FLUID METERING, INC.

Pump Equipment Line

Valveless Metering Pumps And Dispensers

Fluid Metering Inc. Pumps

Over 60 Years of
Precision Fluid Control

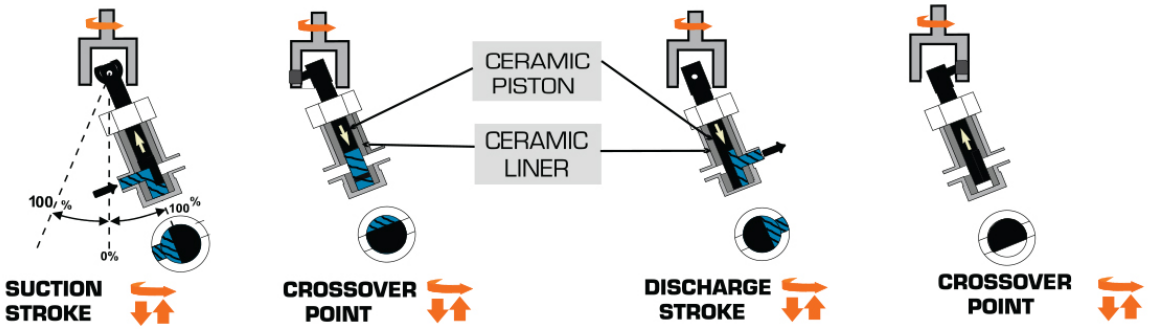
REVODIX
since 1995 레보딕스(주)

Catalog No. **PUMP-C6-1**

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 4,600 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

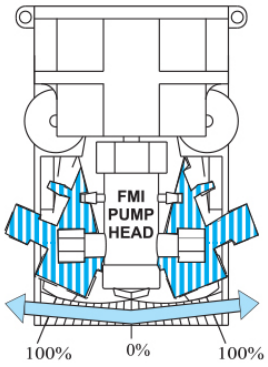
The valveless pumping function is accomplished by the synchronous rotation ⟲ and reciprocation ⇅ of the ceramic piston in the precisely mated ceramic cylinder liner. One complete piston revolution is required for each suction/discharge cycle as shown. The piston always bottoms for maximum fluid and bubble 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 animation of how FMI pumps work, Visit www.FluidMetering.com

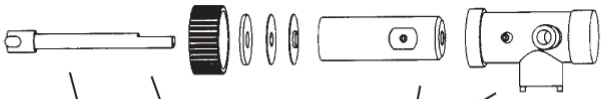
Easy Flow Rate Adjustment



- 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 easygrip Flow Control Ring graduated in 450 divisions from 0 to 100% flow

Pump Head Codes & Materials

펌프 헤드 재질별 P/N 구성



RH LAB PUMP JR. Q PUMP

피스톤 사이즈
00 = 1/8" 외경
0 = 3/16" 외경
1 = 1/4" 외경

피스톤 사이즈
0 = 1/8" 외경
1 = 1/4" 외경
2 = 3/8" 외경
3 = 1/2" 외경

1 C K C W

옵션
(26 ~ 30페이지에서 더 많은 정보를 만나보세요)

W = Isolation Gland (H1, Q1, Q2 & Q3)
WT = Isolation & Temp Gland (Q1 & Q2)
TC = Sanitary Flange
LF = Low Dead Volume Heads- 50 ml/min Max
S = All Stainless Steel Pump Head Carrier (" Q" Only)

피스톤 재질
C = 세라믹
SAN = 멸균가능
Z = 지르코니아

케이스 재질
K = PVDF
S = 스테인리스 스틸 316
SAN = 멸균가능
T = ETFE

실린더 재질
C = 세라믹
Y = 카본
SAN = 멸균가능

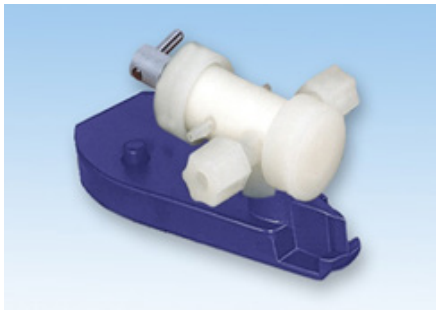
* Materials of Construction (34page 참고)

PHM (펌프 헤드 모듈)

● 사용가능한 모듈

피스톤 사이즈 (Code)	펌프 헤드별 재질 구성								최대 유량
	CKC	CKY	CSC	CSY	SAN*	CTC	ZKC	ZTC	ML/Stroke
RH00							●	●	0.025
RH0	●					●			0.05
RH1	●					●			0.08
Q0									0.1
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(℃)	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)

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

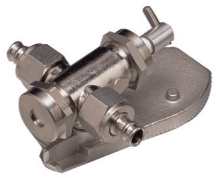
"Hi Temp Gland" Pump Heads

- Designed for applications, which require temperature control of the pump head
- Accepts two standard 1" x 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



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

QSAN-TC

QSAN-TC

Tri-clamp version of SAN

- Quick connect 1" flange for 1/4" 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 1/4" O.D tubing using compression fittings for 0 to 100µl/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 (RH00ZTC, RH0CKC, RH1CKC)

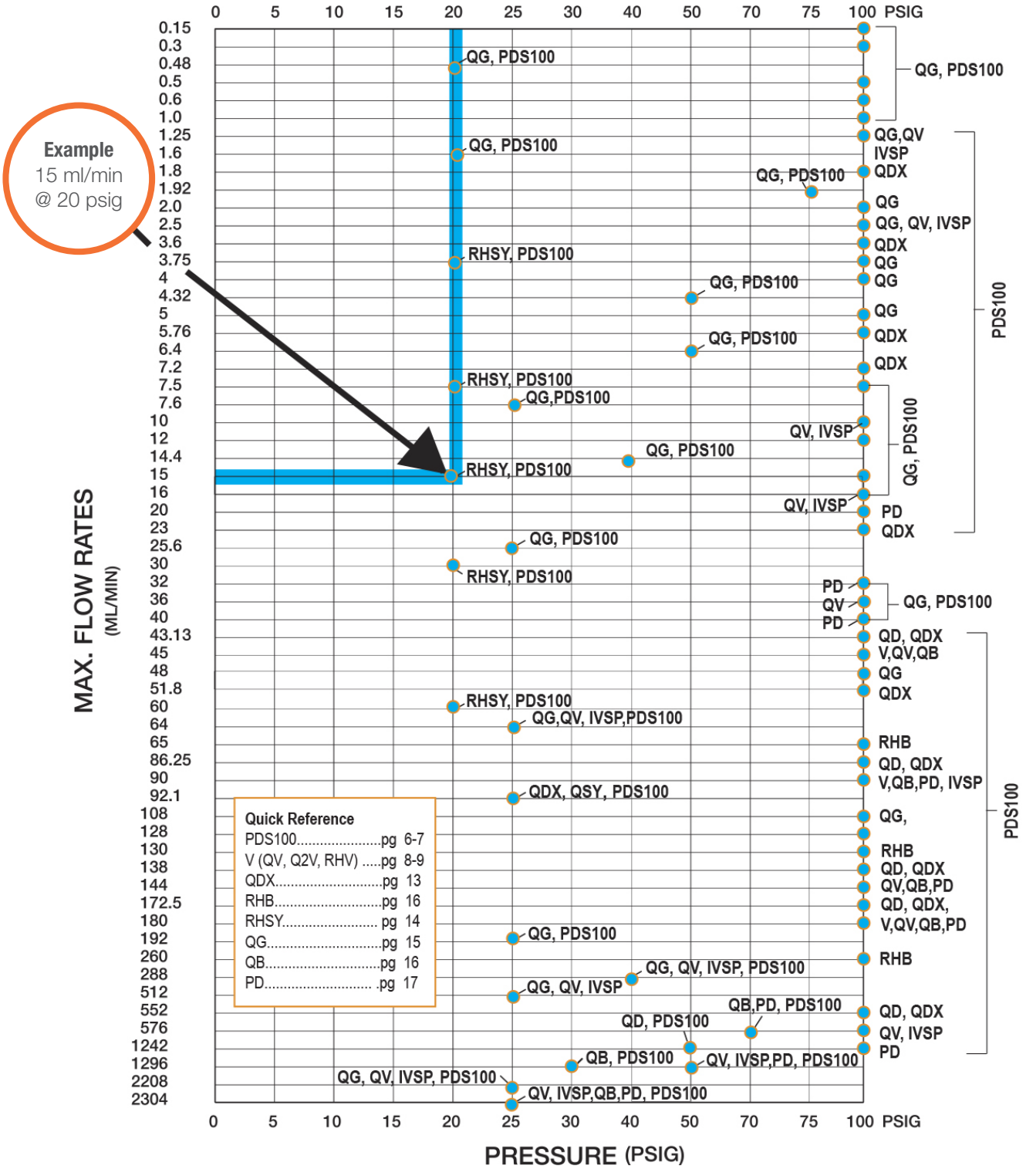
RHLF

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 µL per dispense or 18 µL/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

			Dispense Volume/Revolution		Dispense Rate mL/min (Maximum Stroke)				Pressure (PSIG)	
	Speed (RPM) Standard		Min Dispense (mL/rev)	Max Dispense (mL/rev)	Single		Dual - Pumps In Phase		Single	Dual - 2 Independent "Solo" Pumps Each
Piston Code	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		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	RHV0CKC
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	RHV0CTC
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

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

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)

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

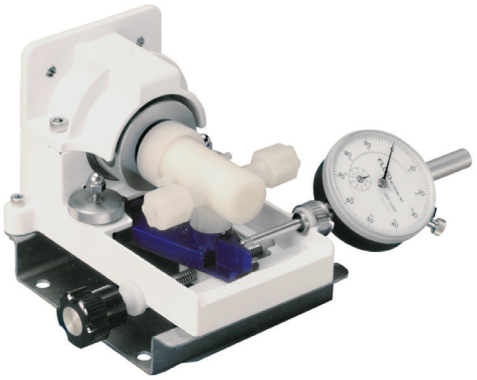
* See General Specifications note (pg 35)

+

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

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

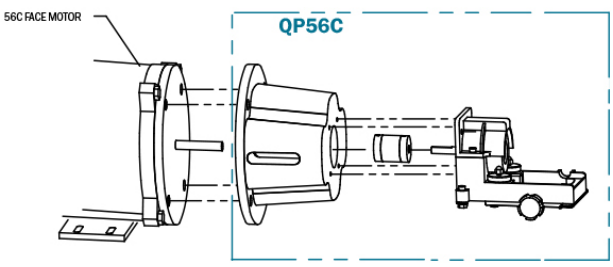
+

Drive Options
Dial Indicator (pg.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 Precision

- 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

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 - 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

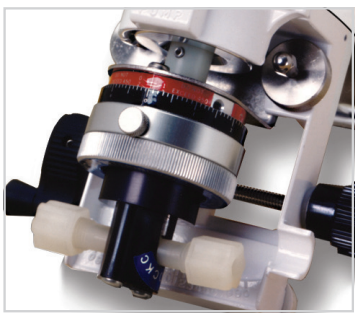
+

Drive Options
Masterflex Adapter (pg. 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

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 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				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

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

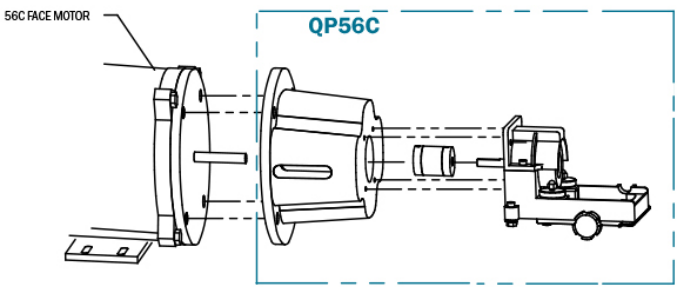
Electrical
115/230 V AC, 60 Hz, 1Ø, 1/3 hp, ball bearing,
UL listed & CSA certified motor, 1725 RPM, pigtail
leads for conduit connection. Motor is totally enclosed, fan cooled.
6.6 amps @ 115 V AC and 3.3 amps @ 230 V AC

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)

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 π-petter®

MAX. Dispense Rates	Complete Pump Assembly
Microliters / Revolution	
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
- **Note** : The **QG6-3, QG6-3MB, QG50-3MB** and **QG50-3MB** configurations are no longer available

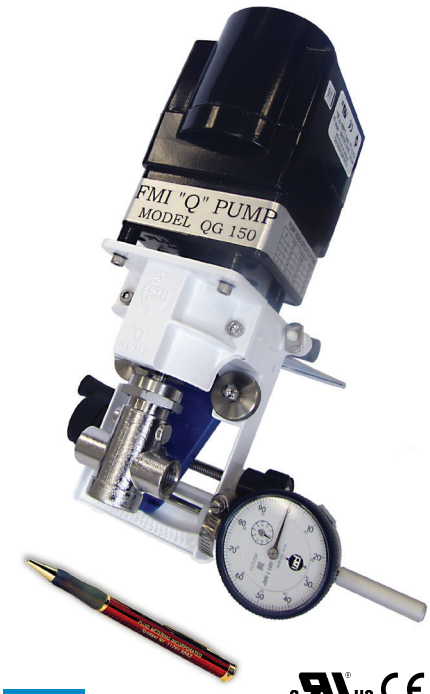
How to Order

Drive + Pump Head = Complete pump
QG + Q3CKC

QG PDM (PUMP DRIVE MODULE)

MAX. Flow		Pressure		PDM	Piston
ML/MIN	GAL/HR	PSIG	BAR		Code
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	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)



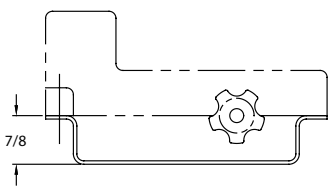
QG

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.30) 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

- 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 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 V DC, 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			
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

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

QB PDM (PUMP DRIVE MODULE)

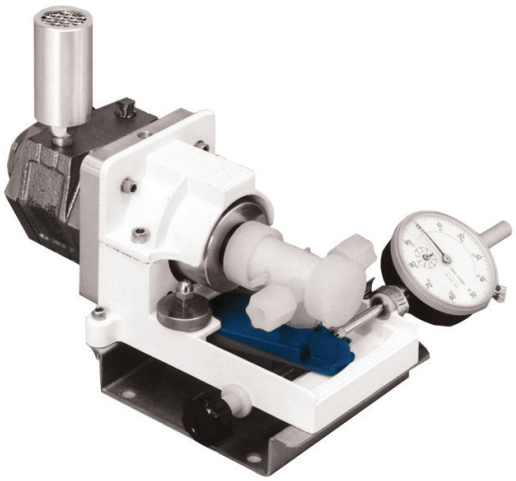
MAX. Flow/Pressure			PDM	Piston Code
ML/MIN	PSIG	BAR		
45	100	6.90	QB	RH00
90				RH0
144				Q0
180				RH1
576*	70	4.38		Q1
1296*	30	2.07		Q2
2304*	25	1.72		Q3

*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

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			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

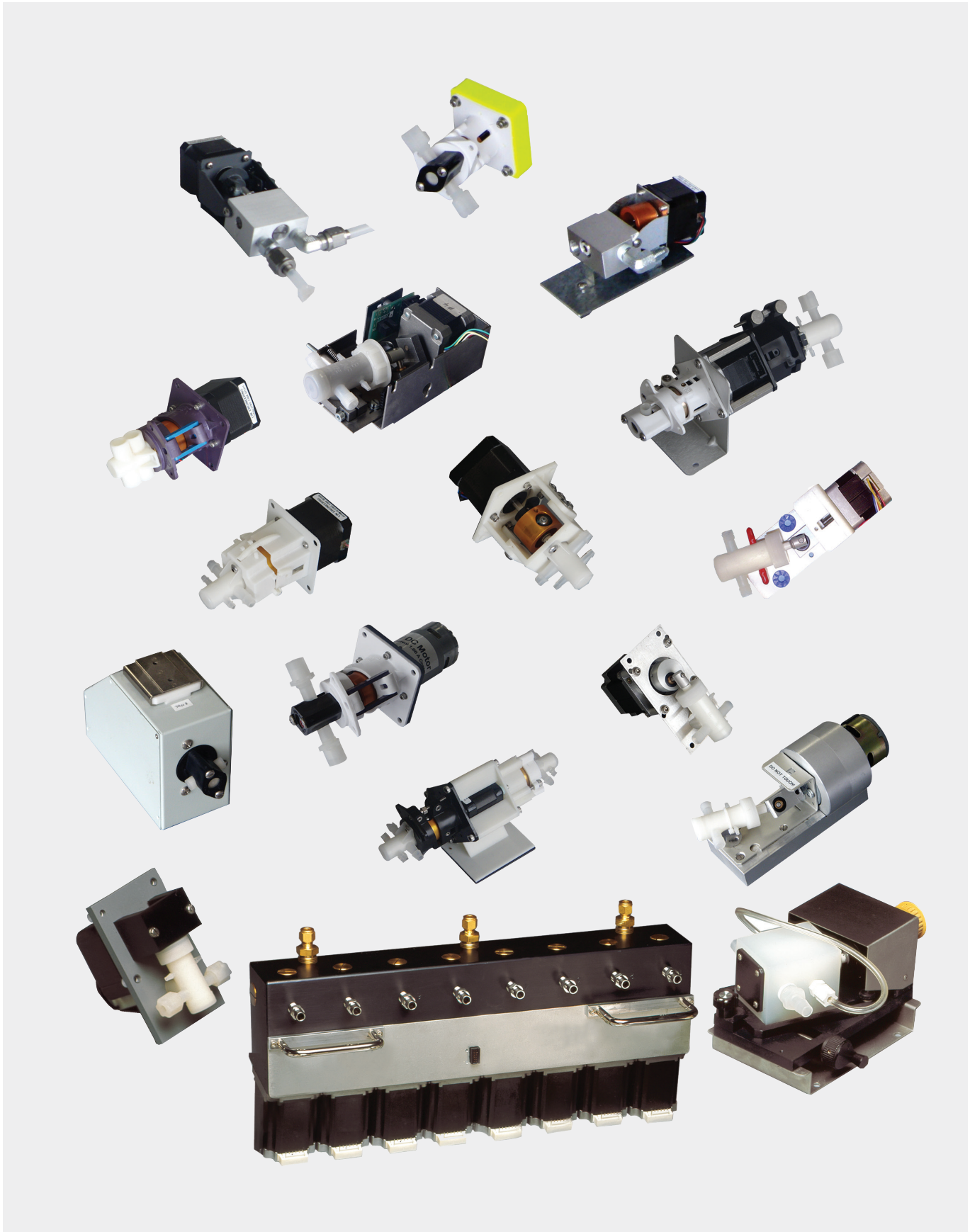
PD

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)

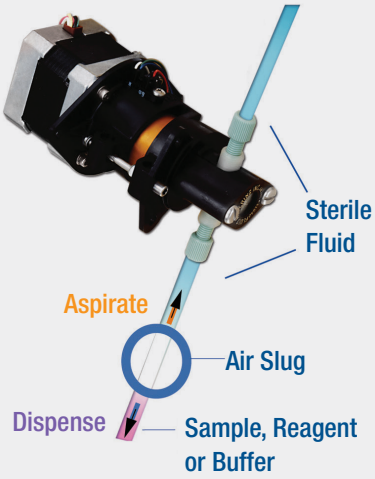
Solutions for All Your OEM Applications



Production - OEM - LAB

One Dispenser / Pump
For All Your Applications

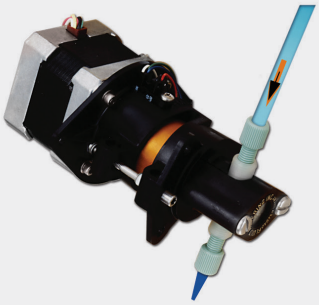
Valveless Syringing
Aspirate & Dispense



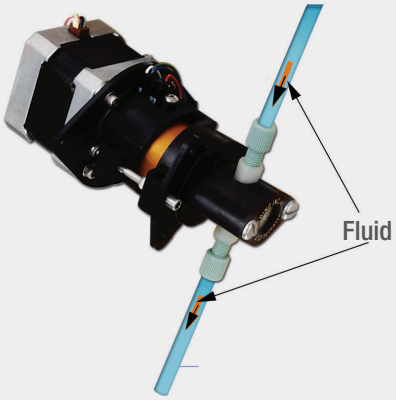
Fast Prime
Flush & Wash

0~2,000 mL/min

Continuous
Dispensing

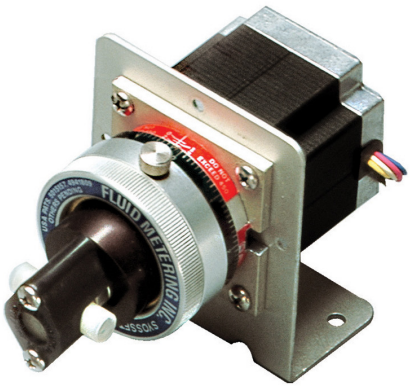


Continuous
Metering



0~2,000 mL/min

Production - OEM - Lab



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

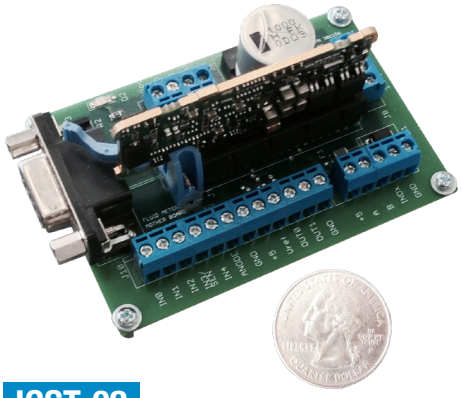
MAX. Dispense Rates Microliters / Revolution	Wetted Parts	Complete Pump Assembly
0 - 25 µL	Zirconia / PVDF / Ceramic	STRH00ZKCLF
0 - 50 µL	Ceramic / PVDF	STRH0CKCLF
0 - 100 µL	Ceramic / PVDF	STRH1CKCLF

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®** 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

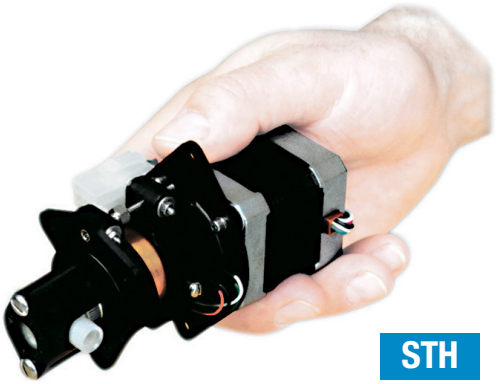
Stepper Control

- 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® programming software included
- Compact size : 2.0" x 3.1" x 1.6" high (51 x 79 x 41 mm)

OEM Dispensers / Pumps

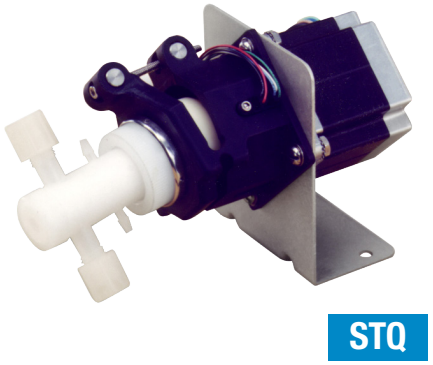
High Precision Stepper Motor Pumps for OEM Applications

- 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



Low Flow STH

MAX. Dispense Rates Microliters / Revolution	Wetted Parts	Complete Pump Assembly
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



High Flow STQ

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

Brushless DC Pump

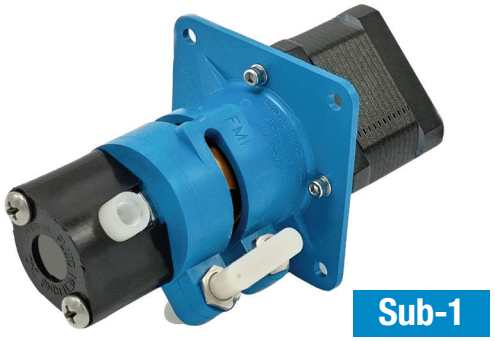
Instrumentation Pump for Wash & Fluid Transfer

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

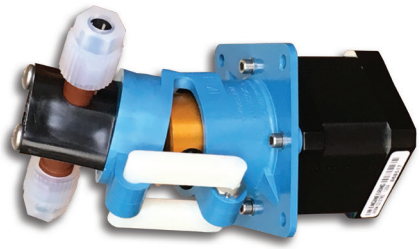
Sub-1 Pump

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



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

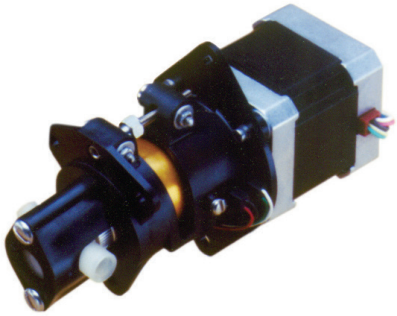
STF

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

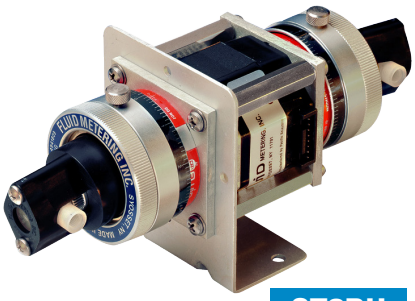
For Proportional and Dual Channel Dispensing and Metering

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

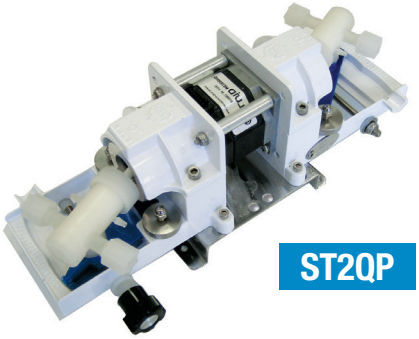
- Fixed displacement for dual channel or proportional fluid control
- Proportional fluid control ideal for mixing and diluting
- Each pump head individually factory calibrated to your specifications
- Accommodates all combinations of **H** piston sizes for dispense ratios up to 100:1

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

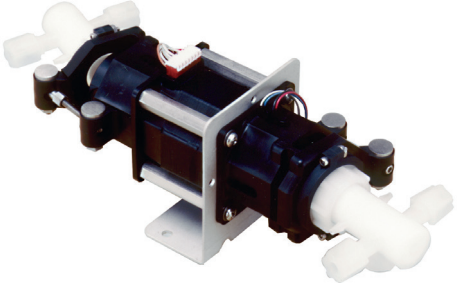


ST2QP

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

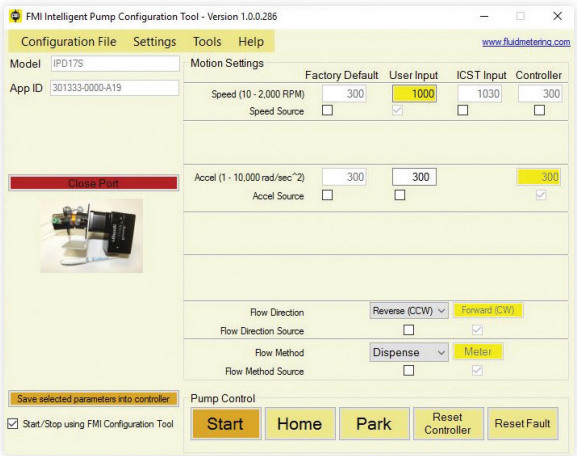


ST2Q

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 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 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	PSIG	BAR		
0.0025 - 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

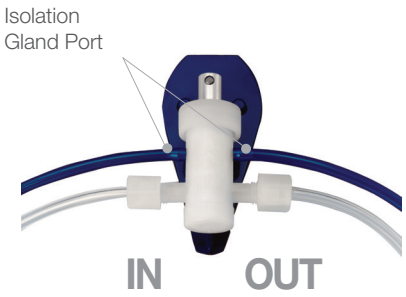
1) Minimum dispense volume per rev. is the total output for 2 identical pumps set at 5% of maximum displacement
2) Maximum dispense volume per rev. is for 2 identical pumps set at maximum displacement
3) Minimum continuous flow rate is the total output for 2 pumps set at 5% of maximum displacement operating 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 SFSTQ

Pump Heads



CKCW

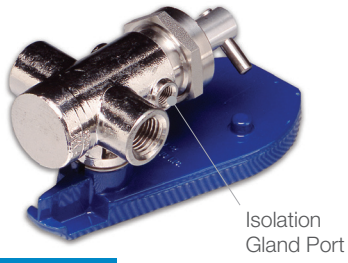
W, WT
Isolation Gland Pump Heads

- 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

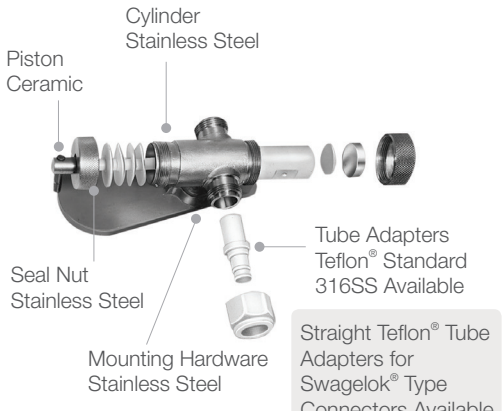
- Easily handles saline, slurries, particulates and abrasives
- Isolates main process fluid from seal area & atmosphere
- Barbed fittings provide quick connections to gland ports



CSC-W

CSC-W
Stainless Steel

- Gland design temperature to 350°F
- Pressure to 100 psig
- Ceramic piston and liner in 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 29 for more info)

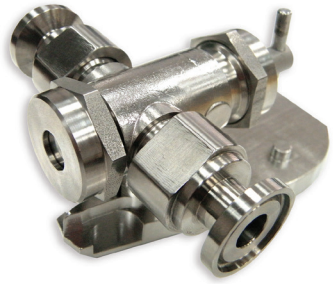
ALL STAINLESS STEEL VERSION AVAILABLE WITH SS PORT NUTS, TUBE ADAPTERS & CARRIER -“SAN-S”

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

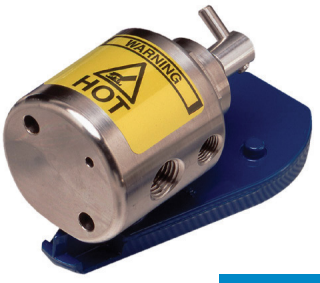
- Increases the operating pressure up to 200 psi for applications requiring flow rates up to 500 mL/min (Consult factory for drive selection)
- Ideal for medium pressure liquid chromatography
- New, high performance, extended-life seal configuration

Q0SCS - 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

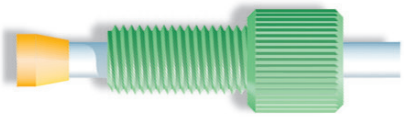
RH-LF

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

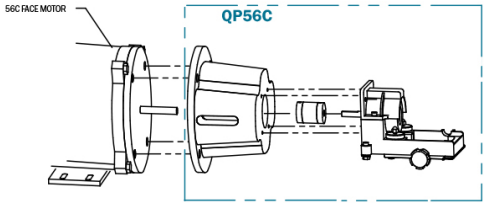
QP/M

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

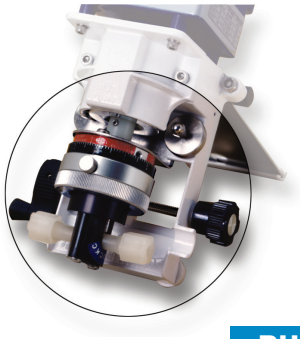


QP56C

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

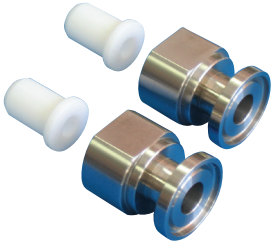


RH/Q

Tri-Clamp Sanitary Pump Heads

- Easily changes barbed fittings supplied with **SAN** to **SAN-TC** type
- 1” Flange will accommodate both 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

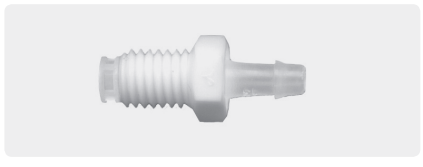
Dial Indicator Kit

Kit # Q485

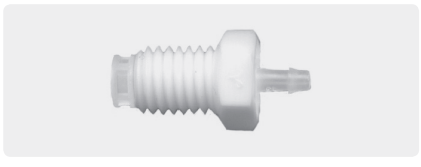
- Ultra-precise flow adjustment for **Q** pumps
- Responds to the slightest adjustment of the **Q** pump adjusting knob
- Each increment on direct reading dial represents 1/1000 of maximum flow
- Easily attaches to all **Q** Pump bases
- Can be ordered with pump or separately

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

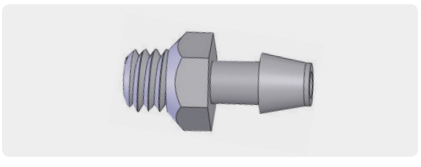
Threaded 1/4-28 UNF fitting to PVDF barb bottom sealing, rotating adapters consisting of a white nylon 1/4-28 fitting with 5/16" hex nut and PVDF (fluid path) insert barb.



#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



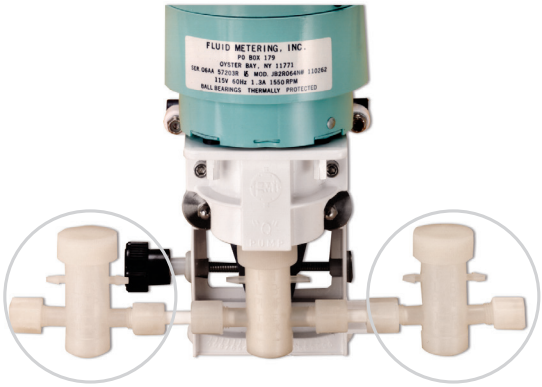
#110847-01
for use with 1/8" flexible tubing connection to isolation gland stainless steel "Q" Pumps

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

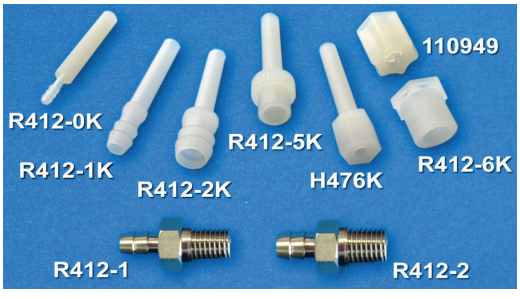
Corrugated Teflon® Tubing Pulse Suppressor

(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



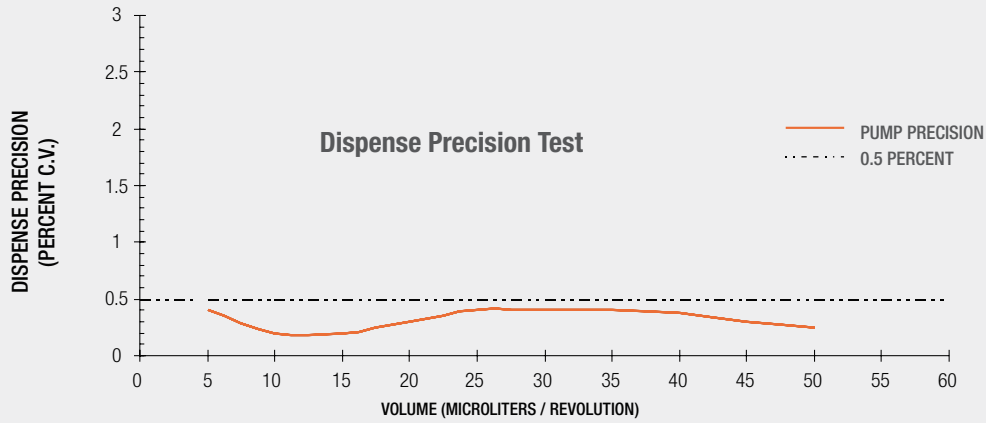
For Plastic Case Pump Heads - The integrally molded port fittings on the standard FMI Type K pump heads accept all 1/4” O.D. tubing. For other tubing arrangements, special port adapters are required.

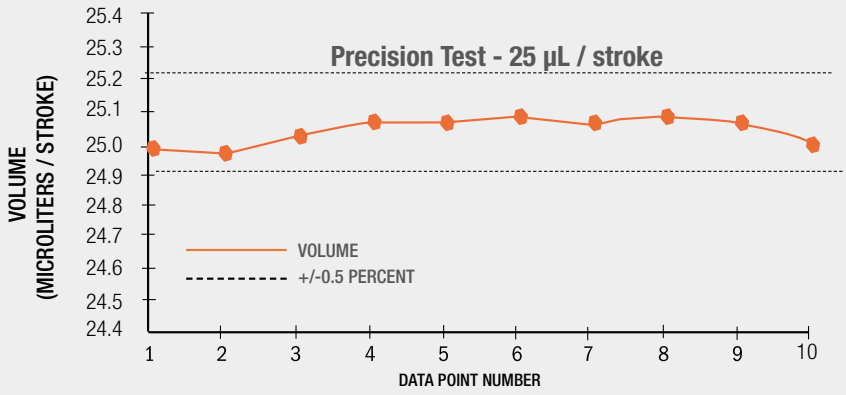
#R412-0K Adapter for 1/8" I.D. tubing
#R412-1K Adapter for 1/4" I.D. tubing
#R412-2K Adapter for 3/8" I.D. tubing
#R412-6K Adapter for 1/2" I.D. tubing
#R412-5K Adapter for 1/4-28 ferrule fittings
#H476-K Adapter for 1/8" O.D. tubing
#110949 Adapter for 6 mm O.D. tubing

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

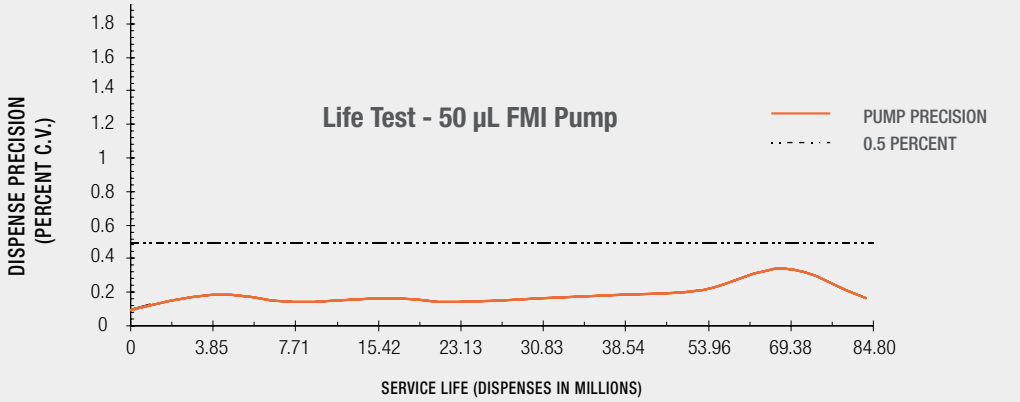
#R412-1 Adapter for 1/4" I.D. flexible tubing
#R412-2 Adapter for 3/8" I.D. flexible tubing

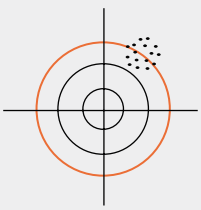
H Typical Flow / Dispense Data



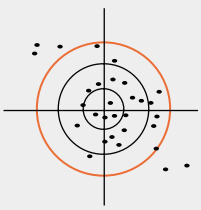


1	24.98
2	24.97
3	25.02
4	25.07
5	25.06
6	25.08
7	25.06
8	25.08
9	25.06
10	24.99
Total	**250.37**
Avg:	**25.04**
Std.Dev.:	**0.04**
C.V.	**0.17**

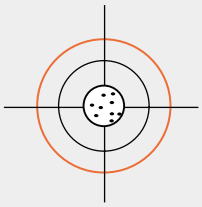




Precision
Repeatability and degree of variation of a set of values



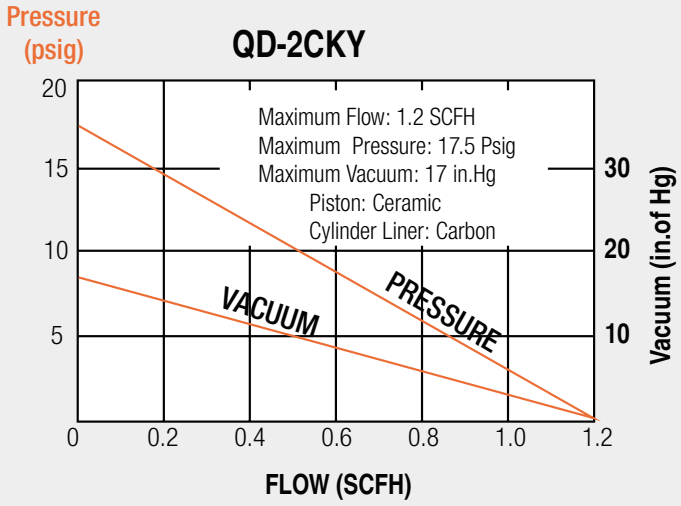
Accuracy
How close the average value is to the true value



FMI Pumps
Accurate & Precise

Q Typical Performance Curves

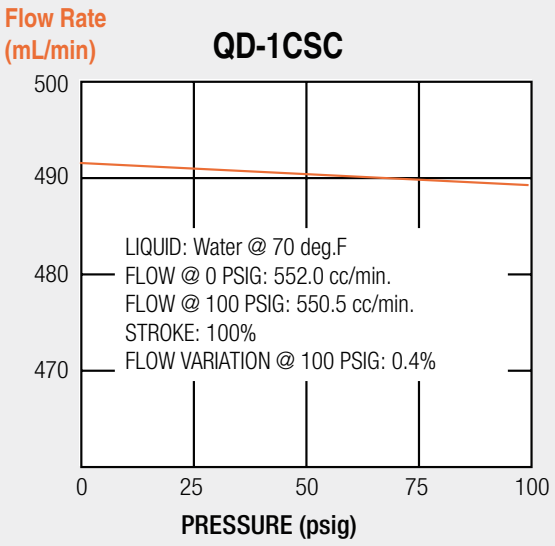
Performance curves shown below are applicable to the "Q" line of metering pumps.

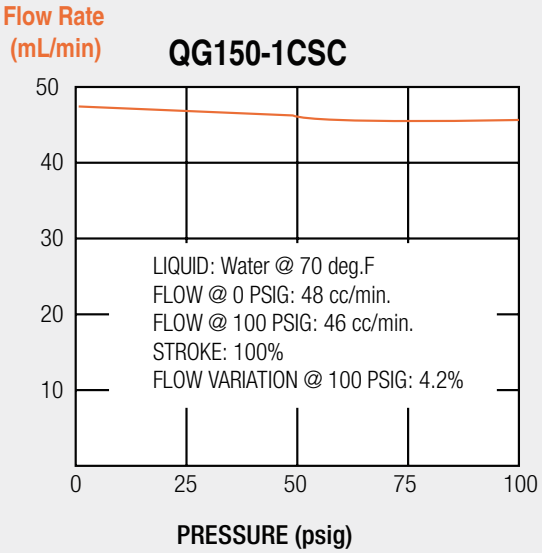


Performance Curve shown represents a test run on an FMI LAB PUMP handling ambient air at 70°F with CKY Pump Head Module.

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.
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_2O 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

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

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