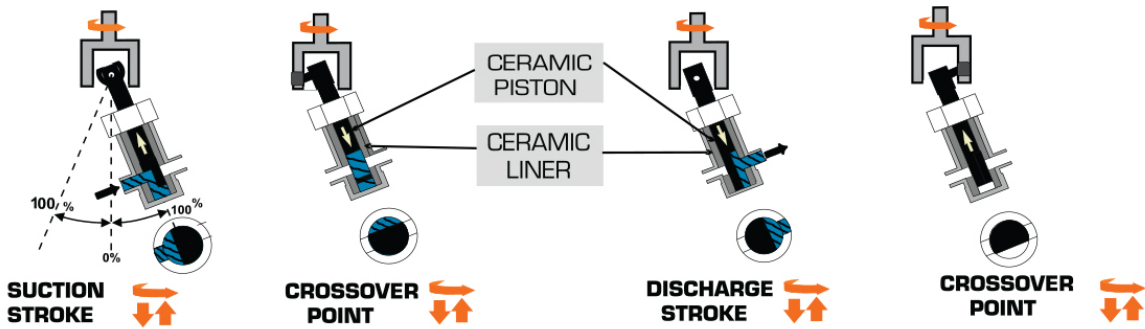


**REVODIX**  
레보딕스(주)

# Valveless Ceramic Dispensers & Metering Pumps Since 1959!

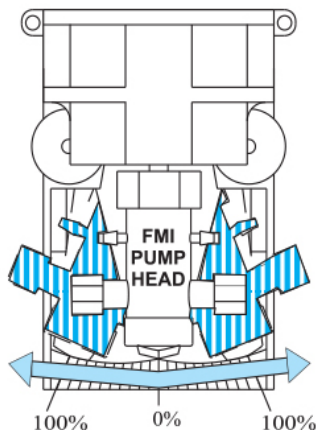
- 밸브가 필요없는 펌프
- 정확도 : 0.5% 이상
- 펌프에 따라 최소 ul 에서 4,600mL/min 까지의 유량
- 최대 200 psig (14 bar)
- 다양한 드라이브 선택 가능 (고정, 가변, 스테퍼, 장비장착형)
- 수백만번의 사이클 동작에도 유지보수가 필요 없음
- 불활성, 부식 방지의 Fluid path 재질 (Ceramic& Fluorocarbon Standard)
- 펌프 양정 : 4.6 m
- 최대 점도 1500 cps 까지 사용 가능

밸브리스 펌핑 기능은 정밀하게 결합된 세라믹 라이너에서 세라믹 피스톤이 회전 및 왕복 운동에 의해 유량이 이송됩니다. 아래 그림과 같이 각 흡입/토출 사이클로 동작하여 유량을 이송하는 로터리 피스톤 방식입니다.



- ① 피스톤이 회전하고 왕복합니다. 피스톤이 뒤로 당겨지고 피스톤이 입구 포트에 열리면 흡입이 생성되고 유체가 펌프 챔버를 채웁니다.
  - ② 피스톤이 왕복 사이클에서 가장 높은 지점에 도달하면 펌프 챔버는 이제 최대 체적 용량에 도달합니다. 회전을 계속하면 입구 포트가 밀봉됩니다.
  - ③ 입구 포트가 밀봉되고 펌프 챔버가 가득 차면 출구 포트가 열립니다.
  - ④ 항상 하나의 포트만 열려 있으며 두 포트가 상호 연결되지 않습니다.
  - ⑤ 회전과 왕복 운동을 계속하면서 피스톤이 강제로 내려가고 피스톤이 출구 포트에 열리게 됩니다.
  - ⑥ 토출이 발생되고 유체가 평평 됩니다. 회전을 계속하면 출구 포트가 밀봉됩니다.
  - ⑦ 출구 포트가 밀봉되고 펌프 챔버가 비어 있으면 입구 포트가 열리고 다른 흡입 스트로크가 시작됩니다.
  - ⑧ 항상 하나의 포트만 열려 있으며 두 포트가 상호 연결되지 않습니다.
- FMI 펌프의 작동 방식에 대한 영상은 아래 사이트에서 확인 가능합니다.  
[www.FluidMetering.com](http://www.FluidMetering.com)

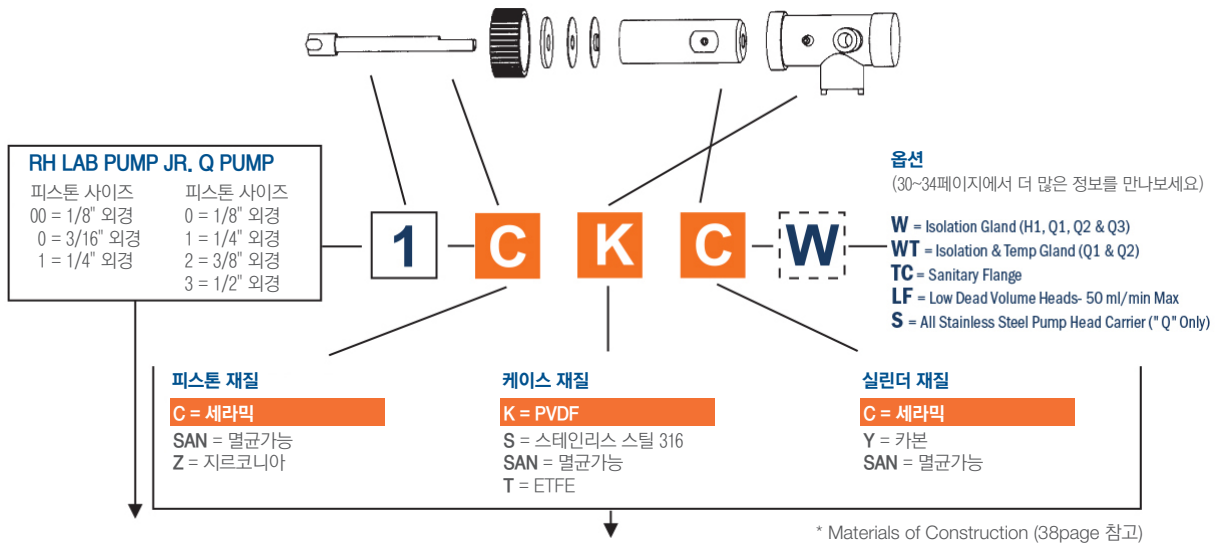
## Easy Flow Rate Adjustment



- 펌프 헤드 위치를 조정하면 피스톤 스트로크 길이가 변경되어 유량이 변경
- 유량 0~100% 사이의 미세 유량 조절 가능
- Q 모델용 유량 Dial Indicator Kit Q485를 사용하면 간단한 교정 가능 (34페이지 참고)
- 펌프 작동 중 또는 정지 상태에서 유량 변경 가능

# Pump Head Codes & Materials

## 펌프 헤드 재질별 P/N 구성

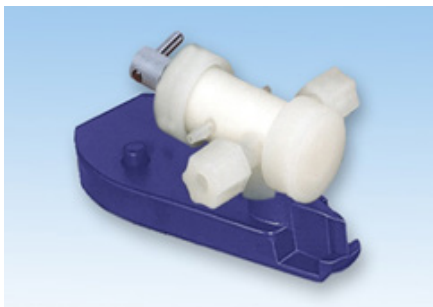


## PHM (펌프 헤드 모듈)

● 사용가능한 모듈

피스톤 사이즈 (Code)	펌프 헤드별 재질 구성								최대 유량 ML/Stroke
	CKC	CKY	CSC	CSY	SAN*	CTC	ZKC	ZTC	
RH00							●	●	0.025
RH0	●					●			0.05
RH1	●					●			0.1
Q0									0.08
Q1	●	●	●	●	●	●			0.32
Q2	●	●	●	●	●	●			0.72
Q3	●		●			●			1.28
피스톤 재질	세라믹	세라믹	세라믹	세라믹	세라믹	세라믹	지르코니아	지르코니아	
케이스 재질	PVDF	PVDF	SUS316	SUS316	SUS316	ETFE	PVDF	ETFE	
실린더 재질	세라믹	카본	세라믹	카본	테프론	세라믹	세라믹	세라믹	
온도(°C)	100	100	175	175	175	100	100	100	

\* SAN : 식품, 바이오, 제약 등 멸균이 필요한 Application 에서 사용(완전 분해 및 세척 가능)



**QCKC**  
Ceramic & PVDF Fluid Path



**QCSC**  
316SS Ceramic & PTFE Fluid Path



**QSAN-TC**  
Tri-clamp version of SAN

# Selection Guide for FMI's Pump Heads

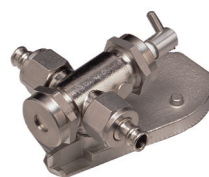


**QCKC**

## 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)



**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 1/4" or 3/8" id tubing



**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



**QSAN-TC**

## QSAN-TC

Tri-clamp version of SAN

- Quick connect 1" flange for 1/4" to 1" tubing sizes



**QCSC**

## QCSC

316SS Ceramic & PTFE Fluid Path (standard)

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



**QCV**

## QCV

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



**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



**RH**

## RH

Small displacement, self contained pump for 1/4" O.D tubing using compression fittings for 0 to 100µl/stroke or 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 (RH00ZTC, RHOCKC, RH1CKC)



**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 1/4" 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



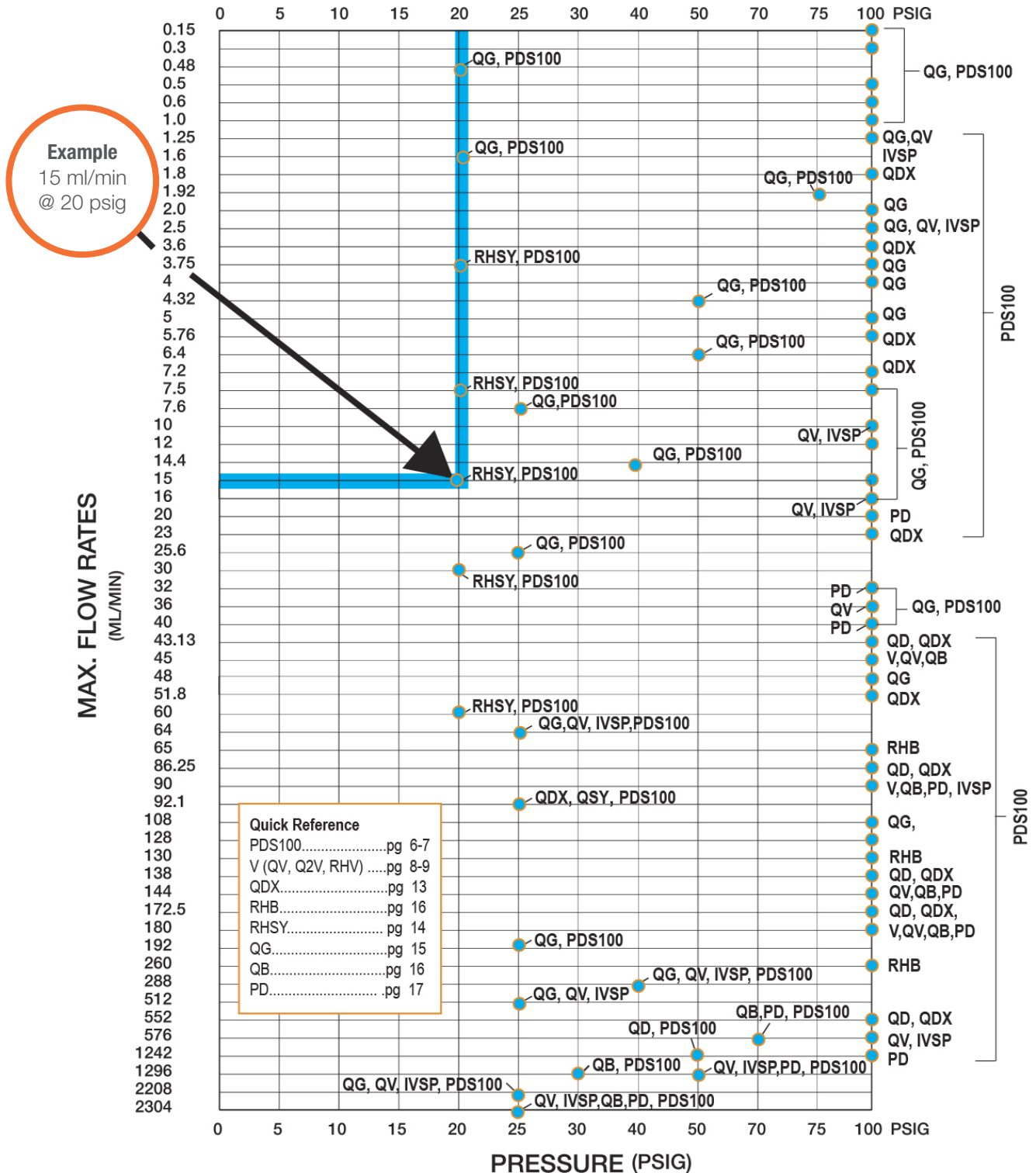
**RHLF**

## RHLF

"Low Flow", Low Dead Volume pump. Female 1/4-28 port version of RH.

# 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

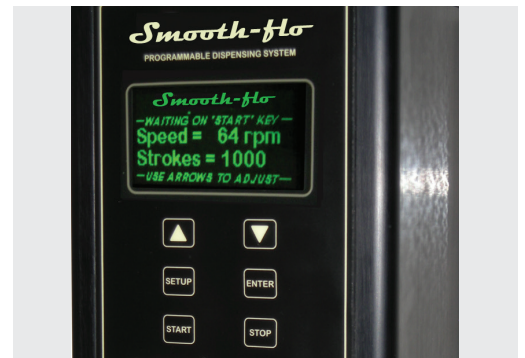
## Valveless, Programmable, Dispensing & Metering System

The **PDS100** is a precision system capable of dispensing or pumping fluids ranging from 3  $\mu\text{L}$  per dispense or 18  $\mu\text{L}/\text{min}$  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 V AC 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 V DC, and 0-10 V DC input for automatic control



LCD Menu Display & Membrane Switches

Piston Code	Speed (RPM) Standard		Dispense Volume/Revolution		Dispense Rate mL/min (Maximum Stroke)				Pressure (PSIG)	
			Min Dispense (mL/rev)	Max Dispense (mL/rev)	Single		Dual - Pumps In Phase		Single	Dual - 2 Independent "Solo" Pumps Each
	Min	Max			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	6	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

## PDS100

### Dimensions

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

### Electrical

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

### Shipping weight

7.5 lb. (3.41 kg)



2RH

RH



STQP



2STQ



2STH



STH



Foot Pedal



# V Variable Speed Pump

## 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 x 146 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)

##### Electrical:

1800 RPM

##### Shipping weight:

RHV : 7 lb (3.15 kg)  
V300 : 5 lb (2.25 kg)

#### RHV Pumps (Includes V300)

MAX. Flow/Pressure			Wetted Parts	MAX. Fluid Temp	Complete Pump
ML/MIN	PSIG	BAR			
90	100	6.90	Ceramic / VDF	212°F	RHVOCKC
180	100	6.90	Ceramic / VDF	212°F	RHV1CKC
45	100	6.90	Zirconia / Tefzel	212°F	RHV00ZTC
90	100	6.90	Ceramic / Tefzel	212°F	RHVOCTC
180	100	6.90	Ceramic / Tefzel	212°F	RHV1CTC



# V Variable Speed Controller

## 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 V DC, & 0-10 V DC input for automatic control
- Start, Stop & Reverse Flow while maintaining flow settings
- Rugged, Anodized, Aluminum Enclosure designed for both bench-top & wall mounting



### V300

#### Dimensions

7 1/4" x 5 1/8" x 6 1/4" wide  
(182 mm x 128 x 159 mm)

#### Electrical

Universal Power Input accepts  
100-240 V AC 50/60 Hz

#### Shipping weight

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



Selectable 4-20 mA, 0-5 V DC, & 0-10 V DC 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	100	6.90	QV	Q3
45	.71				RH00
90	1.4				RH0
144	2.2				Q0
180	2.8				RH1
576*	9.1				Q1
1296*	20.4	100	6.90	Q2V	Q2
2304*	35.9				Q3
90	1.42				RH00
180	2.8				RH0
288	4.4				Q0
360	5.6				RH1
1152*	18.2	50	3.45	Q2V	Q1
2592*	40.8				Q2
4608*	71.8				25



### Drive Options

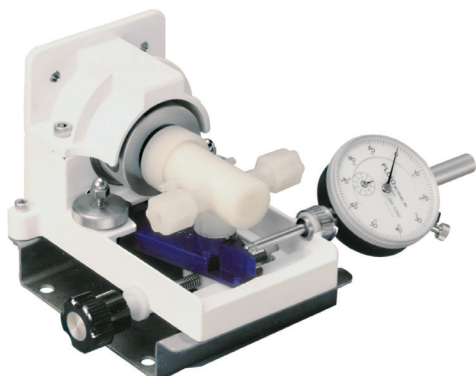
Mounting Base (pg.15) Part # -MB

Dial Indicator (pg.34) Part # -Q485

\* See General Specifications note (pg 39)

# QP Motorless Pedestal

## High Flow - Rugged Duty



### 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)

- 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 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



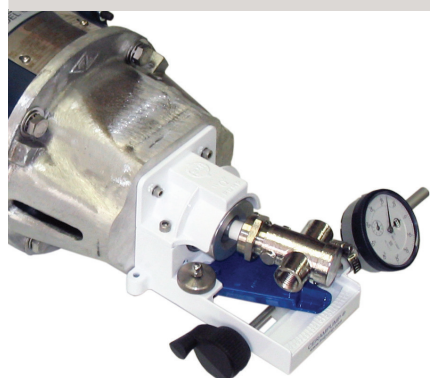
#### Drive Options

Dial Indicator (pg.34) Part # Q485

P56C Face Adapter (pg. 33) Part # - P56C

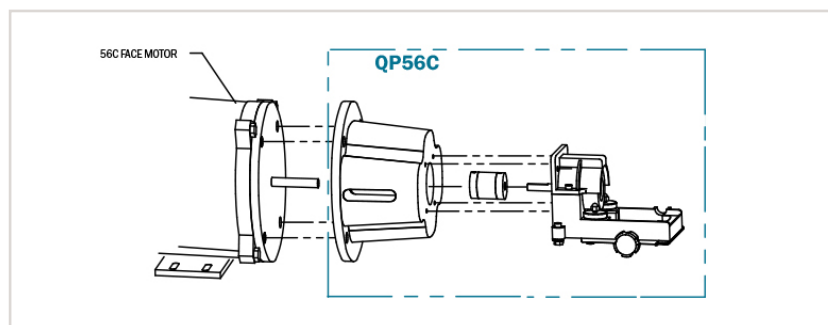
Masterflex™ Adapter (pg. 33) Part # - RH/M

## 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 Precision

- 0 to 100 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

features integrally molded 1/4-28 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. 32).

#### 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

ML/Stroke	MAX. Flow/Pressure		Wetted Parts	Complete Pump Assembly
	PSIG	BAR		
0 - 0.025	100	6.90	Zirconia / Tefzel / Ceramic	RH00ZTC
0 - 0.05	100	6.90	Ceramic / PVDF	RH0CKC
0 - 0.10	100	6.90	Ceramic / PVDF	RH1CKC

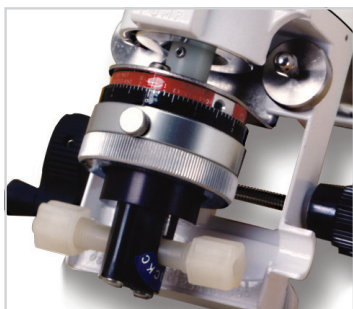


#### Drive Options

Masterflex Adapter (pg. 33) Part # : - RH/M

Adapter for Q (PDM) (pg. 33) Part # : - RH/Q

Low Dead Volume Pump Head (pg. 32) Part # : - LF for 1/4-28



### RH/Q Adapter

See page 33



### OEM Version

See page 25

Actual Size



### RH

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

# 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 137 mm)

### Shipping weight

10 lb (4.5 kg)

### Electrical

115 V AC, 60 Hz, 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/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	50	3.45		Q1
1242*	18.9				Q2
2208*	30.0				25

\* See General Specifications note (pg 39)



### Drive Options

230 VAC (50/60 Hz)\* Part # -2

Mounting Base (pg.15) Part # -MB

Dial Indicator (pg.34) Part # Q485

Hazardous Duty (pg.13) Part # : QDX

# 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



## QDX

### Dimensions

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

### Shipping weight

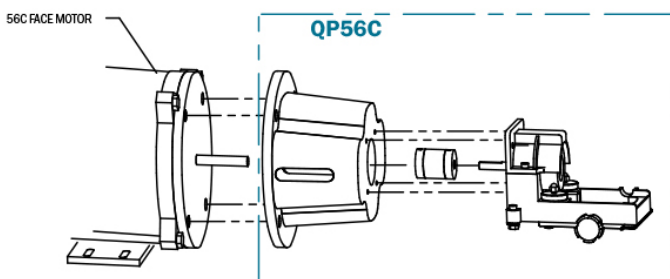
43 lb (19.35 kg)

### Electrical

115/230 V AC, 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 V AC and 3.3 amps @ 230 V AC

# QP56C - Use your own 56C Motor

- Use your own 56C Motor
- Max 1800 RPM



## QP56C

# RHSY Synchronous Pumps

## The Ultimate in Low Flow Metering Accuracy

Small Solutions



### RHSY

#### Dimensions

5" x 5" x 4" wide  
(127 x 127 x 102 mm)

#### Shipping weight

4 lb (1.8 kg)

#### Electrical

115 V AC, 60 Hz, 1Ø, .08 amps, with 3 prong power cord

- 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 Pumps

MAX. Flow			Wetted Parts	MAX. Fluid Temp	Complete Pump
@150 RPM mL/min	@300 RPM mL/min	@600 RPM mL/min			
7.5	15.0	30	Ceramic / PVDF	212°F	RHSY0CKC
15.0	30.0	60			RHSY1CKC

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



#### Drive Options

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

# PiP Precision Dispenser

## Pipetting, Syringing and Diluting

Small Solutions



### PiP

#### Dimensions

5" x 5" x 4" wide (127 x 127 x 102 mm)

#### Shipping weight

5 lb (2.25 kg)

#### Electrical

115 V AC, 60 Hz, 1Ø, .08 amps, 150, 300, 600 RPM with 3 prong power cord

- 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 Pumps micro $\pi$ -petter®

MAX. Dispense Rates	Complete Pump Assembly
Microliters / Revolution	
0 - 50 $\mu$ L	PIPOCKC
0 - 100 $\mu$ L	PIP1CKC



#### Drive Options

Low Dead Volume Pump Head (pg. 32) 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
- **Note** : The **QG6-3**, **QG6-3MB**, **QG50-3MB** and **QG50-3MB** configurations are no longer available

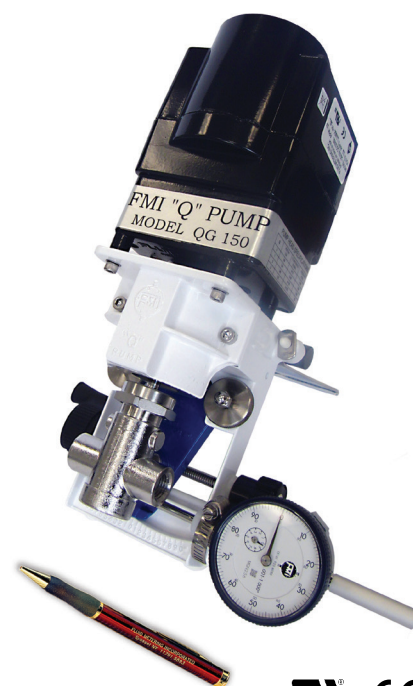
### How to Order

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	QD	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
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 39)



**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 V AC, 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

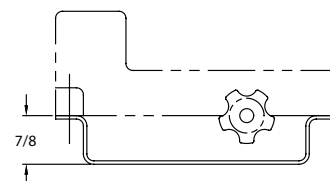
### Drive Options

230 VAC (50/60 Hz)\* Part # -2

24 VAC (50/60 Hz)\* Part # -3

Mounting Base (pg.15) Part # -MB

Dial Indicator (pg.34) Part # Q485



### "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



### RHB

#### Dimensions

8" x 3" x 3" wide (203 x 76 x 76 mm)

#### Shipping weight

7 lb (3.15 kg)

#### Electrical

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



### QB

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

#### Dimensions

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

#### Shipping weight

8 lb (3.6kg)

#### Shaft extension

5/16" dia. x 1" long with flat

#### Electrical

12 V DC, 4 amps; 24 V DC, 3 amps; 90 V DC, 0.41 amps, totally enclosed with 6" pigtail leads

- 12, 24, and 90 V DC 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 32 for more info)

### RHB Pumps

MAX. Flow	Pressure		Wetted Parts	MAX. Fluid Temp	Complete Pump
	ML/MIN	PSIG			
130	100	6.90	Ceramic / PVDF	212°F	RHB0CKC
260	100	6.90	Ceramic / PVDF	212°F	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 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 39)



#### Drive Options

Mounting Base (pg.15) Part # -MB

Dial Indicator (pg.34) Part # Q485

24 VDC (3 amps) Part # -4

90 VDC (0.41 amps) Part # -5



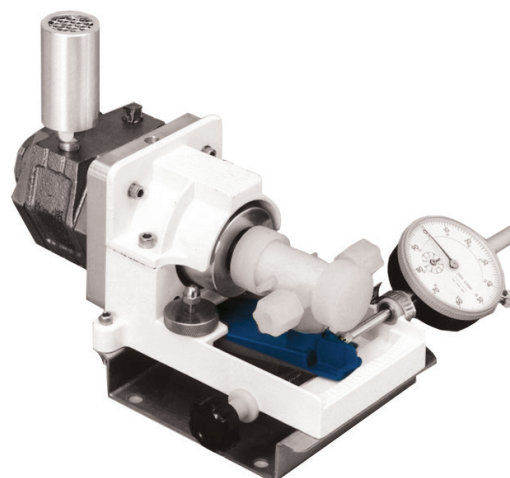
# PD Pneumatic

## 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 = Complete pump  
 SPD + Q1CKC



### 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	3.45		Q1
1296*	50			Q2
2304*	25			1.72

\*See General Specifications note (pg 39)



#### Drive Options

Dial Indicator (pg.34) Part # -Q485

Pulse Suppressor (pg.35) 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:

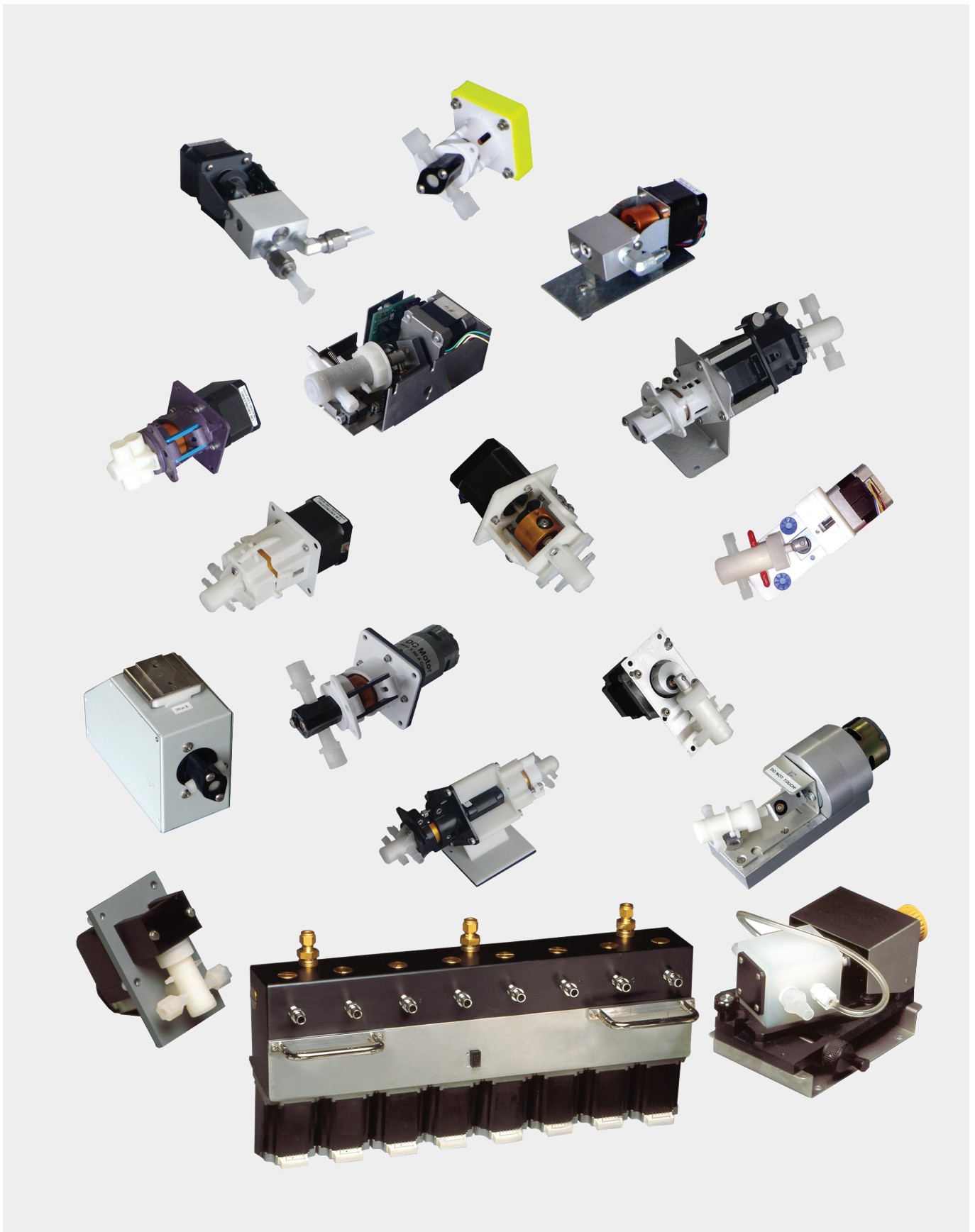
14-16 CFM at 40 psig

Air Inlet size : 1/8" (F) NPT

#### Shipping weight

9 lb (4.05 kg)

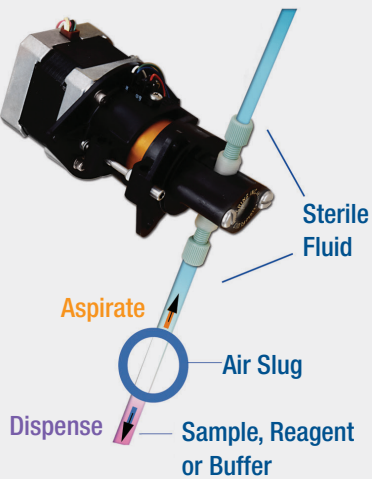
# Solutions for All Your OEM Applications



# Production - OEM

## One Dispenser / Pump For **All** Your Applications

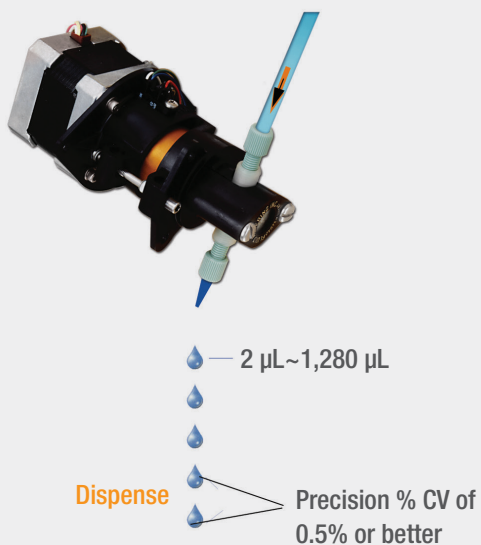
Valveless Syringing  
Aspirate & Dispense



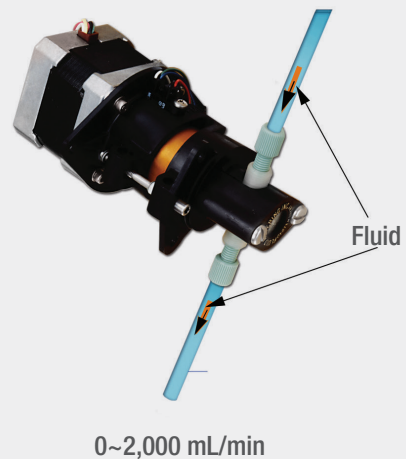
Fast Prime  
Flush & Wash



Continuous  
Dispensing



Continuous  
Metering



# Direct Drive Pump

## Precise Versatility in Fluid Dispensing

**NEW**



### FDD

#### Dimensions

6.44" x 1.66" x 2.30"  
(163.57 x 42.16 x 58.42 mm)

#### Shipping weight

1.30 lb (0.59kg)

#### Electrical

Rated Current Phase : 1.5 Amp

## FDD

The FDD Direct Drive is a compact, linearly driven, ceramic piston pump capable of dispensing less than 1 microliter with both precision and accuracy.

A vastly optimized driving mechanism means the FDD has only THREE moving components. Plus, FMI's distinct CeramPump® technology ensures a longer lifetime and superior chemical inertness in comparison to anything in the marketplace today.

- Anti-backlash mechanisms
- Rotary encoder with over 4000 pulses per revolution
- Linearly driven
- High precision, fine pitch lead screw
- FMI CeramPump® technology
- Only three moving components
- Optical sensor
- Compact Design

## FDD Pump

Pump Pressure Range	100 psi (6.86 bar)
Dispense Volume Range	0 - 150 µL
MIN Dispense Volume	< 1 µL
Motor Speed Range	Up to 2000 step/sec
Flow Rate Range	Minimum 0.105 µL/sec @ 1 rpm Maximum 62.8 µL/se @ 600 rpm
Motor Type	1.8 ° Stepper Motor NEMA Size 17 Frame



# Valveless Waste Transfer Pump

## Ideal for OEM Medical & Analytical Instrumentation



### BLDC

#### Dimensions

6" x 2" x 2"  
(152.4 x 50.8 x 50.8 mm)

#### Shipping weight

2 lb (0.9 kg)

#### Electrical

0.75 / 0.88 Amps (Motor / Driver)

#### Motor

Speed set to approximately 2000 rpm  
Direction set to clockwise rotation



## BLDC

The BLDC pump engineered for waste transfer applications integrates our distinct CeramPump® valveless pumping technology with the long-life performance of a brushless DC motor and integral driver electronics.

All that is needed is a simple 24VDC input power supply to deliver precision fluid control for process instrumentation.

The BLDC Pump is ideal for Clinical Analyzers, Dialysis Equipment and Analytical Instrumentation.

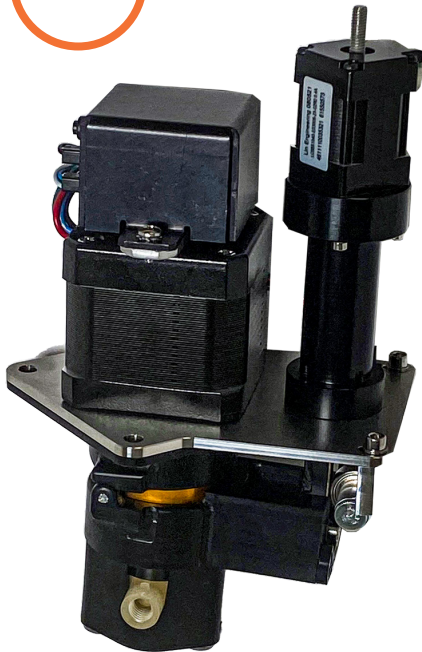
- Valveless fluid control technology having only one moving part in fluid path
- Compact design with integral electronics
- 24 V brushless DC Motor w/Integral Electronics- No Additional Driver Required!
- Sapphire-hard, dimensionally stable ceramic internal components
- Inert fluid path for maximum chemical compatibility
- Factory calibrated for flow rates from 20 ml/min to 400 ml/min.
- Will Maintain Calibration Precision of 1% for Millions of Maintenance-Free Cycles

## BLDC Pump

Pump Pressure Range	60 psi (4 Bar) Max on outlet Pressure spikes up to approx 102 psi (7 Bar) for a maximum of 10 seconds
Operating Pressure Range	200 psi (13.79 bar)
Dispense Volume Range	0.032-1.28 mL/rev
MIN Dispense Volume	4 (Spikes up to 7 for a Maximum of 10 Seconds)
Motor Speed Range	6 ~ 2000 rpm
Flow Rate Range	0.192 ~ 2560 mL/min
Motor Type	24V DC
Flow Rate Adjustment Range	20 ~ 400 mL/min

# Variable Dispense Pump

## ALL-IN-ONE Pump Achieves the Work of Several Pump



### FVD

The FVD Variable Dispense Pump combines the function of priming, flushing, and dispensing into one device, which provides accurate and repeatable dispense volumes of 5 to 200  $\mu$ L in a small lightweight package. The innovative, low-profile design offers unparalleled accuracy and precision with an electrical and mechanical upgrade that can dispense multiple volumes with the same pump. The FVD Variable Dispense is ideal for OEM Medical and Life Sciences Markets.

- Standard motion for priming the line, and syringing motion through electronic angle adjustment for fluid aspiration and dispense
- Flexible link to create a proportional relationship between the linear actuator and angular motion of the pump body
- Pump provides on-the-fly-mixing for high precision mix ratios all within a smaller footprint

### FVD

#### Dimensions

6" x 3" x 3.75"  
(152.4 x 76.2 x 95.3 mm)

#### Shipping weight

1.30 lb (0.59kg)

#### Electrical

Rated Current Phase : 2.0 Amp

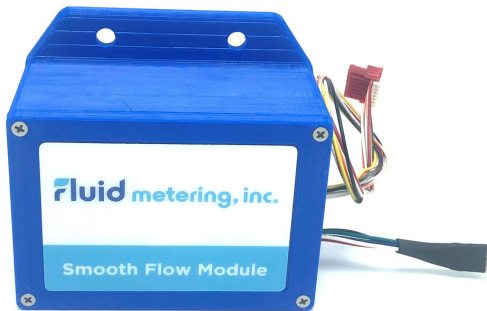
### FVD Pump

Operating Pressure Range	30 psi (2.1 bar)
Dispense Volume Range	0.002 ~ 0.2 mL/rev
MIN Dispense Volume	0.002 mL/rev
Motor Speed Range	5 ~ 1000 rpm
Flow Rate Range	0.010 ~ 200 mL/min
Motor Type	1.8 ° Stepper Motor NEMA Size 17 Frame



# Smooth Flow Technology Controller

## Optimize the Flow Mitigate Pulsation



### FSF

The Smooth Flow state-of-the-art algorithm determines the optimal motion profile needed to counteract pulsations and significantly improves stability.

Using Smooth Flow technology, the flow from the rotating reciprocating pump is instantly changed and transformed into a nearly linear and constant flow.

By lengthening the dispense phase, the same piston pump can now deliver this smooth flow with a duty cycle of up to 95%. This all occurs with absolutely ZERO hardware change.

- Instantly transforms into a near linear and constant flow
- Single Dispense Functionality
- FMI Configurability to desired flow rate
- Integration: Digital inputs to command pump
- Interfaces with select FMI pump technology

### FSF

#### Dimensions

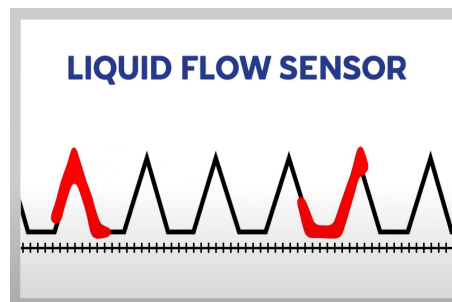
4.2" x 3.6" x 1.95"  
(106.7 x 66 x 49.5 mm)

#### Shipping weight

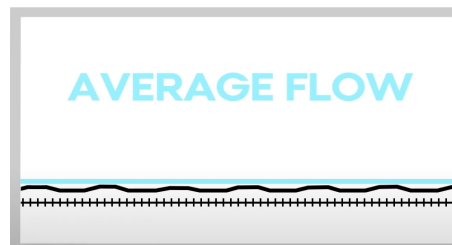
0.40lb (0.18kg)

#### Electrical

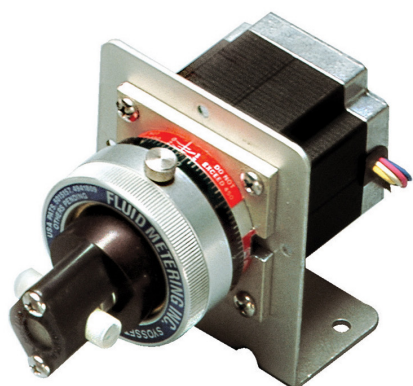
Rated Current Phase : 2.0 Amp



### LIQUID FLOW SENSOR



# Production - OEM



STRH

## STRH

### Adjustable Low Flow Stepper Pump

#### 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	Wetted Parts	Complete Pump Assembly
Microliters / Revolution		
0 - 25 $\mu$ L	Zirconia / PVDF / Ceramic	STRH00ZKCLF
0 - 50 $\mu$ L	Ceramic / PVDF	STRHOCKCLF
0 - 100 $\mu$ L	Ceramic / PVDF	STRH1CKCLF

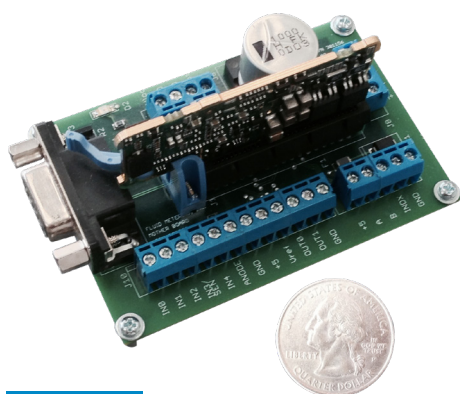


STQP

## STQP

### Adjustable High Flow Stepper Pump

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



ICST-02

## ICST-02

### Stepper Control

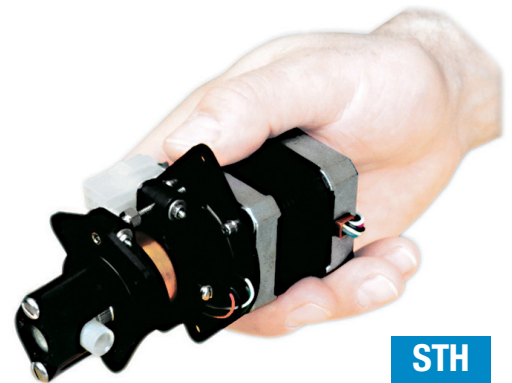
- Programmable control for all FMI Stepper Pumps
- Extensive dispense & metering capabilities
- Multiple input and output connections
- RS 232 Serial Port for PC connection
- MS Windows<sup>®</sup> programming software included
- Compact size : 2.0" x 3.1" x 1.6" high (51 x 79 x 41 mm)



# OEM Dispensers / Pumps

## High Precision Stepper Motor Pumps for OEM Applications

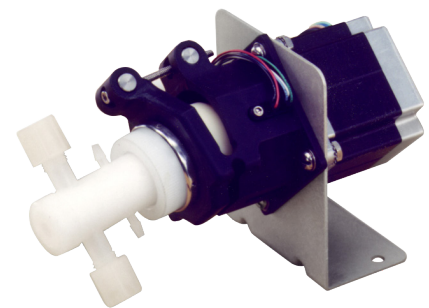
- Ceramic and fluorocarbon fluid path
- Displacement of 0 to 1280 microliters (1.28 mL) per revolution
- Excellent chemical resistance
- 1.8° stepper motors with opto sensors



**STH**

### Low Flow STH

MAX. Dispense Rates	Wetted Parts	Complete Pump Assembly
Microliters / Revolution		
0 - 25 µL	Zirconia / PVDF / Ceramic	STH00ZKCLF
0 - 50 µL	Ceramic / PVDF	STH0CKCLF
0 - 100 µL	Ceramic / PVDF	STH1CKCLF
0 - 200 µL	Ceramic / PVDF	STH2CKC



**STQ**

### High Flow STQ

MAX. Dispense Rates	Wetted Parts	Complete Pump Assembly
Microliters / Revolution		
0 - 320 µL	Ceramic / PVDF	STQ1CKC
0 - 720 µL	Ceramic / PVDF	STQ2CKC
0 - 1280 µL	Ceramic / PVDF	STQ3CKC

## Brushless DC Pump

### Instrumentation Pump for Wash & Fluid Transfer

- 24 V brushless DC motor
- Fixed displacement, factory calibrated to your specifications
- Compact design with integral electronics

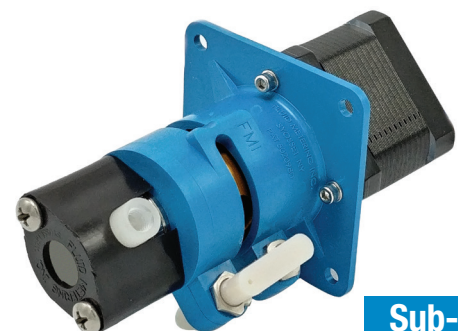


**BDC**

## Sub-1 Pump

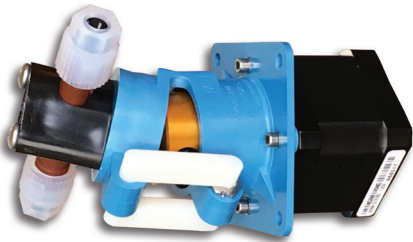
### Sub-Microliter Dispensing Pump

- Patent pending Adjustable Dual Eccentric bushings for precise flow calibration
- Dispense volume as low as 1 µL / stroke
- Four pump heads available



**Sub-1**

# OEM Dispensers / Pumps



STF1-9

## STF1-9 Valveless 400µL Dispensing Pump

Ideal for OEM Metering & Dispensing Applications

- Compact design
- Larger piston allows higher dispense / metering rate
- 9 pump drives and 4 pump heads - 36 possible configurations

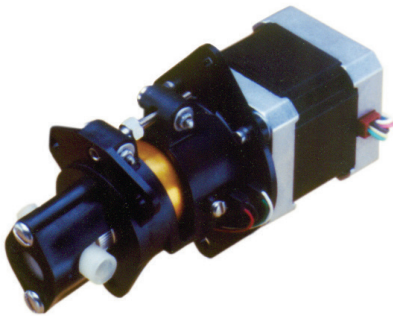


STF

## STF Fixed Displacement Pump

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

- Economical design with fixed displacement link
- Precision stepper motors with opto sensors
- 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

Isolation  
Gland Port

## 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

# Ratio:Matic® Duplex Stepper Pumps

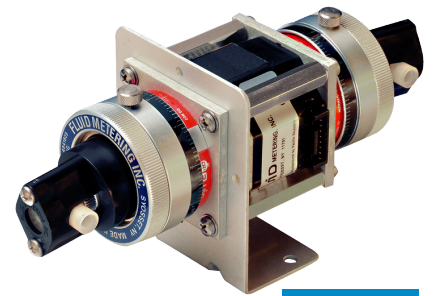
## For Proportional and Dual Channel Dispensing and Metering

### 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



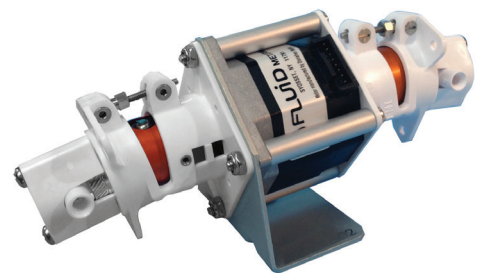
ST2RH

### 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

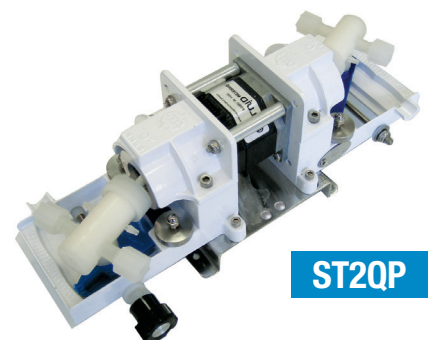


ST2H

### ST2QP

#### High Flow Adjustable

- Dual **STQP** 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

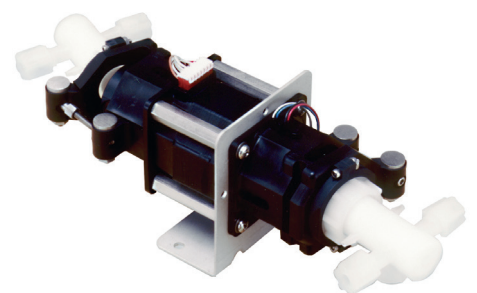


ST2QP

### 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



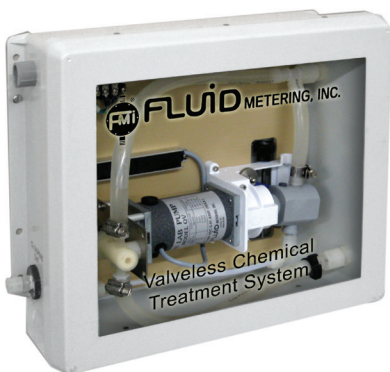
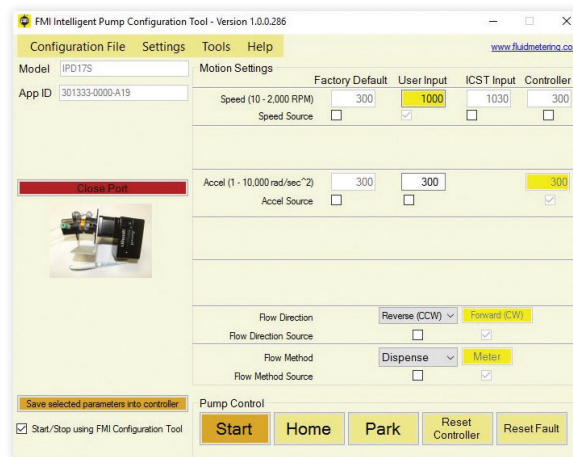
ST2Q

# Specialty Pumps



## 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 0-5 V, RS-232 serial , CANopen protocol supported



## 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 V DC



# 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

### PDS100 SF Smooth-flo

Dispensing (mL/Rev.)		Metering (mL/min.)		MAX. Flow/Pressure		PDM	Piston Code
Min. <sup>1</sup> - Max. <sup>2</sup>	Min. <sup>3</sup> - Max. <sup>4</sup>	PSIG	BAR	PSIG	BAR		
0.0025 - 0.050	0.015 - 10	60	4.12	PDS-100 SF	20	1.38	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 x 128 x 159 mm)

#### Electrical

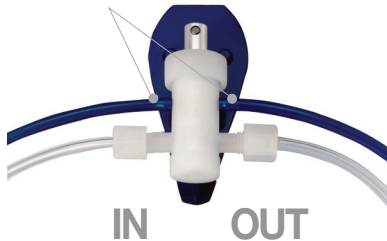
RS485, 4-20 mA, 0-10 V, 0-5 V interface for connection to process sensors, PLC and PC controllers



### PDS100 SFSTQ

# Pump Heads

Isolation Gland Port



**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



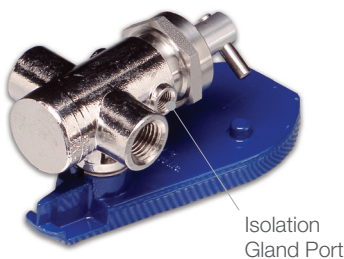
**H-W**

Isolation Gland Port

## 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



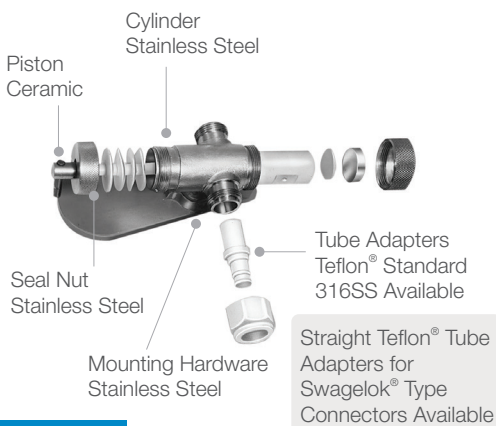
**CSC-W**

Isolation Gland Port

## CSC-W

### Stainless Steel

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



**SAN-S**

DESIGNED FOR QUICK DISASSEMBLY  
FOR MAXIMUM CLEANING

## 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 and biological attack
- Ideal for food, dairy, brewery, pharmaceutical & biotech applications
- Tri-Clamp Flange Kit (see page 33 for more info)

**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 316 SS Tri-Clamp flange fittings
- Tri-Clamp fittings are an industry standard for applications which require “quickconnect” fittings for easy sanitizing and/or sterilization
- 1" Flange will accommodate both 1/2" and 3/4" standard tube sizes
- Ideal for food, beverage, biotech, and pharmaceutical process applications



SAN-TC

## Q1CSC-200

### 200 PSI Q Pump Head

- 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 125 psi
- Wetted parts of ceramic and PVC



Q1CV, Q2CV

# Options



**Q-LF**

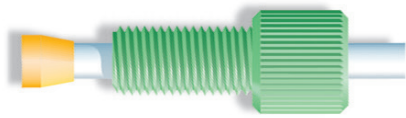


**RH-LF**

## LF

### 1/4-28 Low Flow Pump Heads

- 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



**Q-661**

## Q661

### Small Bore Tubing Kit

- 1/4-28 Fittings and 1/16", 1/8" O.D. Teflon Tubing
- Designed for all LF Pump Heads and to complement the **FMI R479** and **R412-5K**, the Small Bore Tubing Kit has a flangeless design that eliminates the need for special tools and assures leak-free, zero dead volume connections.
- Tefzel® and Teflon® wetted surfaces

#### Kit Q661A Delrin (Black) - 1/16"

10' - 1/16" O.D. x 1/32" I.D. TFE tubing  
10 - Delrin Nuts (Black)  
10 - Tefzel Ferrules (Blue)

#### Kit Q661B Delrin (Green) - 1/8"

10' - 1/8" O.D. x 1/16" I.D. TFE tubing  
10 - Delrin Nuts (Green)  
10 - Tefzel Ferrules (Yellow)

#### Kit Q661C TFE (white) - 1/8"

10' - 1/8" O.D. x 1/16" I.D. TFE tubing  
10 - Teflon Nuts (White)  
10 - Tefzel Ferrules (Yellow)

#### Kit Q661 Delrin - 1/16" & 1/8"

Contains both Q661A & Q661B



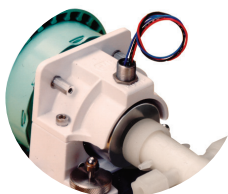
**Hall Effect Sensor**

### Hall Effect Electrical Specification

Order : HES-6

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



### Proximity Type Rotational Sensor

Order : PRS-1

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



# Accessories

## QP/M & RH/M FMI Masterflex® Kits

Enhance your Existing Masterflex Pump Drives

- 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.

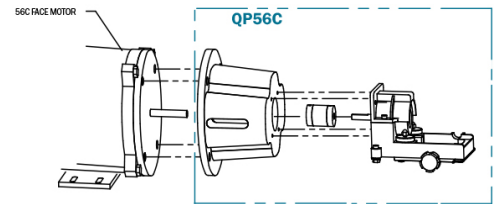
Order : KIT # QP/M or RH/M



## 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

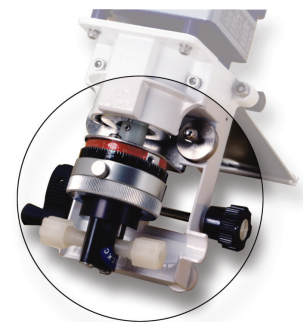


QP56C

## 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 1/2" and 3/4" standard tube sizes
- Kit consists of 316 SS Tri-Clamp flange and Teflon port seal

Order : KIT # 400576 (Q1 & Q2)  
 KIT # 400577 (Q3)



Tri-Clamp

# Accessories



## R479

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

## 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

#### Kit #R479

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

#### #R478

Consists of ten spare ferrules



## Q485

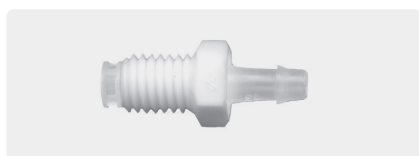
## Q485

### Dial Indicator Kit Kit # Q485

- 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

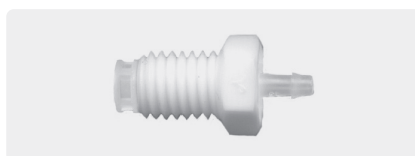
## Low Flow Barb Adapters for 1/16" & 1/8" I.D. Tubing

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.



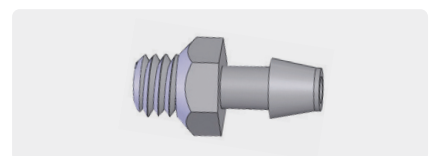
#### #110873A

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

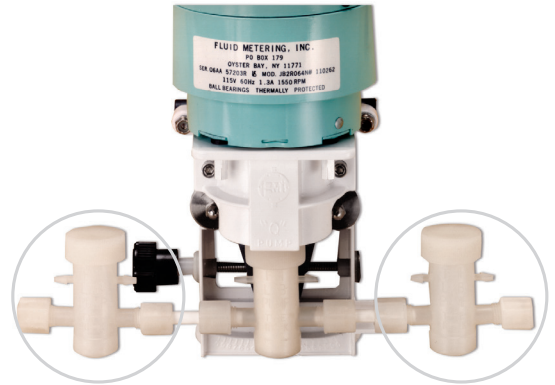
for use with 1/8" flexible tubing connection to  
isolation gland stainless steel "Q" Pumps

# 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

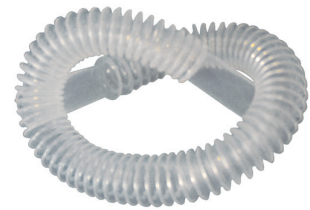


**PD-HF**

## Corrugated Teflon® Tubing Pulse Suppressor

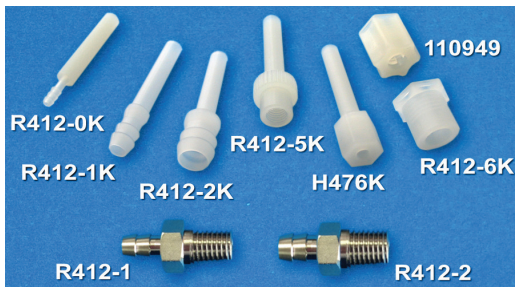
(For High Flow Applications)

- 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



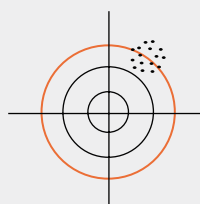
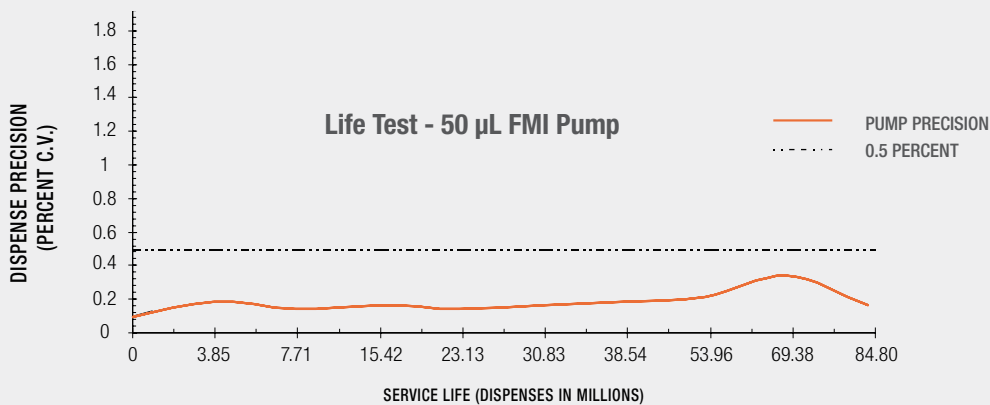
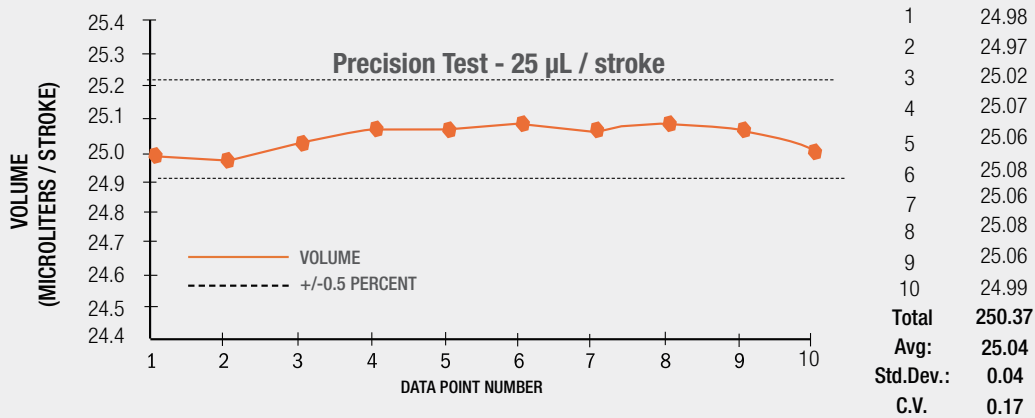
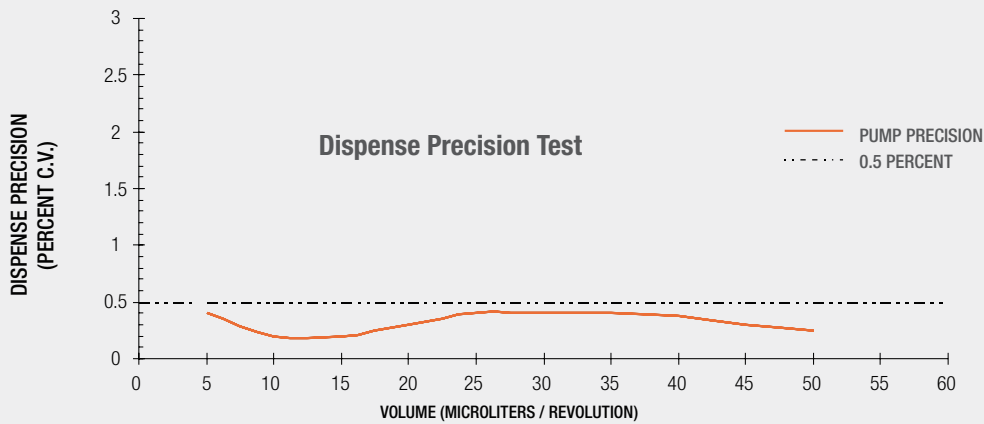
- #R412-0K Adapter for 1/8" I.D. tubing
- #R412-1K Adapter for 1/4" I.D. tubing
- #R412-2K Adapter for 3/8" I.D. tubing
- #R412-6K Adapter for 1/2" I.D. tubing
- #R412-5K Adapter for 1/4-28 ferrule fittings
- #H476-K Adapter for 1/8" O.D. tubing
- #110949 Adapter for 6 mm O.D. tubing

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.

Stainless steel adapters are used with FMI Type S pump heads.

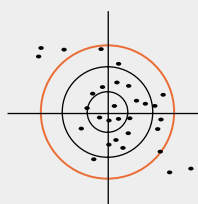
- #R412-1 Adapter for 1/4" I.D. flexible tubing
- #R412-2 Adapter for 3/8" I.D. flexible tubing

# H Typical Flow / Dispense Data



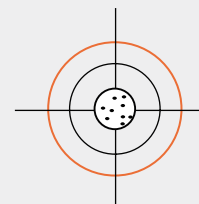
### Precision

Repeatability and degree of variation of a set of values



### Accuracy

How close the average value is to the true value

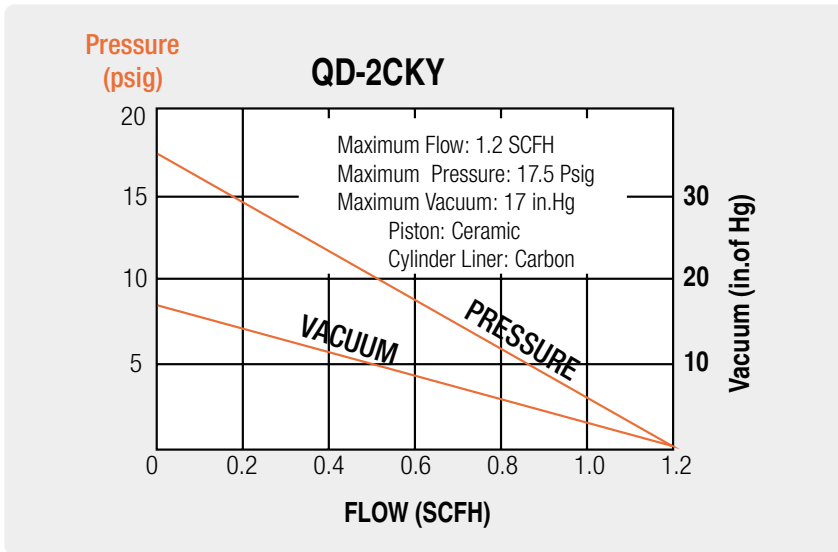


### FMI Pumps

Accurate & Precise

# Q Typical Performance Curves

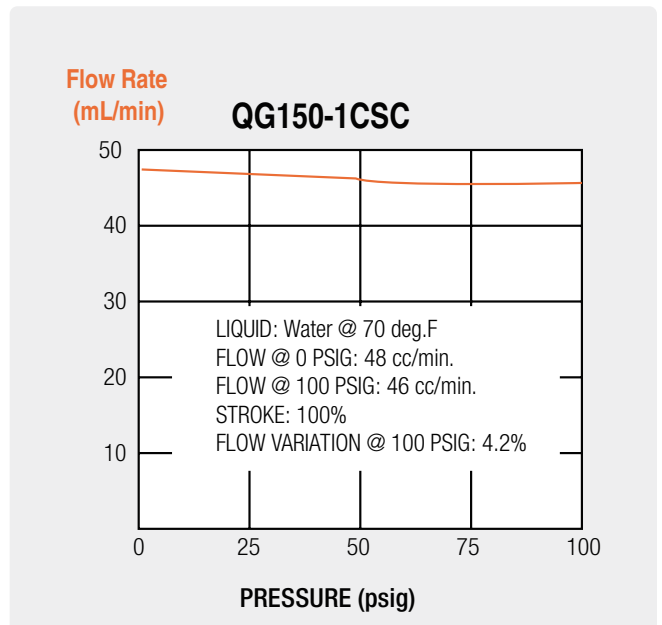
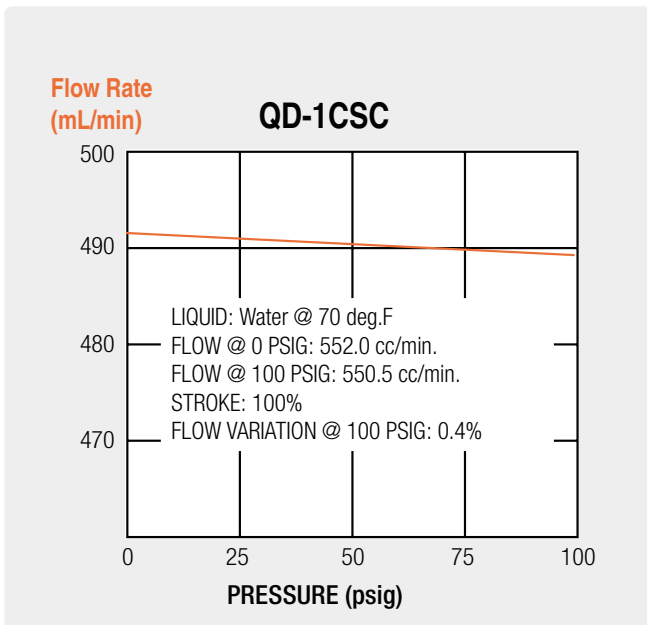
Performance curves shown below are applicable to the “Q” line of metering pumps.



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 Al<sub>2</sub>O<sub>3</sub>, excellent chemical resistance, thermal stability and mechanically resistant to common abrasives.

**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.

## **Z**— Zirconia\*

YTZP pistons for H00 ceramic liners in very low dispense/flow apps.

**\*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 @ 240°F 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**— ETFE

**Fluoropolymer E-TFE** - Used for cylinder cases in some FMI pump head modules. Excellent chemical resistance to most acids, bases and solvents. Autoclavable @ 240°F 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.

### **PTFE**

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 precision 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 4 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**

## 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 H<sub>2</sub>O 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 1,200 mL/min

