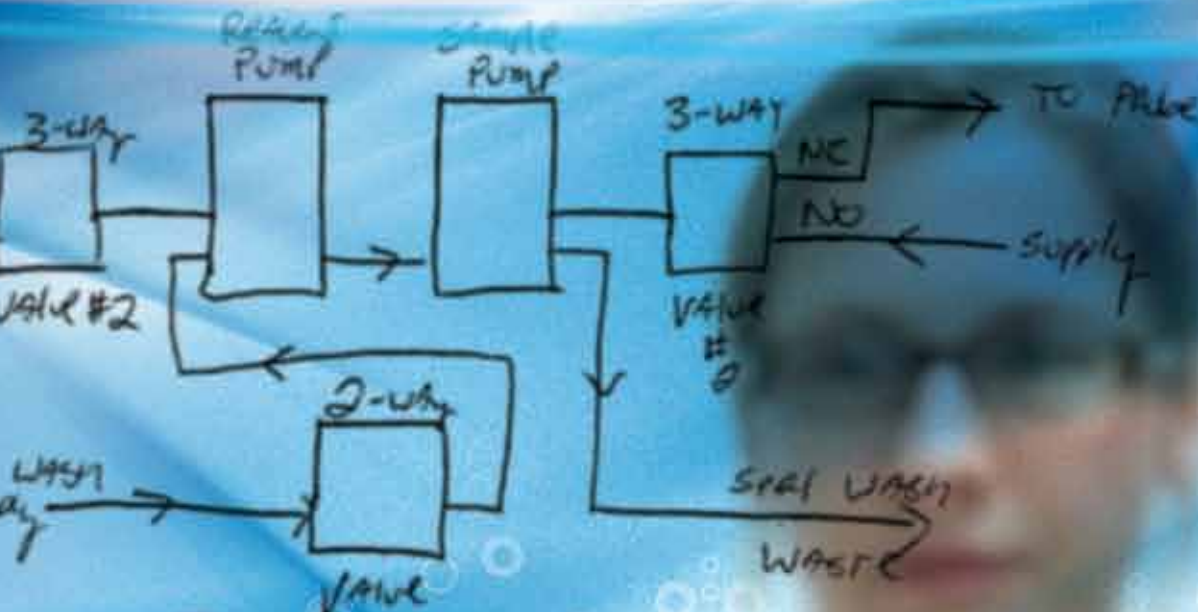




INSTRUMENT DESIGN RESOURCE

COMPONENTS AND SERVICES
TO OPTIMIZE LIFE SCIENCE FLUIDICS





Andrew Silvernail, President,
IDEX Health & Science LLC

Welcome to the first Instrument Design Resource, a book for the specialists who develop instrumentation for

- ▶ In vitro diagnostics
- ▶ Biotechnology
- ▶ Analytical Instruments
- ▶ Laboratory Automation

What constitutes waste in a fluidic system?

How do we—together—eliminate waste to increase performance through higher-level fluidics?

At IDEX Health & Science we believe that waste in a fluidic system runs deeper than leaks, clogs, or dead volume. It is reagent waste, sample loss, false results, and under-performance of the instrument.

At the most basic level, it is our intention to offer you the world's broadest portfolio of precision engineered fluidics, plus a deep and experienced team of fluid specialists (more than 65 scientists and engineers) to expand your capability and increase your efficiency. In a larger sense, it is to offer you the full benefit of every problem we have already solved for every customer to drive out fluidic waste in the most demanding environments. World class technology, products, and experience: Optimized Fluidics.

In addition to the printed copy, online you'll find a link-enabled electronic version of this book to help you navigate our website. I hope you'll visit www.idex-hs.com/ResourceOnline

Thank you for doing business with IDEX Health & Science!

A handwritten signature in black ink, appearing to read 'Andrew Silvernail', written in a cursive style.

Andrew Silvernail
President, IDEX Health & Science LLC

ISO 9001-2000 · ISO 13485 · RoHS · REACH

Pre-Worried

A fully integrated fluidic system—
completely tested—on time, on spec,
on budget.

How much sleep could that save you?
Co-engineered fluidic sub-systems are
our specialty.

Stress relief is just a little freebie.

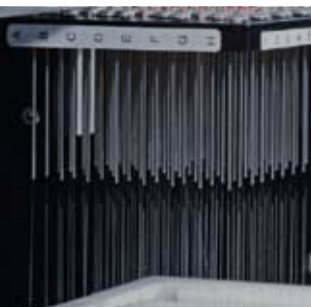
*The Controlled Delivery Module,
a compact, configurable fluidic
prototype. See page 11 for details.*

Call 866.339.4653
and talk to a real person!

www.idex-hs.com

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Highly precise pumps for dispensing plus gear, piston, and peristaltic pumps for metering applications

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Precision rotary valves for injection, selection, and switching

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Customized devices to remove dissolved gases, bubbles, or both

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Custom manifolds and high-precision machined plastic components

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Tubing

Custom and stock tubing and tubing assemblies for low to high pressures

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Connections

Optimized connections at any pressure from less than 100 psi to more than 20,000 psi

For High & Ultra-High Pressure Instruments

IDEX Health & Science offers the broadest portfolio of fluidic components for precision instrumentation, especially for ultra-high applications above 12,000 psi.



For High and Ultra-High Pressure Instruments

Throughout the guide, these icons indicate a page containing products particularly applicable to techniques utilizing high pressures from 6,000–12,000 psi (414–827 bar), and ultra-high pressures from 12,000+ psi (827 bar).



NEW!



UHPLC Fitting

See page 48

- ▶ Reliably holds to 20,000 psi (1,379 bar)
- ▶ Stainless steel construction withstands elevated temperatures
- ▶ Reusable
- ▶ Biocompatible PEEK™ flow path
- ▶ Fits 1/16" OD tubing standard in most systems

NEW!



UHPLC Cartridge Check Valve

See page 35

- ▶ Rated to 15,000 psi (1,034 bar)
- ▶ Cartridge design allows easy in-field service
- ▶ Low internal volume preserves accuracy
- ▶ Multiple body and thread configurations available
- ▶ Contact us for custom solutions exceeding 20,000 psi (1,379 bar)



For Low-Pressure Instruments

Throughout the guide, this icon indicates a page containing products particularly applicable to techniques utilizing maximum pressures of approximately 100 psi (7 bar).

For Low-Pressure Instruments

IDEX Health & Science develops specialized components to meet the high reliability and value thresholds of diagnostic instrument manufacturers.

NEW!

 **RHEODYNE**

TitanEZ™ Ceramic Valve

See page 29

- ▶ Ultrahard sealing surfaces for long service life
- ▶ Low internal volume increases result accuracy
- ▶ Stand-alone or manifold-mounted design increases design flexibility
- ▶ Multiple position/port configurations accommodate a variety of instrumentation



NEW!

 **UPCHURCH®
SCIENTIFIC**

Diagnostic Tubing Assemblies

See page 45

- ▶ Cost effective for instruments and manufacturing
- ▶ 3 Styles to fit every instrument need
- ▶ Reliably reduces leaks in the instrument
- ▶ Easy to install, easy to service

“How are you using it?”

Nearly every discussion with the Research, Development, and Engineering (RD&E) team of IDEX Health & Science starts the same way:

“What is your flow rate?”

“What are your pressures?”

“What do you need to accomplish?”

At the same time that designers demand ever-smaller fluidic footprints from in vitro diagnostics to HPLC, the need for fluidic efficiency continually increases and significantly impacts the final success of an instrument. Yet what could possibly be so complicated about flowing Fluid X from Point A to Point B? Turns out, at today’s microflow rates, quite a lot.

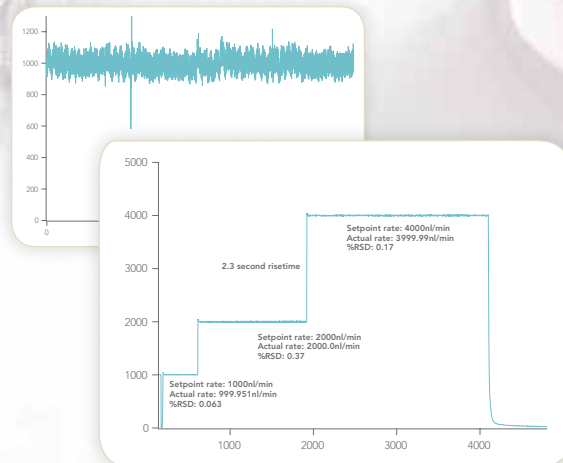
Artifacts such as compressibility, mixing, trapped gases, diffusion, and particulates swell the complexity of fluidic system development, creating implications for the ultimate goal: reliable, consistent, accurate results.

With more than 65 mechanical, software, electrical engineers, and scientists—yet a single point of contact—the RD&E team of IDEX Health & Science has been extremely successful in providing **creative new solutions involving novel fluidic technologies** that solve our customers’ problems and achieve the results they need.

Not yesterday’s off-the-shelf remedies, but **new solutions to emergent problems.**

Utilizing the industry-leading brands of IDEX Health & Science and select partner technologies, RD&E creates and optimizes custom fluidic assemblies to

- ▶ Increase system reliability
- ▶ Reduce fluidic waste and variability
- ▶ Develop new ways of moving fluids within cost and time constraints



Observation of unacceptable flow fluctuation in Mass Spectrometry applications stimulated research leading to development of proprietary flow stabilization technology.

Prototype

“...a couple of phone calls
and a few e-mails and
we had a prototype plan...”

— Doug Jamieson, R&D Manager, DIONEX CORPORATION

Case Study

For their next-generation analyzer, a major manufacturer of clinical chemistry/immunoassay instrumentation wanted less complexity and simpler operation, greater inter-connectivity, and a more compact design without compromising accuracy or reliability.

In a co-development partnership, the RD&E team of IDEX Health & Science designed and built prototype sub-systems integrating precision pumps, valves, and a degasser that drops into the instrument as single part. By consolidating wiring & tubing in the microfluidic unit, RD&E also reduced the overall instrument footprint.

The partnership enabled the customer to focus on the core chemistry of the instrument while significantly shortening overall instrument development time in bringing the new platform to market.

Rapid Prototype Development



An integrated stainless steel piston displacement pump and custom valve assembly combined to create a compact fluidic module that includes stainless steel fittings and a tubing kit.



A completely integrated piston displacement pump and custom valve fluidic assembly for a flow-controlled nanospray reference sprayer for a mass spectrometer.



Precise, feedback-controlled fluidic module with a rotary switching valve for aspirate and dispense operations.



Custom manifold assembly for IVD and biotech applications that combines three piston pumps and solenoid valves in a value priced module.

Rapid Response RIGHT Response

Customers who have collaborated with IDEX Health & Science tell us that we have 'met or exceeded their expectations.'

After a recent co-engineering project involving a technically difficult OEM-specific configuration, the customer reflected how we:

- ▶ responded with technical know-how
- ▶ demonstrated powerful commitment to make their technology work
- ▶ impressed him with our ability to work closely with his team, quickly and accurately perceiving his core needs
- ▶ provided quick, effective solutions
- ▶ accommodated changing specifications and evolving needs
- ▶ produced competitively superior products
- ▶ provided a highly-customized solution that worked exactly as needed

"To the instrument manufacturer, the value of an integrated module or sub-assembly is that all the components are designed to function together, and the device is fully tested prior to delivery."

— Brad Besse, V.P., Business Development, Diagnostics

In fact, one customer commented that 'this was the most outstanding collaborative effort in which he'd ever participated.'

Evaluation Prototypes

PeriMeter

One of the many fluidic prototypes available for testing in a conceptual system, the PeriMeter combines proprietary flow-feedback control on the highly accurate Ismatec® peristaltic pump, providing nearly pulseless flow for dispensing or metering. The PeriMeter arrives complete with tubing and tubing cassette, controller cards, communication cards, and software to enable immediate use.

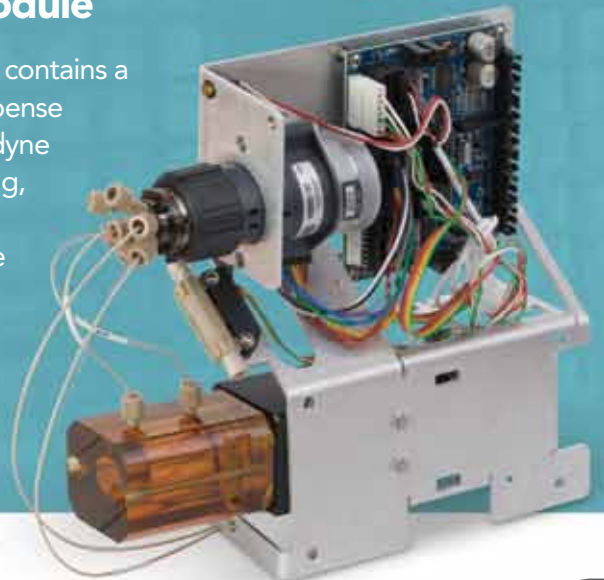


Sampling and Wash Engine

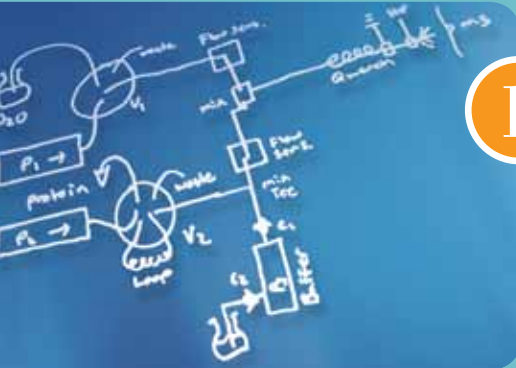
Another customizable design available for easy evaluation, the **Sampling and Wash Engine** incorporates a Sapphire Engineering® precision dispense pump, a Rheodyne® six-port selector valve, all necessary tubing, controller cards, communication cards, and software to allow full usage immediately.

Controlled Delivery Module

This compact, configurable module contains a Sapphire Engineering precision dispense pump with flow sensor and a Rheodyne flow-control valve, to automate filling, rinsing, and dispensing functions within a fluidic system. Each module operates through a shared communication bus protocol, and all controller cards, communication cards and software are provided.



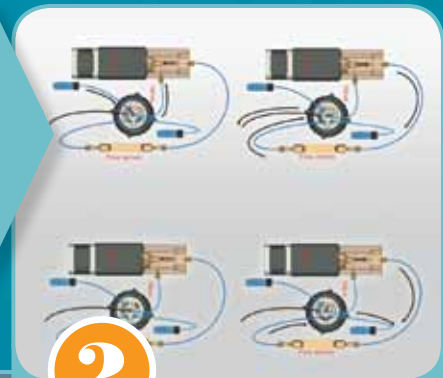
The Collaboration Workflow



1

Define the system problem or goal

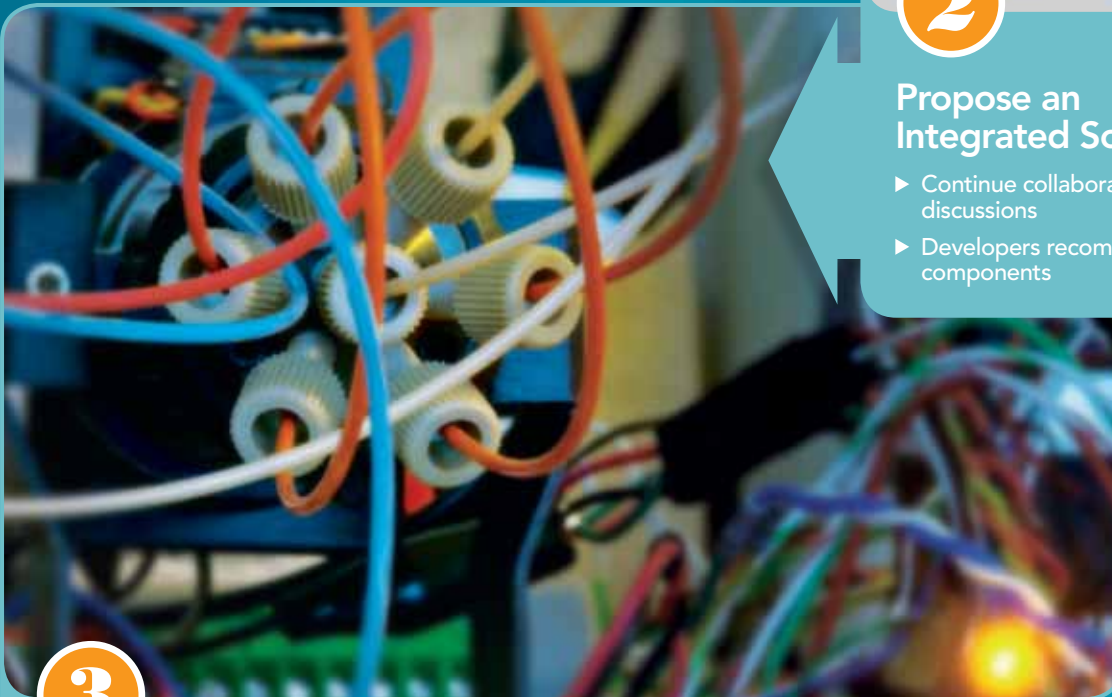
- ▶ Establish the application-specific performance goals for fluid delivery
- ▶ Define the cost and time parameters
- ▶ Engage in collaborative problem solving discussions



2

Propose an Integrated Solution

- ▶ Continue collaborative discussions
- ▶ Developers recommend components



3

Integrate components

- ▶ Developers source optimal components
- ▶ Resolve emergent compatibility issues
- ▶ Validate component performance



4

INTEGRATED SOLUTIONS

Fully integrated, application-specific fluidic prototypes optimized for performance and control, then manufactured, tested, and delivered as a single part

Customize functional prototypes

5



6

Test and validate

► Prototypes are tested, analyzed and optimized

Develop software and control methods

- Automate hardware using custom controllers
- Provide evaluation software



7

Manufacture and deliver

► Product engineers collaborate on fluid connections, electrical components, mounting configurations, controller firmware, production and delivery schedules

Benefits

- ▶ Smaller, space-saving design
- ▶ Independent channel aspiration capability
- ▶ Dispenses to any substrate for application flexibility
- ▶ Sub-microliter dispensing

Applications

- Biosensor manufacturing
- PCR applications
- Genomics/Proteomics
- Low pressure chromatography

8-Channel Syringe Drive

15,000 step syringe drive

For specifications see page 15



Nano-Dispense Engine

Sub-microliter dispensing

For specifications see page 15



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(707) 588-2000

www.idex-hs.com/liquidhandling

Customize

8, 12, or 16 channel systems

Driver boards available



LIQUID HANDLERS

Syringe Drives



At Volumes of:	5 µL	10 µL	50 µL	500 µL
Accuracy	2%	1%	<0.5%	<0.4%
Precision	2%	1.50%	<0.5%	<0.2%
Resolution	15,000 steps / 60 mm			
Speed (per second)	20 µL max			
Power	24 VDC			
All models feature syringes and independent channels				
Options below vary by model. Visit the website for detail and dimensions.				
Motorized Drive · Motor with Driver · Control Electronics · Software				

Nano-Dispense Engines



Input Ports	8 Solenoid, 8 Syringe	12 Solenoid, 12 Syringe
Output Ports	8	12
Channels	8	12
Speed (per second)	20 µL max	
Precision	5% @ 500 nL	3% @ 1 µL
Accuracy	5% @ 500 nL	3% @ 1 µL
Dispense Modes	Same or independent volumes/channel	
Power	24 VDC	
Both models feature electronics, and custom drivers.		
Available Nozzles: 125 µm, 200 µm, custom. Visit the website for detail and dimensions.		

TECHNOLOGY COMPARISON

	Nanodrop™	Flow-Through Solenoid	Dispense-Thru Solenoid	Disposable Tip
Dispensing; Contact and Non-Contact	Y	N	Y	N
Aspirate and Dispense	Y	N	Y	Y
Solenoids or Pump in Flow Path	N	Y	Y	Y
Sample Transfer	Y	N	Y	Y
Reliability	Y	N	N	N
Manifolds in Design	N	Y	Y	N
Viscous Reagents	Y	N	N	N
Low Dead Volume	Y	N	N	Y
Difficult Reagents	Y	N	N	N
Ease of Cleaning	Y	N	N	N/A
Independent Channel (Asp/Disp)	Y	N	N	N
Low Maintenance Cost	Y	N	N	N
Single Tip Dispensing	Y	Y	Y	N

Blue cells indicate unique technology capability



Customize

Multiple valve configurations available

Variety of pump head material choices for chemical corrosion resistance

Pump-in-manifold and integrated solenoid valve design on some models

Custom stroke and piston sizes available

VFP17

To 100 psi (7 bar)

For configurations and specifications see page 20

Custom manifold & solenoid valve option

Custom fluidic modules save valuable design and assembly time.



Valve-mounted option



Benefits

- ▶ Optical end-of-stroke detection for enhanced precision
- ▶ Flexible pump head design for easy integration with valves, manifolds, and other components
- ▶ Zirconia Ceramic piston technology for increased lifetime



Applications

HPLC

Hematology

Nucleic acid assays

Immunoassays for
Infectious diseases

Benefits

- ▶ Direct plug-in replacement for industry standard 30 mm syringe pumps
- ▶ No routine maintenance required for significant cost savings
- ▶ Accuracy and precision identical to typical syringes and valves



PVM & IPV

Integrated Piston and Valve

For configurations and specifications see page 20



S17

To 2,500 psi (172 bar)

Customizable for longer life, improved performance, and greatly reduced cost-of-ownership.



CALL FOR QUICK TECHNICAL INFORMATION:

USA – Middleboro, MA
(866) 339-4653

www.idex-hs.com/dispensepumps

External Gear Pumps with Electromagnetic Drive



Applications

- Printing equipment
- Emissions reduction
- Medical equipment
- Chemical processing

Pump Benefits

- ▶ Pulseless, continuous flow with variable speed for precise fluid control
- ▶ Compact, magnetically coupled design for simple integration and serviceability
- ▶ Hermetically sealed for leak-free operation
- ▶ Chemically resistant materials for long pump life

GA Pump

Flow rates from 8.5–550 mL/min

For configurations and specifications see page 21

Customized GA Pump
For high system pressures



GJ Pump

Flow rates from 160–5,200 mL/min

For configurations and specifications see page 21



I-Drive Benefits

- ▶ Contains no moving parts for reliability and longer life
- ▶ Low power consumption, compact size for efficient system integration
- ▶ Simple integration into PLC-controlled machines



I-Drive®

24 VDC Electro-magnetic Drive

For configurations and specifications see page 21





Micro Annular Internal Gear Pumps

ML Pump

Flow rates from
0.0015–288 mL/min

For configurations and specifications see page 21



Benefits

- ▶ High precision dosing in the microliter flow range
- ▶ Small package size for easy integration
- ▶ Abrasion resistant due to ultrahard materials

Applications

Analytical and biotech sampling and dispensing

Pharmaceutical and medical equipment

DNA analysis

Spray coating

MH Pump

Flow rates from
0.003–288 mL/min

For configurations and specifications see page 21



Customize

Variety of control and port options

Multiple gear sizes, mounting configurations, and drive options

Wide selection of wetted materials available

CALL FOR QUICK TECHNICAL INFORMATION:

USA – Vancouver, WA
(360) 253-2008

www.idex-hs.com/gearpumps

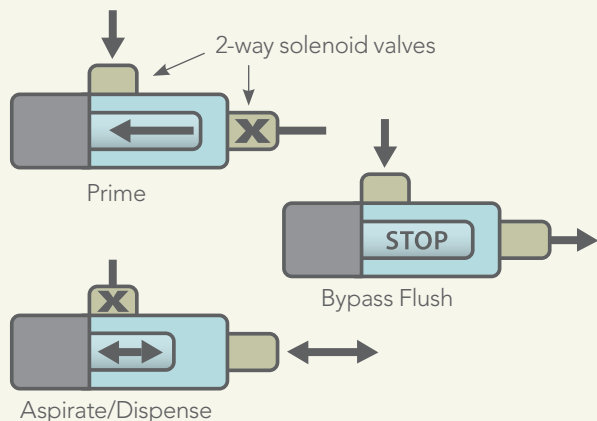


DISPENSE PUMPS

	S17	VFP17	PVM/IPV	
Standard Sizes (total pump volume)	50 µL, 100 µL, 250 µL, 500 µL, 1 mL, 2 mL, 3 mL, 5 mL	25 µL, 50 µL, 100 µL, 250 µL, 500 µL, 1 mL, 2.5 mL, 5 mL	50 µL, 100 µL, 250 µL, 500 µL, 1 mL, 2.5 mL, 5 mL	
Maximum Operating Pressure	5,000 psi (345 bar)	3,000 psi (206 bar)	100 psi (7 bar)	
Dispense Volume Min/Step	0.0083 µL (50 µL) to 0.5556 µL (5 mL)	0.0063 µL (25 µL) to 1.2500 µL (5 mL)	0.0167 µL (50 µL) to 1.6667 µL (5 mL)	
Dispense Rate Maximum	30 (@50 µL) to 4,000 (@5 mL)	25 (@25 µL) to 4,200 (@5 mL)	45 (@50 µL) to 4,200 (@5 mL)	
Dispense Accuracy	< 1%			
Dispense Precision	100% dispense: < 0.2 % CV 10% dispense: < 0.5 % CV 1% dispense: < 2 % CV			
Resolution (full steps per stroke)	3,000/6,000	2,000/4,000	3,000	
Wetted Materials	Head	Ultem® Standard; Custom materials available	Acrylic Standard; Custom materials available	
	Piston	TZP Ceramic; Sapphire	TZP Ceramic	
	Seal	UHMWPE, Viton®, Customizable	UHMWPE, Viton, Customizable	UHMWPE, Viton
Operating Temperature	60–110 °F/15–45 °C	60–110 °F/15–45 °C	62–104 °F/17–40 °C	
Anticipated Life	5 million cycles	2 million cycles	3 million cycles	
1.8 degree Bipolar Stepper Motor	Yes	Yes	No	
Voltage	24 V			
Encoder	Option	Option	Integrated	
Controller Board	Option	Option	Standard with PVM	
Seal Wash	Option			
Connection Ports	1/4-28, M6, custom	1/4-28 or M6	1/4-28	
Home Position	Aspirate or Dispense		Full Dispense	

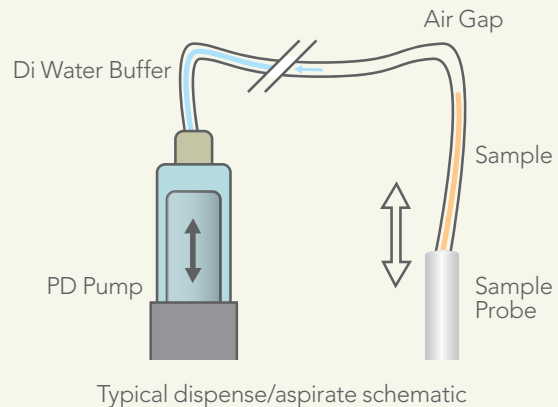
Pump head equipped with bypass valves:

Positive displacement pump with (2) solenoid valves can replace a traditional syringe pumps with a 3-way valve.



Precision Dispense Pump application:

Using a buffer fluid, the sample can be accurately aspirated and dispensed. The buffer solution can also be used to wash the probe.



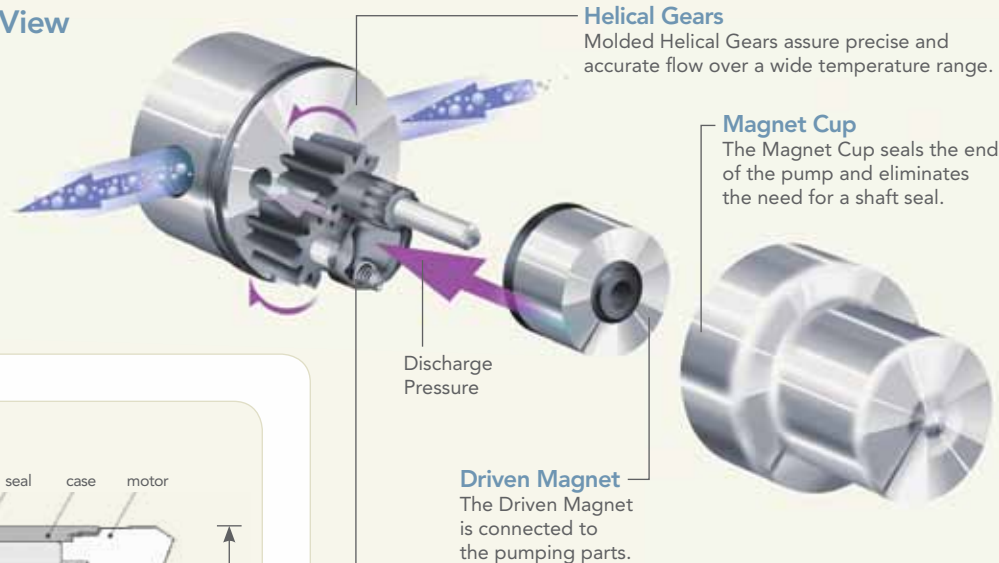
MICROPUMP

GEAR PUMPS

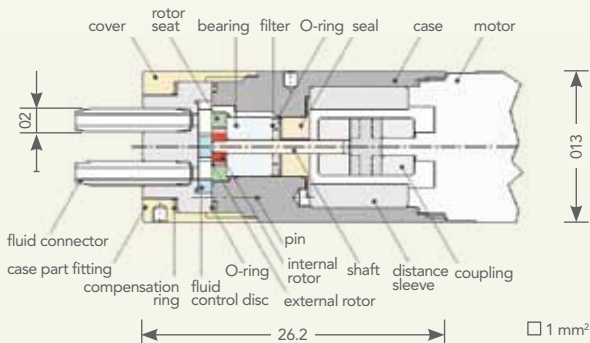


	GA	GJ	ML	MH
Technology	External Gear	External Gear	Micro Annular	Micro Annular
Speed Range	500–6,000 rpm	500–5,500 rpm	100–6,000 rpm	1–6,000 rpm
Displacement Volume	0.017–0.092 mL/rev	0.316–0.91 mL/rev	0.15–4.8 mL/rev	0.048–288 mL/rev
Flow Rate Range	8.5–550 mL/min	160–5,200 mL/min	0.0015–288 mL/min	0.003–1,152 mL/min
Maximum System Pressure	300 psi (14 bar)	300 psi (14 bar)	88 psi (6 bar)	1,233 psi (85 bar)
Maximum Differential Pressure	75 psi (5.2 bar)	80 psi (5.5 bar)	116 psi (8 bar)	1,160 psi (80 bar)
Wetted Materials	Gears: PPS, PEEK™, Carbon Graphite Seals: PTFE, Viton®, Base: 316SS	Gears: PPS, PEEK, PTFE Seals: PTFE Base: 316SS	Gears: WC-Ni Seals: PFE Base: 316SS, Ceramics	Gears: WC-Ni Seals: PTFE, FPM, EDPM, FFPM Base: 316SS
Viscosity Range	0.2–1,500 cP	0.2–1,500 cP	0.3–100 cP	0.3–50,000 cP
Self Priming	No	Yes (Wet)	Yes	Yes
Temperature Range	- 46 to 177 °C	- 46 to 121 °C	- 20 to 60 °C	- 5 to 60 °C
Motor Options	I-Drive®, BLDC, DC, AC, Air	I-Drive, BLDC, DC, AC, Air	DC	DC Servomotor, Ex-proof, or BLDC
Voltage Range	20–30 V	20–30 V	4–24 VDC	12–30, or 42 VDC
Nominal Power	40 W	70 W	3, 4.5, or 20 W	150 W
Control Options	0-5VDC, 4-20mA, manual	0-5VDC, 4-20mA, manual	Integrated encoder with various controllers	Integrated encoder with various controllers

Gear Pump: Exploded View



Micro Annular Pump

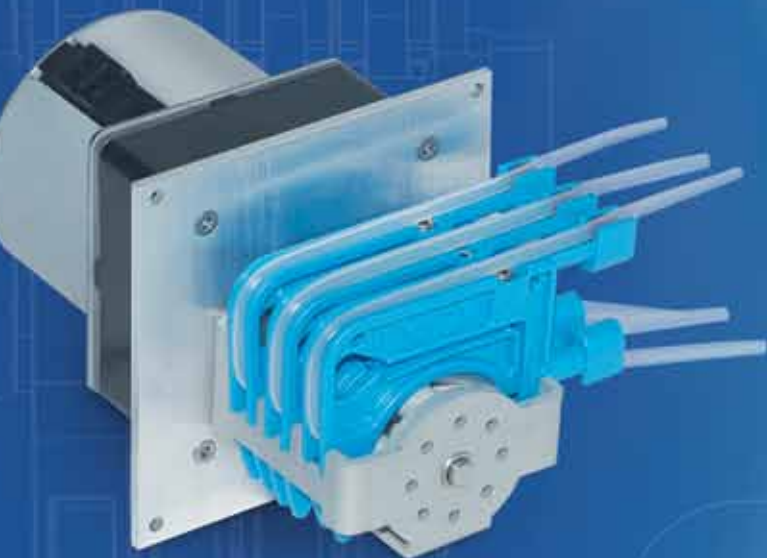


Suction Shoe
Discharge pressure keeps the Suction Shoe seated tightly on the top of the gears preventing flow from decreasing at higher outlet pressures.

MiniClick Pump with DC Drive

Flow rates from 0.001–26 mL/min

For configurations and specifications see page 23



Benefits

- ▶ High precision for accurate, repeatable results
- ▶ Rugged and durable with long service life
- ▶ No cross-contamination — fluid contained wholly in tubing
- ▶ Easy to clean; no fluid holes
- ▶ Quick, easy to change tubing for different media

Applications

Highly sensitive cellular analysis

Agricultural testing

Pharmaceutical research and manufacturing

DNA sequencing

Customize

Multiple channels available

Multiple drive options

Pump head available separately

Wide variety of tubing materials

MS/CA Pump with AC Drive

Flow rates from 0.001–34.4 mL/min

For configurations and specifications see page 23



IPC

Flow rate down to 0.4 µL/min

With 4–24 channels available, this stand-alone pump provides highly repeatable and accurate fluid delivery. The planetary drive system supports long tubing life.

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(360) 253-2008

www.idex-hs.com/peristalticpumps

ISMATEC













PERISTALTIC PUMPS

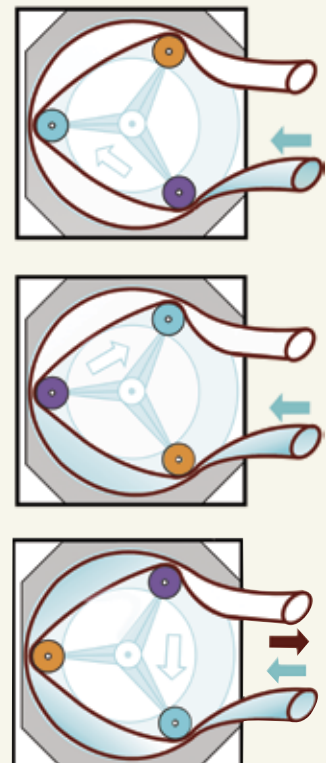
	MiniClick	MS-CA	IPC
Technology	Peristaltic	Peristaltic	Peristaltic
Number of Channels	3 or 6	1 to 5	4, 8, 12, 16, or 24
Number of Rollers	5	6, 8, or 12	8
Speed Range	1–160 rpm	1–160 rpm	.11– 45 rpm
Flow Rate Range	.001–26 mL/min	.001–34.4 mL/min	.0004–44 mL/min
Maximum Differential Pressure	22 psi (1.5 bar)	22 psi (1.5 bar)	15 psi (1 bar)
Wetted Materials	Tubing Only	Tubing Only	Tubing Only
Self-Priming	Yes	Yes	Yes
Maximum Temperature	238 °C*	238 °C*	238 °C*
Motor Options	Synchronous or Brush DC	Synchronous or Brush DC	Brush DC with Encoder
Voltage Range	12 VDC–230 VAC	12 VDC–230 VAC	115/230 VAC
Nominal Power	8–10 W	7–10 W	30 W
Control Options	Optical Encoder & OEM Controllers	Optical Encoder & OEM Controllers	Keypad, Analog & RS232

*Depends on tubing selection

Tubing Selection Options:

		
Tygon® LFL	Tygon® ST R-3603/R-3607	PharMed® Ismaprene
		
Tygon® MHSL 2001	Tygon® MHLL	Tygon® HC F-4040-A
		
Tygon® SI Silicone 3350 (Platinum)	Silicone (Peroxide)	Norprene® A-60-G
		
Viton® Fluran® HCA F-5500-A		

Peristaltic Pumping Principle



“Critical to the chemistry is very precise control of fluids in the instrument”

Flow-controlled microfluidics empower a new biomedical analyzer that has the capability to perform 4,000 to 5,000 simultaneous yet discrete reactions on minute DNA samples. Scientist Darren Lewis explains, “A unique feature of this system is how the various chemistries occur in individual droplets that don’t compete with each other.”

The tiny biological samples required for analysis are first purified and sheared to an appropriate length. The instrument then creates picoliter sized droplets of sample in a flowing stream of fluorinated oil. “Because oil and water are immiscible, sample droplets channel separately through a chip device for analysis,” Lewis adds. This deceptively simple ballet requires multiple synchronized pumps to introduce oil and reagents. A different pump injects sample, while a final pump deposits sample into a vial at the end.

“Critical to the chemistry is very precise control of fluids in the instrument so the same volume of fluid enters and leaves the analyzer. A perturbation on any one of the fluid lines requires compensation on all the other fluid lines simultaneously,” Dr. Lewis continues. “Any failure to do that results in loss of experimental results.”

Before the fluidic engineering team visited the customer, a prototype sub-assembly was

created and optimized with specific tubing and programmed to achieve specific flow rate ranges. Lewis describes the scene, “We explained the concept of flow feedback control and put the unit on a desk—we used a water bottle as a fluid source—and they were instantly impressed with the prototype. They told us they’d never seen flow precision like that before.”

After the first order for prototypes, IDEX Health & Science continued to customize subsequent prototypes with firmware and hardware. The final product consists of multiple pumps, valves, and a flow sensor, optimized with all tubing and connections, then tested and serviced by IDEX prior to delivery. “We even drill the holes, mount the hardware and wire everything together,” Dr. Lewis concludes.



Degassing Drives Out Detection Errors

Although degassing technologies have been used in HPLC for decades, makers of instruments for in vitro diagnostics still struggle with dissolved gases and bubbles. A major diagnostics company traced detection errors in their large-scale analyzer to bubbles in the flow path, and consulted IDEX Health & Science for our debubbling technologies when their internal degassing efforts didn't produce the required accuracy. Within two weeks, a custom prototype scaled to ensure the proper level of degassing over the desired flow rates was installed on the instrument. Immediately what had been a failure rate of four percent dropped to zero as a result of active debubbling/degassing via the Systec® Transfer-Line Degasser.

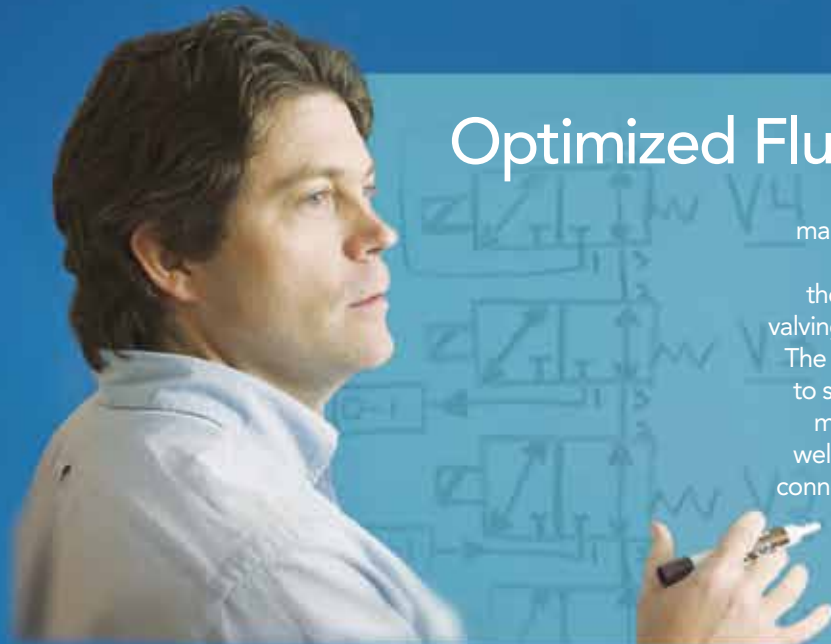
Precision. Accuracy. And Usability.

As more of our diagnostic customers realize the advantages of co-engineering an entire fluidic package—pumps, valves, degassers, connections mounted on a custom manifold—we are discovering and resolving usability issues encountered by *their* customer, the instrument user. Technicians who service our IDEX Health & Science dispense module appreciate the design feature that makes it impossible to lose the mounting screws for the module. The screws can be loosened for service, but not completely removed, so they can't fall out or get lost inside the instrument. In other modules, we orient the valves to minimize electrical problems, and position tubing to enable ready access and quick exchange. We not only expect our custom fluidic modules to meet the required precision and accuracy requirements but also to solve common use complaints that we've heard from the field.



Optimized Fluidics for Diagnostics

In Europe, a diagnostic customer wanted to use a manifold in their new instrument to increase reliability and reduce service requirements. We customized the module—a single-layer manifold with integrated valving—that plugged into their system as a single part. The modular design enabled the instrument designers to stack four of the interlocking units closely together, minimizing the size of the overall fluidic assembly as well as achieving the goal of higher reliability over the connections they had used in the past. Once again, the total fluidic experience of IDEX Health & Science helped resolve the primary issue of reliability, but also saved space in the instrument.





TitanHT™

Ultra-High Pressure Applications

For configurations and specifications see page 30



Customize

Chemically resistant and biocompatible wear surfaces available

Multiple liquid-end configurations available

Available PCB for motor drive and valve control

(Standard configurations available, page 30. Call about custom options)



TitanHP™

High Pressure Applications

For configurations and specifications see page 30



RheBuild® Kits

Rebuild with genuine Rheodyne parts

Each kit contains parts, tools, and instructions to maintain the precision performance of Rheodyne valves.

Benefits

- ▶ Integrated driver/actuator provides flexible space-saving design
- ▶ Easy maintenance reduces down time
- ▶ Continuous flow extends column life
- ▶ Control up to 128 devices per instrument

Applications

UHPLC, HPLC, SCF

Column switching

Sampling

Prep to nanoscale chromatography

Multidimensional chromatography

Rapid Replacement Pods

Expand system flexibility and reduce instrument down time

Our unique Pod design simplifies your system configuration, and your manufacturing and materials planning processes. Pods and actuators can be ordered separately, allowing the actuator to be built into every instrument in advance, and the fluidics to be configured at time of order.

Rapid Replacement Pods allow very low maintenance downtime; Pods are easily removed and replaced in minutes.

For configurations and specifications see page 30



CALL FOR QUICK TECHNICAL INFORMATION:

USA - Rohnert Park, CA
(707) 588-2000

www.idex-hs.com/valves



TitanEX™

Low Pressure Switching Applications

For configurations and specifications see page 30

Applications

Solvent/reagent and
buffer selection

Fraction collection
and dispensing

Process control/
monitoring

IVD sample handling
and preparation

Water quality analysis

Customize

Biocompatible,
chemically resistant,
and long life wear
surfaces available

Multiple liquid-end
configurations available

Optional driver board
allows up to 128 devices
to be connected to a
single instrument

EZ stand-alone or manifold-
mounted valves available

*(Standard configurations available,
page 30. Call about custom options)*

CALL FOR QUICK TECHNICAL INFORMATION:

USA - Rohnert Park, CA
(707) 588-2000

www.idex-hs.com/valves

TitanEZ™

Long Life When Using Difficult Reagents

For configurations and
specifications see page 30

Benefits

- ▶ TitanEX unique fittingless system facilitates fast tubing installation
- ▶ TitanEZ is manifold mountable to reduce total fluid flowpath, increase system reliability
- ▶ Polymer and ceramic flow paths available for your specific applications
- ▶ Replace multiple solenoid valves with one Titan valve

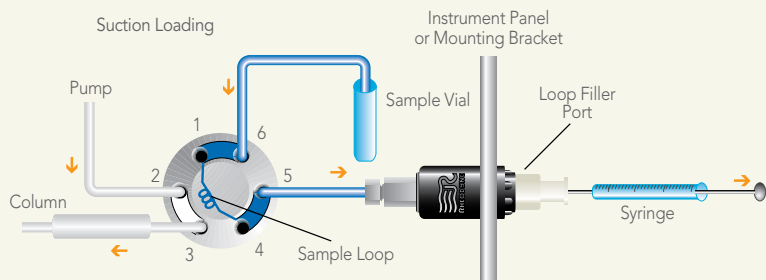




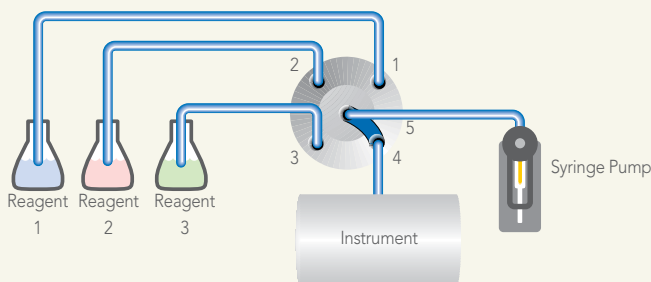
VALVES

	TitanHT™	TitanHP™	TitanEX™	TitanEZ™
Pressure Rating	0–15,000 psi (0–1,034 bar)	0–6,000 psi (0–414 bar)	0–125 psi (0–9 bar)	0–102 psi (0–7 bar)
Available Liquid Ends	2-position, 4-port			X
	2-position, 6-port	X	X	X
	2-position, 10-port	X	X	X
	3/7 injector with purge	X		X
	4-position, 5-port			X
	4-position, 4-port			X
	6-position, 7-port	X	X	X
	8-position, 4-port	X		
10-position, 11-port	X		X	X
Wetted Materials	DuraLife®, UltraLife™*, Stainless Steel w/PEEK™, PEEK	DuraLife*, DuraLife II*, Stainless Steel w/PEEK, PEEK	RPC-7*	Ceramic-on-ceramic
Port-to-Port Volume	0.2–50.9 µL	0.28–0.50 µL	1.5–32.7 µL	24–30 µL
Flow Passage Diameters	0.006–0.060 in 0.15–1.5 mm	0.004–0.012 in 0.10–0.30 mm	0.016–0.060 in 0.41–1.5 mm	0.060 in 1.5 mm
Operating Temperature	0–60 °C			
Connections	10–32, M4, 1/4-28	10–32, M4	Rheodyne TitanEX™ fittingless connections	Customizable and manifold mountable
Replacement Components	Rapid Replacement Pod™, RheBuild® Kit, replacement stators, rotor seals	Rapid Replacement Pod, RheBuild Kit, replacement stators	Core assembly module (CAM) includes rotor, stator, and driver body	N/A
Position Capability	Multiposition with random access			
Optional Driver Board	Yes			
Stop-to-Stop Actuation Speed	100–280 ms	100–280 ms	280 ms	100–280 ms
Communication Protocols Available	BCD, Level Logic Pulse, Dual Pulse, I2C, UART			
PCB Power Requirements	Consult factory	24 V @ 1 amp max	24 V @ 1 amp max	Consult Factory

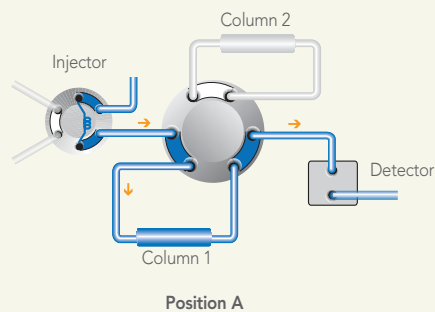
* Rheodyne material combinations



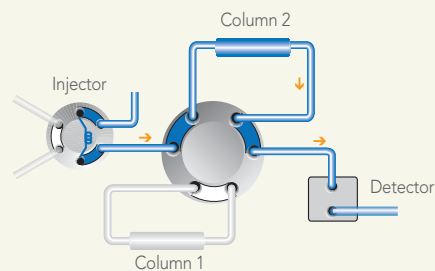
Suction sample loading using a Loop Filler Port.



Low Pressure Bulk Reagent Dispensing using a 4-Position 5-Port Titan Valve



Position A



Position B

Column Selection Using a 2-Position, 6-Port Switching Valve.

More schematics are available online.

“A true development partner on a critical component of the mass spectrometer”

— Robert McCarthy, Managing Director, Integrated Solutions

A recent innovation in the analytical instrument market is a sophisticated Mass Spectrometry (MS) system that automates unattended QC checks with the push of a button. Early prototypes of this automated functionality exhibited emergent issues common in highly precise fluidic development such as carryover, mixing, leakage, cross-contamination, reagent waste, and sample loss.

In partnership with the instrument manufacturer, IDEX Health & Science developed a fluidic prototype that replaced the original syringe pumps and solenoid valves from their prototype MS system with Sapphire Engineering™ precision dispense pumps and Rheodyne® shear valves. Engineers customized the pumps and valves to rinse more effectively and handle the high pressures necessary in MS analysis. Development of operational protocols to synchronize the fluidic routines completed the design stage. With the hardware functioning, the development team optimized the tubing connections and diameters, rinse times,

rinse volumes, and developed a firmware algorithm to maximize the performance of the system. In a second, more complex stage of the project, the team developed a flow-controlled nanospray reference sprayer for the mass spectrometer. This complete sub-assembly features proprietary firmware and control. The new unit enables the mass spectrometer to achieve much more stable nanospray volumes than most competing technologies.

A configuration of the Controlled Delivery Module enabled development of the fluidic system for the mass spectrometer.





MINI Degassing Module

Increased throughput with ultra-efficient degassing

For configurations and specifications see page 34



Customize

Optimize degasser configuration to meet flow rate/solvent needs

Custom labeling

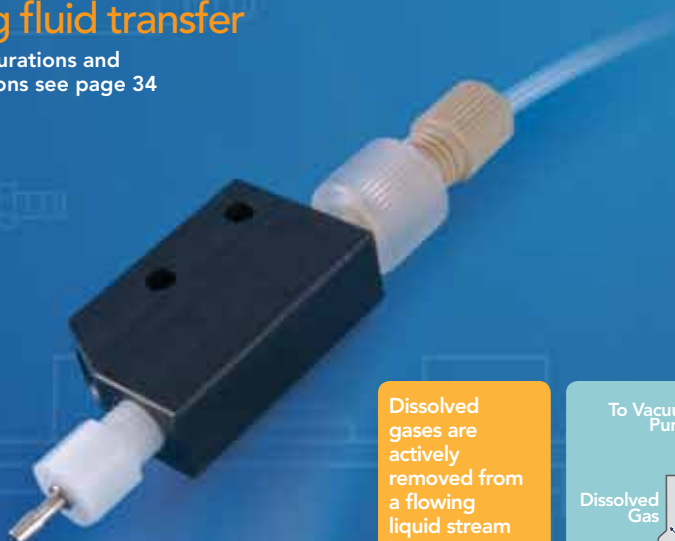
Transfer-Line Degasser

Removes dissolved gases during fluid transfer

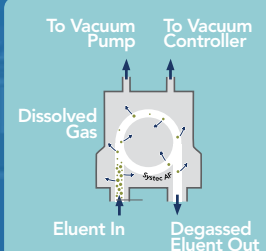
For configurations and specifications see page 34

Benefits

- ▶ Eliminates baseline fluctuations for improved detector sensitivity
- ▶ Coaxial design reduces number of connections, improves reliability
- ▶ Single lumen design increases degassing reliability



Dissolved gases are actively removed from a flowing liquid stream by vacuum via the Systec AF membrane.





Debubbler/Degasser

Combines vacuum degassing with active bubble removal

For configurations and specifications see page 34

Applications

Liquid Handling

IVD

HPLC/UHPLC

O₂ and CO₂ removal

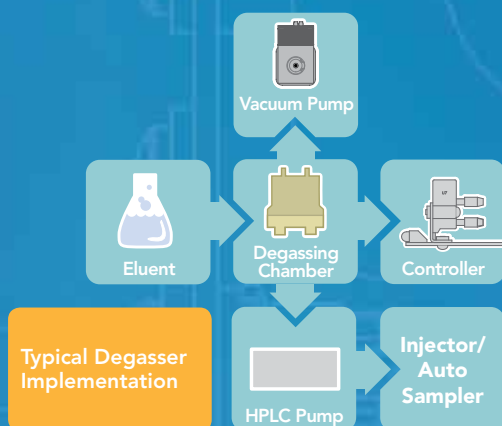
Benefits

- ▶ Improves instrument performance—reduces downtime due to bubble formation
- ▶ Fewer false positives due to reduction of partial reagent dispenses
- ▶ Easily integrates into any pump, degassing tray, or stand-alone degassing application

Active Debubbler

Remove bubbles in fluid stream before or after the pump

For configurations and specifications see page 34



CALL FOR QUICK TECHNICAL INFORMATION:

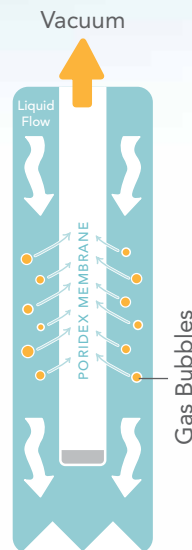
USA – Rohnert Park, CA.
(707) 588-2000

www.idex-hs.com/debubblers



DEBUBBLERS

	Active Debubblers	Degasser/ Debubblers	Transfer Line Degasser
Bubble Removal (volume of air removed/min @ 10 mL/min H ₂ O)	up to 30 cc	up to 30 cc	N/A
Degassing Efficiency† @ 1 mL/min H ₂ O	N/A	55% O ₂ removal	70% O ₂ removal
Membrane Material	PORIDEX™	PORIDEX	PORIDEX
Other Wetted Materials	Ultem®, Polyethylene	Ultem, Polyethylene, ETFE	Polyethylene, ETFE
Solvent Compatibility	Solutions >50% aqueous. Not compatible with detergent concentrations > 0.05%		
Standard Bubble Trap Volume	2.5 / 5.0 mL	2.5 / 5.0 mL	N/A
Transfer-line Volume	N/A	2.5 / 5.0 mL	4 mL
Maximum Pressure (@25 °C)	0.7 MPa (100 psi)		
Maximum Operating Temperature	40 °C		
Recommended Vacuum Level	16 kPa (abs)		



Gas bubbles are actively removed from a flowing liquid stream by vacuum via the PORIDEX membrane.

† Debubbling / degassing efficiency can be optimized based on flow rate, fluid to be degassed, and gas to be removed

DEGASSERS

	OEM MINI Degassing Modules	Stand-Alone Degassing Modules	MINI Degassing Chambers	Prep. Scale Degassing Chambers
Maximum number of degassing channels	5	5	N/A	N/A
Degassing Efficiency† @ 1 mL / min MeOH	>70% O ₂ removal		> 85% O ₂ removal	> 90% O ₂ removal (@ 5 mL/min)
Membrane Material	SYSTEC AF®			
Other Wetted Materials	PEEK™, PPS(GF), PTFE(GF), FEP			
Solvent Compatibility	Not compatible with fluorinated solvents. Special version available for GPC solvents			
Flow Path ID	1.14 mm (0.045")			1.91 mm (0.075")
Internal Volume	480 µL (standard)		100–925 µL	8.4–13.8 mL
Maximum Pressure (@25 °C)	0.5 MPa (70 psi)			
Pressure Drop	0.18 kPa/mL/min	0.18 kPa/mL/min	<0.36 kPa/mL/min	<0.06 kPa/mL/min

† Degassing efficiency can be optimized based on flow rate, fluid to be degassed, and gas to be removed
1. Standard ID; other sizes available.

VACUUM

	Analytical Scale ZHCR Vacuum Source	Prep Scale ZHCR Vacuum Source	SST Vacuum Source
Vacuum Pump Type	Self purging diaphragm		
Vacuum Control Type	ZHCR Closed-loop*		Constant RPM
Default Vacuum Level	6.7 kPa (abs)	10.7 kPa (abs)	16 kPa (abs)
Maximum Air Flow (SCCM)	3 @ 6.7 kPa vac.	10 @ 10.7 kPa vac.	1 @ 120 RPM
RS-232 Interface	Yes	Yes	No
Wetted Materials	Polypropylene, PTFE, EPDM		
Expected Lifetime	> 5 yrs		

* Patented control system for optimal vacuum stability

HPLC Components

Precision elements for instrument systems

Check valves, balls, seats

Filters

Flow cells

Frits

Guard columns

Pistons and assemblies



NEW!

SAPPHIRE
ENGINEERING

UHPLC Cartridge Check Valve

- ▶ Rated to 15,000 psi (1,034 bar)
- ▶ Cartridge design allows easy in-field service
- ▶ Low internal volume preserves accuracy
- ▶ Multiple body and thread configurations available
- ▶ Contact us for custom solutions exceeding 20,000 psi (1,379 bar)



CALL FOR QUICK TECHNICAL INFORMATION:

USA – Oak Harbor, WA
(800) 426-0191

www.idex-hs.com/HPLCcomponents



Isobar UHPLC Columns

For pressures up to
20,000 psi (1,379 bar)

For configurations and specifications see page 38



Customize

A variety of standard and custom column lengths available

Multiple port configurations

Inner diameter options from 0.25 mm to 50 mm

Modular Columns

High pressure seal formed by threads on tube and end fitting

For configurations and specifications see page 38



Benefits

- ▶ **Unique Isobore internal surface finish** reduces wall effect, significantly improves column efficiency
- ▶ **Leak proof, reliable all-metal design** with high strength threaded end fittings meets critical UHPLC requirements
- ▶ **HiFlo™ stainless steel frits** inside machined PEEK sealing rings guarantee a leak-free seal and reproducible results
- ▶ **Packing accessories** to compliment these products are available

Applications

UHPLC/HPLC

Fluid Handling

SFC

Preparative Chromatography

Compression Columns

Pre-assembled for quick integration

For configurations and specifications see page 38



CALL FOR QUICK TECHNICAL INFORMATION:

USA – Middleboro, MA
(866) 339-4653

www.idex-hs.com/columns



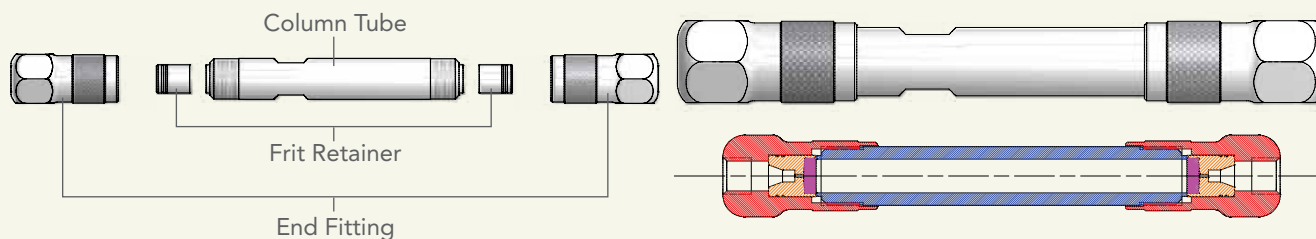
COLUMNS	Isobar UHPLC	Modular	Compression
Material	316 Stainless Steel	316 Stainless Steel, PEEK	316 Stainless Steel, PEEK
Inner Diameters Available	2.1, 3.0, 4.6 mm	1.0, 2.1, 3.0, 4.0, 4.6, 7.8, 10.0, 15.0, 21.2, 30.0, 50.0 mm	1.0, 2.1, 3.0, 4.0, 4.6, 7.8, 10.0 mm
Lengths	2.0 cm minimum	2.0 cm minimum	3.3 cm minimum
Maximum pressure	20,000 psi (1,379 bar)	15,000 psi (1,034 bar)	10,000 psi (689 bar)
Dead volume	0.175 µL	0.428 µL	0.167 µL
Type of fitting accepted	10/32 UNF 2B	10/32 UNF 2B	10/32 UNF 2B
Concentricity	+/- 0.002 in	+/- 0.002 in	+/- 0.002 in
Frit Style	All Steel Retainer	PEEK Cap	PEEK Ring
Standard Porosities	0.5 µm, 2.0 µm	0.5 µm, 2.0 µm, 5.0 µm	0.5 µm, 2.0 µm, 5.0 µm
Frit Material	Stainless Steel or Titanium	Stainless Steel or Titanium	Stainless Steel or Titanium

Dimensional tolerances, ID +/- .002 in; OD +/- .002 in

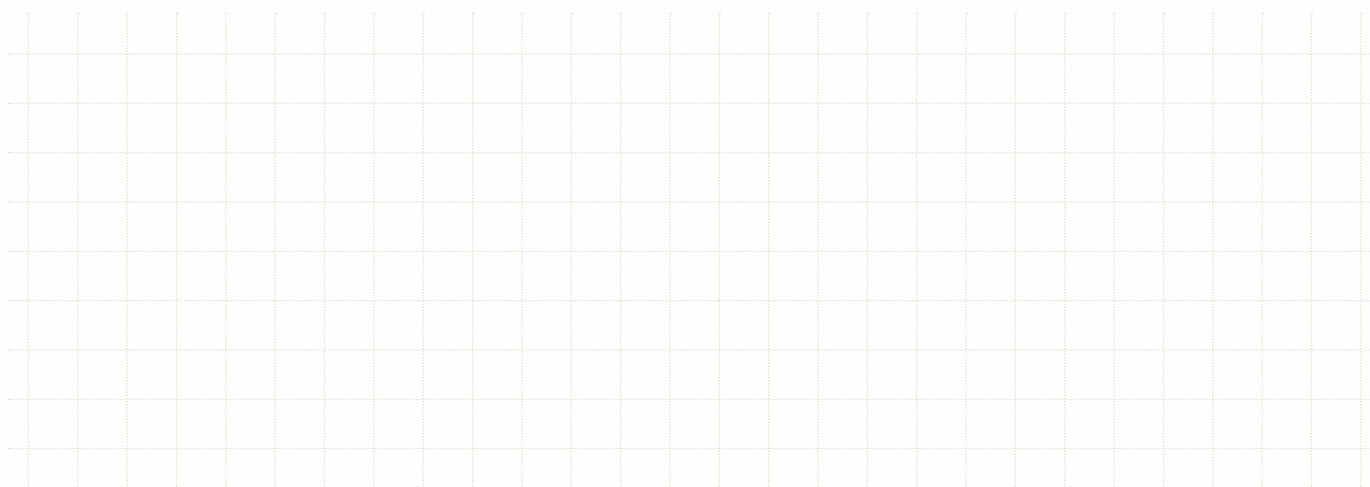
End cut perpendicular within .003 in

Interior surface finish = 16 Ra maximum

Isobar UHPLC Column:



Cross section of assembled IsoBar column



Customer Case Study

New Valves Save Lab Time

For a system in development, a large analytical instrument company needed valves with expanded performance capabilities. IDEX Health & Science engineers implemented an exclusive technology within the valve platform that allows the system to recognize the valve configuration and update the system program automatically. This advancement eliminates the need for repetitive programming or manual system configuration,

saving time in the laboratory. The new capability provides a desirable design feature to the instrument manufacturer and differentiates their instrument from others on the market. Our Health & Science customer is very happy with the product and, to date, has purchased a significant number of valves. The end-user Chemist also benefits from the convenience and easy operation of the new instrument.



Customer Case Study

Prosolia

Utilizes Upchurch Scientific® tubing and fittings in Omni Spray® Ion Sources for Desorption Electrospray Ionization that enable direct sampling of surfaces under ambient temperature and pressure with no sample preparation.

Photo courtesy of Prosofia, Inc.

Customer Case Study

Uniqsis

Utilizes Rheodyne® valves, and Upchurch Scientific tubing and fittings in the FlowSyn™ continuous flow reactor that is capable of running up to 10 sequential experiments in reactors of 1 mm inner diameter. Temperature range from -40 to $+260$ °C at flow rates of up to 20 mL/min.

Photo courtesy of Uniqsis Ltd.

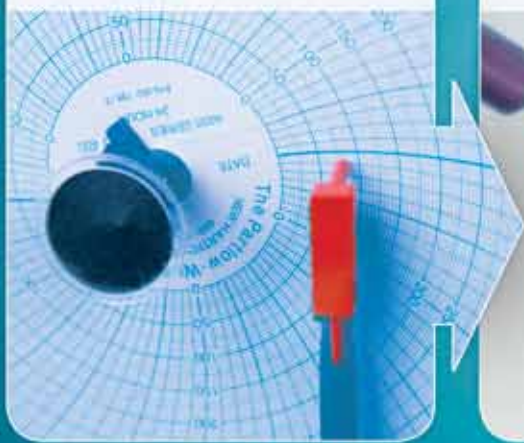


WHAT SETS US APART

- ▶ State of the Art CNC machining centers
- ▶ Distributed numerical control and programming
- ▶ CNC milling, turning, tapping equipment
- ▶ Laser, thermal, machine-form processes
- ▶ ECM equipment for precision cutting and bending of metal tubing

Proprietary processing of complex, material-specific components for highly specialized, precision-flow applications

Stress Relief



Deburring



Polishing



Plastics

Precision machined components

- ▶ Holes as small as 0.004" (102 μm) in thermoplastics
- ▶ Tolerances of less than 0.0001" (2.54 μm) in thermoplastics
- ▶ Surface finishes down to 1 $\mu\text{in.}$ (.025 μm RA)



Ultrahard Materials

Sapphire, Ruby,
Alumina and Zirconia
Ceramic, Quartz, Glass



MACHINING

- ▶ Rapid Response Teams for fast-turn prototypes
- ▶ Proprietary finishing processes to optimize the flow path
- ▶ Design and materials consulting for fluidic applications
- ▶ Experienced, material-specific machining specialists

Cleaning



Performance Testing



Assembly

Kitting

Packaging

Ball-Seats, Pistons for HPLC, UHPLC

- ▶ Holes as small as 0.002" (50.8 μm)
- ▶ Tolerances as low as 0.00001" (0.254 μm)
- ▶ Surface finishes down to 0.25 $\mu\text{in.}$ (0.006 μm RA)

Metals

Column hardware, Components for Fast Chromatography

- ▶ Holes as small as 0.007" (178 μm) in metals
- ▶ Tolerances as low as 0.00050" (500 $\mu\text{in.}$) in metals
- ▶ Surface finishes down to 10 $\mu\text{in.}$ (0.25 μm RA)

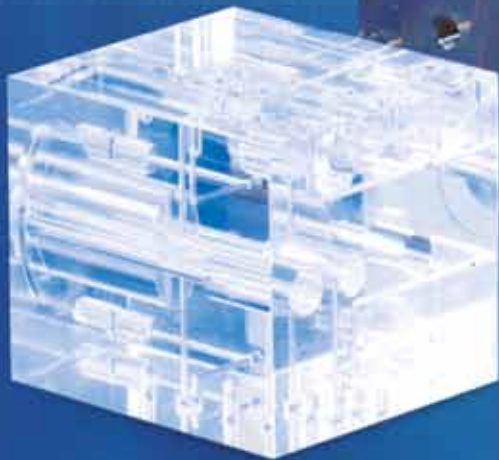
Fluidic Manifolds

Fastest, most repeatable system results

For configurations and specifications see page 43

Benefits

- ▶ Shortest fluid path possible for lowest reagent use, faster test results
- ▶ Fewer connections and leak points for increased reliability
- ▶ Lowest "unswept" volume to minimize carryover
- ▶ Optically clear flow paths for bubble detection, sensing, and imaging
- ▶ Compact 3-D flow paths, unrestricted component mounting for smallest possible footprint



CALL FOR QUICK TECHNICAL INFORMATION:

USA - Bristol, CT
(866) 339-4653

www.idex-hs.com/manifolds

Applications

Genomics

Medical Devices

Semiconductor

IVD

Customize

Available in any size,
with any number of layers

Multiple material choices

Ultra-close tolerances
& complex geometries
possible

EPI



MANIFOLD TECHNOLOGY	Diffusion Bonding	Solvent Bonding	Adhesive Bonding	Thermal Bonding	Cross Drilled
Manifold Construction	Multilayer	Multilayer	Multilayer	Multilayer	Single Layer
Process Description	Application of heat, pressure, and time to molecularly bond layers together.	Application of a chemical solvent to bond layers together.	Application of an adhesive to bond layers together.	Application of thermal energy to weld layers together.	Drilled from outside of part to connect all flow paths.
Typical Materials	Acrylic (PMMA) Ultem® (PEI) Polycarbonate (PC) PolyVinyl Chloride (PVC)	Acrylic (PMMA) Ultem (PEI) PolyVinyl Chloride (PVC) Polysulfone (PSU) ABS®	Most engineering plastics except fluoropolymers and polyolefins	Acrylic (PMMA), Ultem (PEI) Polypropylene (PP), Kynar® (PVDF) Polyfluoroalkoxy (PFA), Polycarbonate (PC) ABS, Polyethylene (PE), Polysulfone (PSU)	All Machinable Plastics
Typical Fluids	Sample/Reagent/Buffer/Waste/Air				
Typical Track Width/ Drill Hole Diameter	> .015" (0.38 mm) < .118" (3 mm) Track	> .079" (2 mm) Track	> .079" (2 mm) Track	> .015" (0.38 mm) Track	> .020" (0.5 mm) Hole
Track Configurations	3-D Curved Straight	3-D Curved Straight	3-D Curved Straight	3-D Curved Straight	Straight (Drilled)
Track Cross Section	Square track Round track "D" track	Square track Round track "D" track	Square track Round track "D" track	Square track Round track "D" track	Round
Manifold Technology Selection Guidelines	<ul style="list-style-type: none"> ▶ Best fluid flow performance ▶ Lowest carryover and unswept volumes ▶ Lowest dead volume 	<ul style="list-style-type: none"> ▶ Ideal for manifolds with larger tracks and features 	<ul style="list-style-type: none"> ▶ Broader bondable material selection ▶ Ideal for manifolds with larger tracks and features 	<ul style="list-style-type: none"> ▶ Capability to bond fluoropolymers and polyolefins 	<ul style="list-style-type: none"> ▶ Lowest cost manifold solution ▶ Offers the broadest range of material options
General Design Considerations	<ul style="list-style-type: none"> ▶ Consult our engineering experts at the start of your project for application, design and DFMA assistance ▶ When selecting materials consider fluid compatibility, functional performance requirements, environmental conditions, manufacturability and cost ▶ Reduce part count by integrating as many discrete components onto the manifold such as valves, pumps, sensors, and fittings ▶ Consider field serviceability of manifold; placement of components on any manifold face that is accessible or a complete assembly replacement that offers plug and play modularity 				
Relative Cost 1= Baseline	2.5	1.5	1.5	2	1

Typical application pressures less than 100 psi (7 bar)

Additional Features Available

Manifold Mount Solenoid Valves (Fluid Control)	Manifold Mount Pumps (Metering/ Fluid Control)	Manifold Mount Rotary Valves (Fluid Control)	Embedded Metal Contacts (Fluid Detection-Electrical)	Mixing Chamber	Marking (Identification)

WHAT SETS US APART

TUBING

Fast turnaround on difficult and custom melt-extruded, high-performance thermoplastic tubing

Services

- ▶ Materials Research
- ▶ Custom Tubing—ID, OD, Length
- ▶ CNC Metal Tube Forming
- ▶ Polymer Thermoforming
- ▶ Simple to Complex Extrusion
- ▶ Forming and Final Assembly

Customize

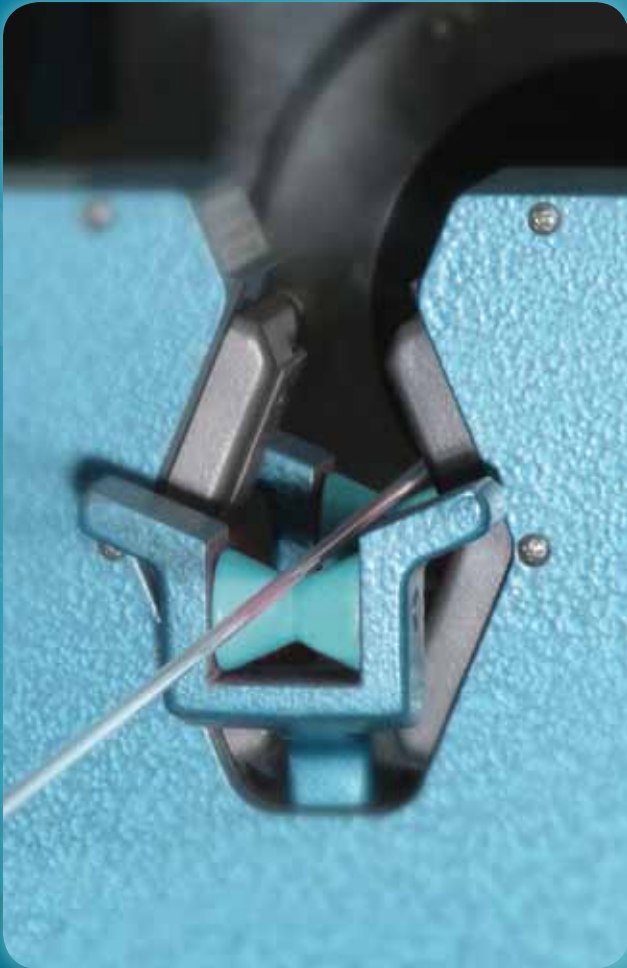
- Custom Compound Runs
- Custom Extrusion—ID, OD, Length
- Custom Assemblies

Specialties

- ▶ PEEK™
- ▶ Difficult Polymers
- ▶ Stainless Steel
- ▶ Extremely Small Tolerances
- ▶ Proof of Concept
- ▶ Prototypes

Cost Efficiencies

- ▶ Experience with Premium Polymers
- ▶ SPC-Guaranteed Precision on ID/OD



Online laser gauges and statistical process control with closed-loop feedback guarantee precise tolerances on extruded tubing.

High Pressure

- Stainless Steel
- PEEK
- PEEKsil®
- Radel®



Low Pressure

- FEP
- PFA
- High Purity PFA
- Tefzel®
- PTFE



Custom Tubing Assemblies

Low Pressure
High Pressure
UHPLC

- ▶ Formed
- ▶ Assembled
- ▶ Labeled
- ▶ Bar-coded
- ▶ Packaged

A guide is available to help build tubing assemblies. Download the configurator at
▶ www.idex-hs.com/CustomTubing

Rapid Response, Rapid Results

Engineers from an IVD company needed additional end surface on the very small stock tubing they were purchasing to adhere the tube to a microchip. Fluidic engineers from IDEX Health & Science developed a new thermal tipping procedure for the outer diameter of the 1/32" OD tube that greatly improved the bond of the tubing to the microchip. Six months after a casual mention at a meeting for a "nice-to-have" product, the customer now purchases 2,000 tipped tubes per month.



Rapid Response, Rapid Revisions

The Advantage of On-Site Mold Tooling

"The operational qualification process is compressed by having a toolmaker on site," explains one molding engineer.

"We can design the tool, with the design engineer, the manufacturing engineer, and the toolmaker all at the same table, often before the quote is given. We're able to narrow the time frame and eliminate hidden costs. It's easier to change things when they're on paper instead of in steel."

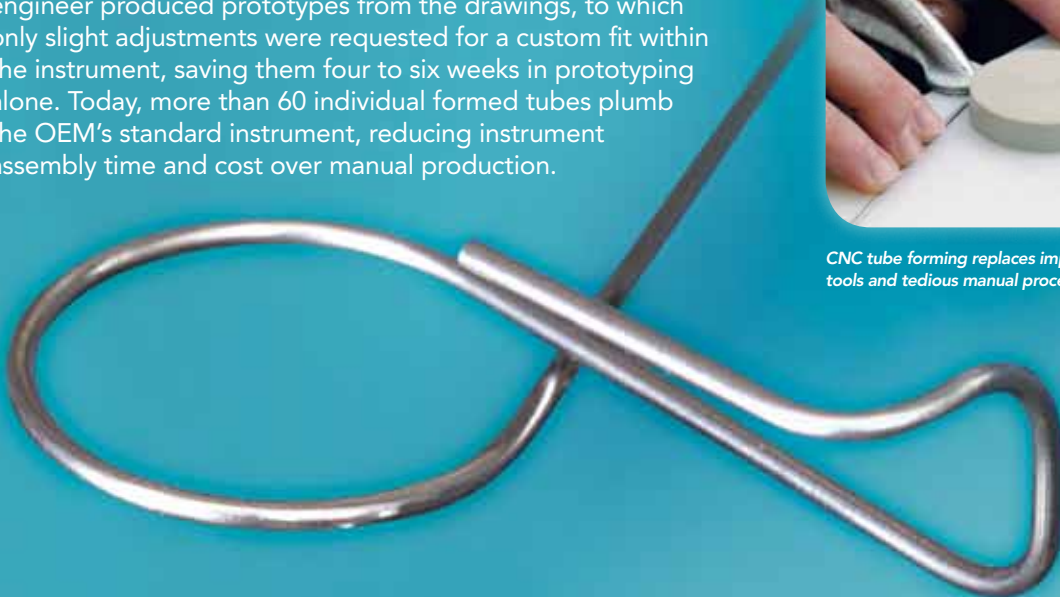
Rapid Response, Reduced Cost

The Advantage of CNC Metal Tube Forming

A number of workers at a large HPLC manufacturer were observed in production manually bending stainless steel tubing around fixtures. When introduced to the advantages of CNC automated tube forming, the OEM forwarded drawings for four tubing configurations. Within one week, the development engineer produced prototypes from the drawings, to which only slight adjustments were requested for a custom fit within the instrument, saving them four to six weeks in prototyping alone. Today, more than 60 individual formed tubes plumb the OEM's standard instrument, reducing instrument assembly time and cost over manual production.



CNC tube forming replaces imprecise hand-built tools and tedious manual processing.



WHAT SETS US APART

MOLDING

Small, complicated, insert-molded jobs in difficult, high-value resins

Services

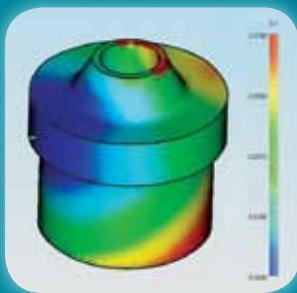
- ▶ Insert Molding
- ▶ Over Molding
- ▶ Micro Molding
- ▶ Mold Design
- ▶ MoldFlow Analysis

Cost Efficiencies

- ▶ On-site Tool Design
- ▶ Materials Specialization
- ▶ Family Tooling

Specialties

- ▶ On-site Mold Tooling
- ▶ Cold and Hot Molds
- ▶ Manual Processes
- ▶ Complicated Molds
- ▶ Difficult Resins
- ▶ Machine-to-Mold Conversions



MoldFlow Analysis

Planning Cuts Costs, Adds Value

Instead of tooling eight separate molds for a medical device customer, IDEX Health & Science built one mold with eight interchangeable sets of parts. That decreased their tooling costs for the overall package by approximately 75%. It also saved six to eight weeks in tool production for that customer.

High Pressure Connections

To 20,000 psi (1,379 bar)

Extensive range of materials and configurations for high, ultra-high pressure systems

Applications

UHPLC

HPLC

LC/MS

NEW!



UHPLC Fitting



- ▶ Reliably holds to 20,000 psi (1,379 bar)
- ▶ Stainless steel construction withstands elevated temperatures
- ▶ Reusable
- ▶ Biocompatible PEEK™ flow path
- ▶ Fits 1/16" OD tubing standard in most systems

WHAT SETS US APART

Three Ways to Optimize Tubing and Connections

1

IDEX connection specialists can spec and connect your system

by plumbing your prototype or consulting on your schematic to achieve the necessary flow rates, volumes, pressures, and serviceability.

2

Already plumbed?

Receive all your tubing, fittings, and associated accessories pre-packaged, assembled, and kitted for your production needs. Use our guide (below) or call us to easily specify your exact needs.

www.idex-hs.com/connections

3

Experimenting or assembling in-house?

Two-thirds of our 10,000 fluidic fittings, tubing, connectors, and accessories are custom OEM products. Request our 173 page catalog of products or go online at

www.idex-hs.com/connections

Customize

Materials

Pressures

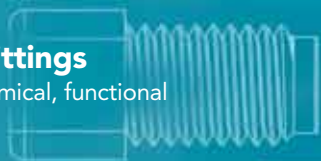
Colors



CONNECTIONS

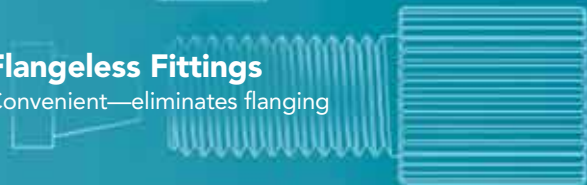
Flanged Fittings

Simple, economical, functional



Flangeless Fittings

Convenient—eliminates flanging



SuperFlangeless™ Fittings

Higher pressures, prevents tubing twist



VacuTight™ Fittings

Air-tight connection under vacuum



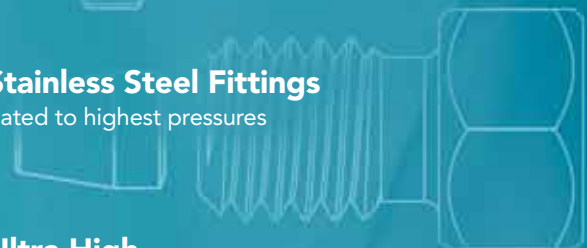
MicroTight / NanoTight™ Fittings

Microflow connections for capillary tubing



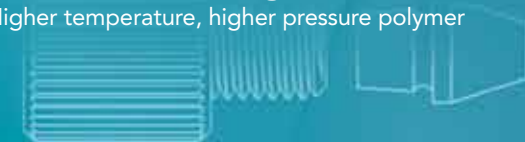
Stainless Steel Fittings

Rated to highest pressures



Ultra-High Performance Fittings

Higher temperature, higher pressure polymer



Low Pressure Connections

To 100 psi (7 bar)

Value priced materials for diagnostic systems in multiple configurations

Applications

IVD

Lab Automation

Genomics



Request our 173 page catalog showing thousands of in-stock items at www.idex-hs.com/connections

Configurations

Package Options

Delivery Schedules

CALL FOR QUICK TECHNICAL INFORMATION:

USA – Oak Harbor, WA
(800) 426-0191

www.idex-hs.com/fittings

Tools for the "\$1,000 Genome"

"...most sequencing techniques rely at some stage on chemistry"

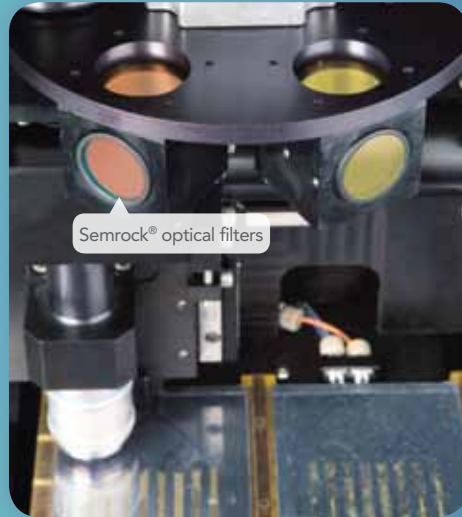
— George M. Church, Professor of Genetics, Harvard Medical School, *Scientific American*

With a defined vision of advancing 'the dawn of truly personalized medicine,' developers at Dover (a Danaher Motion Company) in collaboration with the Church Laboratory at Harvard Medical School have developed a second-generation DNA sequencer incorporating fluidics and optical filters from IDEX Health & Science.

The open-platform Polonator integrates multiple subsystems (fluidics, optics, motion, flow cells, digital imaging, electronics and more) all designed to be completely modular and easily upgraded as the instrument evolves. Keeping sequencing costs low while maintaining high throughput, accuracy and reliability have been key defining factors driving the development of the Polonator.

Kevin McCarthy, Chief Technology Officer for Dover, discovered the precision components of IDEX Health

& Science via the Rheodyne® TitanHP™ valves. "This valve is great," he emphasized, "compact, simple, effective!" From there, McCarthy shopped the Health & Science portfolio, incorporating Upchurch Scientific® tubing and fittings, and Semrock® optical filters. IDEX optical engineers customized two of the 15 optical filters in the instrument, and IDEX fluidic engineers developed a custom flow controller for the project to enable multiple shut-offs to fit tightly together in the flow path.



IDEX optical engineers collaborated to identify and suppress a subtle laser side band to improve image quality.

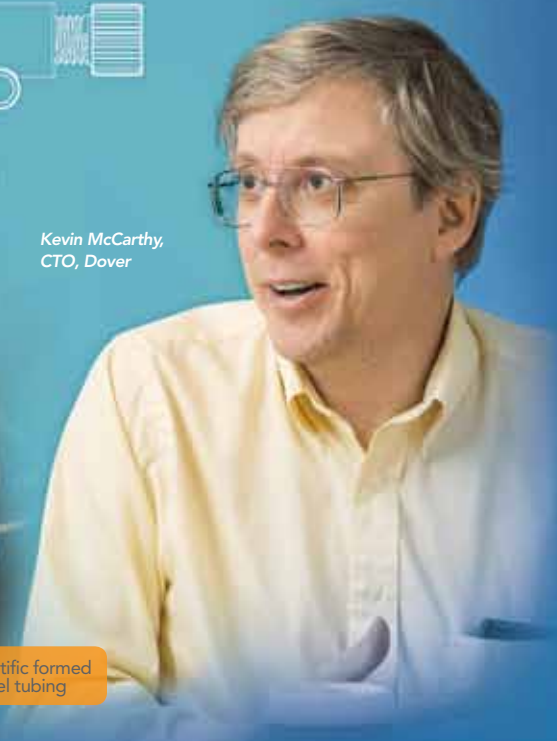


The Polonator G.007

Custom Flow Control Valve



Kevin McCarthy,
CTO, Dover



Optical Filters

For Fluorescence and Raman Spectrometry

For configurations and specifications see page 52

Benefits

- ▶ Brightest, most discriminating filters for the fastest measurement
- ▶ Proven durability for permanent performance
- ▶ Highest batch-to-batch reproducibility for repeatable manufacturing

Applications

Quantitation

Spectrometry

Laser-based Analytical Instrumentation

Customize

Wavelength functionality to specification

Square, circular or rectangular filters

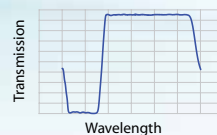
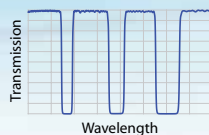
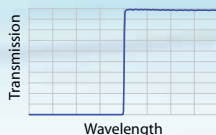
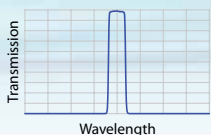
Custom sizing

Laser labeling

CALL FOR QUICK TECHNICAL INFORMATION:

USA – Rochester, NY
(585) 594-7050

www.idex-hs.com/opticalfilters



	Bandpass	Edge	Notch	Dichroic Beamsplitter
Typical Transmission	> 97%	> 98%	> 93%	> 90–95%
Typical Blocking/ Reflection	OD 6-8	OD 6	OD 4-6	Reflection > 99%
Wavelength Range	230–1,700 nm	230–1,700 nm	230–1,100 nm	230–1,700 nm
Edge Steepness	< 1.0%	< 0.2%	< 1.0%	< 2.0%

Created using hard-coated, ion-beam-sputtering deposition

Custom specs: wavelength, blocking, size, engraving and mounting

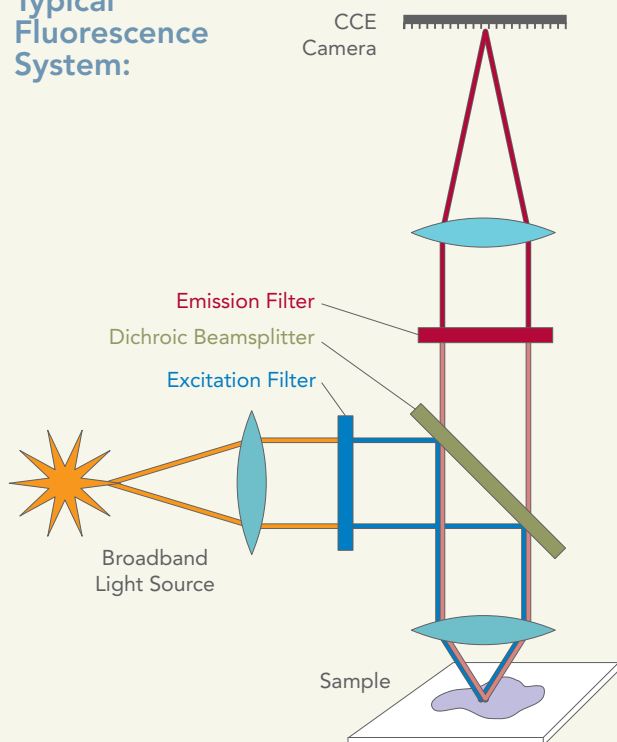
Rapid turnaround on custom design

Custom sizes in less than one week

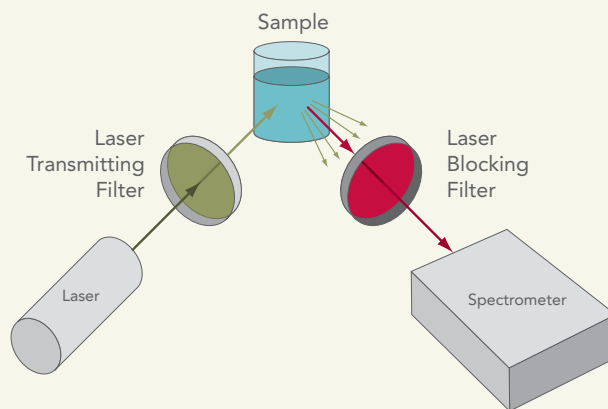
Co-development engineering available

Five year warranty on all products

Typical Fluorescence System:



Typical Raman System:



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www.idex-hs.com/ResourceOnline



100% leak testing of ruby ball/valve seat assemblies prior to packaging



Accelerated life-cycle testing for IDEX Health & Science components



Ultraviolet curing of bonded tubing inserts



100% visual inspection of IDEX Health & Science ultrahard HPLC components rejected this flawed ruby piston

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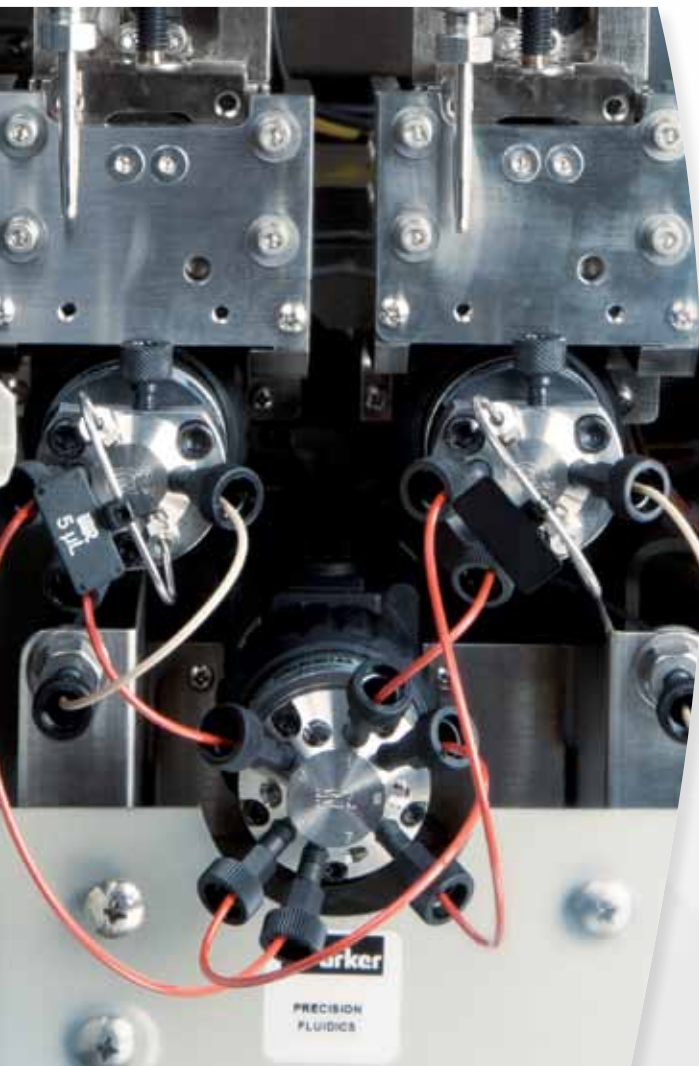
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Coordinate Measurement Machine inspection of pump housing

TRADEMARKS &
REGISTERED TRADEMARKS

Rheodyne® valves, Upchurch Scientific® tubing and fittings in the Parker Smart Syringes Autosampler. The Parker Autosampler Smart Syringe enables high-throughput robotic handling by eliminating the restrictions of electrical or fluidic tethers.

Photo Courtesy of Precision Fluidics
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Thank You to our many valued partners who welcomed us into their facilities and permitted us to show their products.



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