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Precision Engineered Fluidics™

There's Never a Crowd On the Leading Edge

Integrated Fluidics for In Vitro Diagnostic Instruments

Molecular Diagnostics
Immunology
Clinical Chemistry
Hematology
Cancer Screening
Point of Care

A detailed scanning electron micrograph (SEM) of biological cells, likely red blood cells, showing their characteristic biconcave disc shape. The cells are densely packed and exhibit a textured surface. The image is rendered in shades of green and blue, with a dark background. A decorative horizontal line with brackets at both ends spans across the top of the page, partially overlapping the image and the text area.

Leading-Edge Value

Instrument manufacturers tell us that the demand to do more with less is what's keeping them up at night. And we've been listening closely to our diagnostic customers for more than 40 years.

Every aspect of IDEX Health & Science exists to create lasting value for our customers. A Lean business model in an environment of continuous process improvement positions us to offer you rapid response times, extremely reliable products, specialty engineering, and cost-effective fluidic integration.

As independent businesses, our success depended on providing reliable components. Now as the combined brands and products of IDEX Health & Science, our growth—our future—depends on helping you get to market faster with instruments of even-higher quality. With the broadest portfolio of fluidic technologies available, we believe no company in the world is better equipped.

Brands of IDEX Health & Science include:

Eastern Plastics machined polymer components and fluidic manifolds

Gast[®] compressors, vacuum pumps, and air motors

Ismatec[®] peristaltic pumps

Isolation Technologies advanced column hardware

Jun-Air ultraquiet clean-air compressors

Micropump[®] gear and micro-annular gear pumps

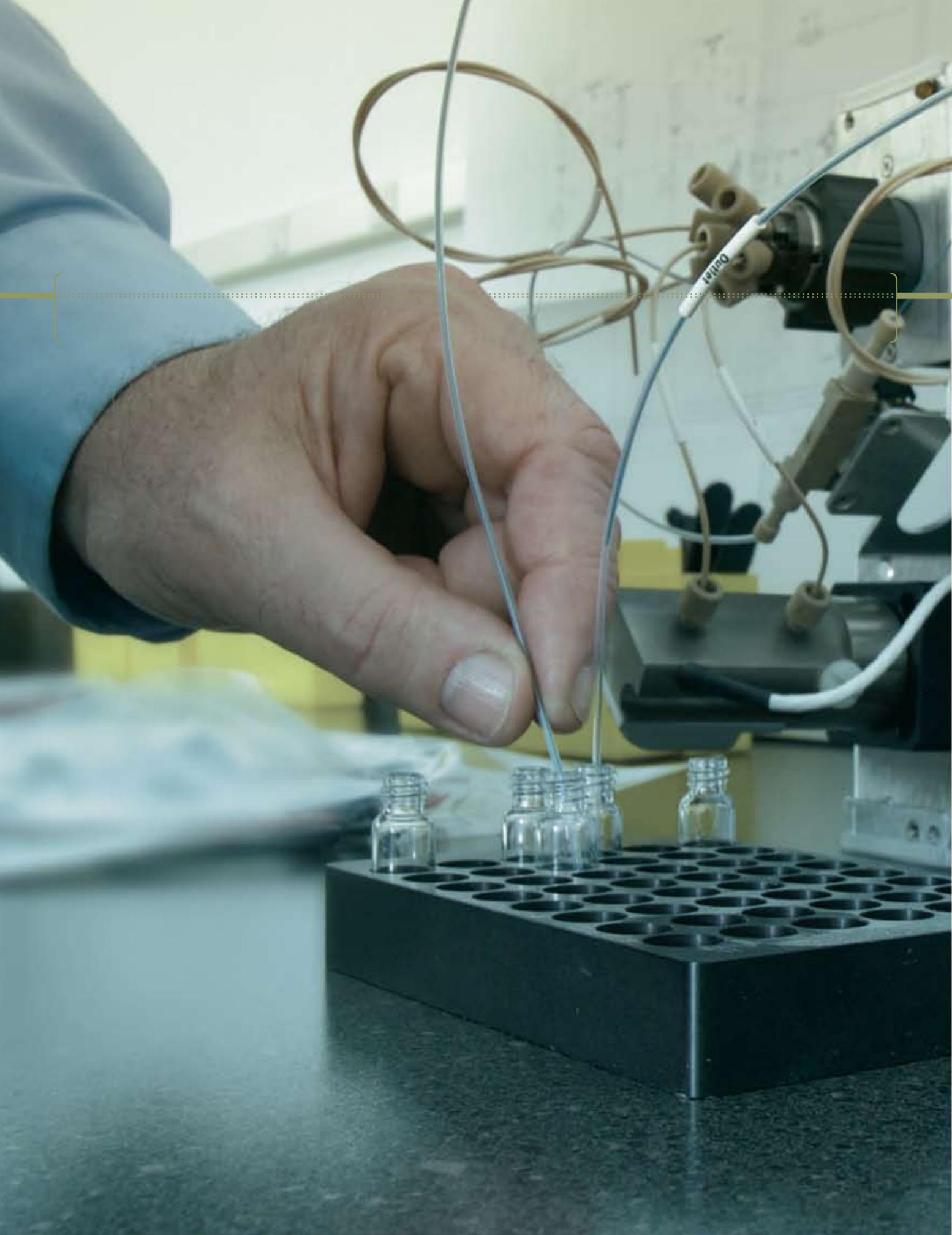
Rheodyne[®] high- and low-pressure fluidic valves

Sapphire Engineering[™] precision dispense pumps, ultrahard materials

Systemc[®] degassing and debubbling systems

Trebor[®] chemical pumps, mixers, and liquid heaters

Upchurch Scientific[®] fittings, formed tubing, and tubing assemblies



Introducing Integrated Solutions

Recognizing the need to focus and lead the efforts of our 118 fluidic engineers, we invested in a new Integrated Solutions Group to be your single engineering contact with the diverse specialists of IDEX Health & Science.

We appreciate your need to shorten instrument development time and still overcome capacity constraints. We understand the push to be first-to-market, while maintaining the superior quality that eliminates unscheduled service calls down the road. Working with our experienced Integrated Solutions team gives your team the expanded engineering capacity and expertise beyond your core competencies that can significantly shorten your time to market.



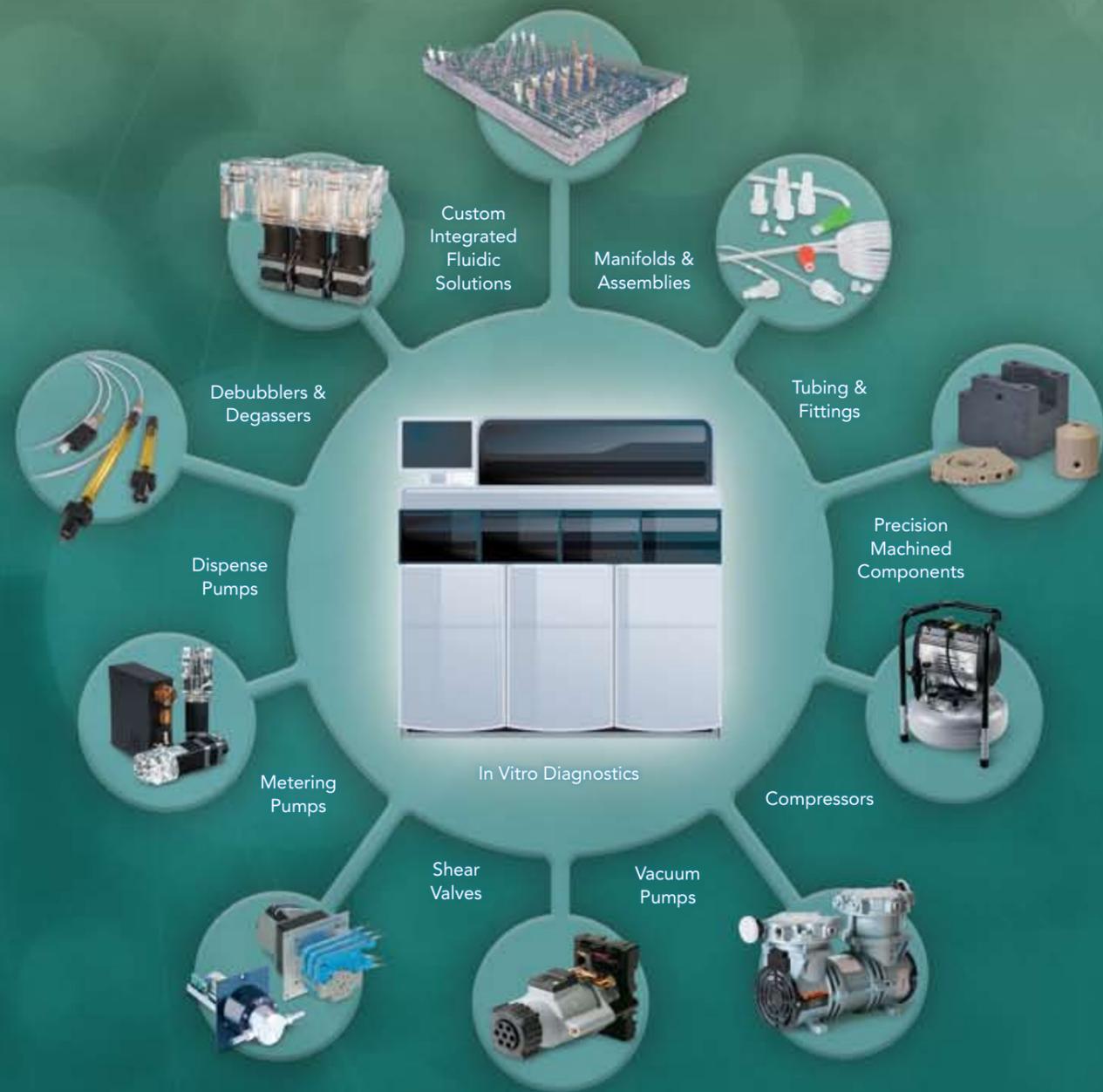
ISG specializes in designing, integrating, and controlling custom fluidic assemblies.

“Every new instrument that comes out needs to be developed faster than previous instruments, with fewer people. One customer reported that they’re expected to get instruments out now with a team of 30 people—where they had more than 100 five years ago.”

*Bradford C. Besse
VP, Business Development
Diagnostics & Biotech Markets
IDEX Health & Science*



Members of the Integrated Solutions Group working on a customer's fluidic application.



Integrated Solutions Integrated Value

Sample-Dispensing Module

Technology integration and reliability were problems for a leading diagnostic OEM using several stand-alone pumps with valves connected by multiple lines of tubing for a sample-dispensing application. The OEM frequently experienced dispense-precision errors due to frequent leaks and system bubbles, requiring tedious and expensive service calls to their customer in the clinical lab. The core fluidics team at IDEX Health & Science designed a compact and cost-effective module which includes three dispense pumps, three solenoid valves, and three active debubblers integrated on a custom fluidic manifold. The integrated assembly eliminated the bubble and leak issues, while reducing the size and number of connections by more than 50 percent.



a valve from Rheodyne, and sophisticated feedback control logic, via flow-sensing technology, which allowed the OEM to achieve a completely smooth, pulseless flow rate of 0-30 microliters per minute.

Although initially skeptical of the ISG recommendation, after internal testing, the customer was enthusiastic about the Controlled-Delivery Module, which allowed them to innovate beyond their competitors.

Fluidic Manifold Assemblies

In low-pressure systems, manifold-based assemblies enable complex fluidic circuits combining pumps, valves, ceramics, heaters, debubblers, sensors, and electronics—all in a very small size. Through our manifolding capabilities—proven for decades on generations of diagnostic instruments—IDEX Health & Science can replace existing hardware connected via bundles of tubing with a custom designed, integrated manifold assembly. This integrated



fluidics assembly will help reduce overall system size, reduce the number of physical connections, increase reliability, and improve overall performance, thus making manufacturing and service less expensive.

Controlled-Delivery Module

A biotech OEM's instrument required an extremely smooth, precise flow in the nanoliter to microliter range.

Irregularities in the lead screws of many industry-standard dispense pumps caused significant, unacceptable peaks and swings in the delivered flow rates on their instrument. The Integrated Solutions Group (ISG) developed an optimized design with a pump from Sapphire Engineering,



High-Volume Precision Pumps

Pumps for Dispensing

For small-volume dispensing applications, Sapphire Engineering™ precision dispense pumps offer the high precision, long life, flexibility, and low cost of ownership needed for contemporary IVD instruments. Ceramic piston technology enables a maintenance-free life of up to 20x longer than traditional syringe pumps.

Dispensing Technologies*

- Piston
- Syringe

*Many models are 100% compatible with syringe pumps on existing instruments.

Pumps for Metering

For small-volume metering, transfer, circulation, or dosing applications, Micropump® gear, centrifugal, and piston pumps; and Ismatec® peristaltic-tubing pumps provide a high level of accuracy and repeatability, not to mention excellent chemical and biological compatibility. Most feature innovative static seals for long life and low maintenance.



Metering Technologies

- Micro-annular gear
- External gear
- Peristaltic
- Valveless piston
- Centrifugal



Shear Valves, Degassers

Low-Pressure Valves

Rotary shear-valve technology offers many benefits over traditional solenoid valves. On many IVD instruments, a single Rheodyne® shear valve can replace numerous individual solenoid valves. In addition, shear valves—by design—eliminate the pumping phenomenon common in most solenoid valves. Available in both polymer-on-polymer and ceramic-on-ceramic versions, Rheodyne valves can be customized with a variety of liquid ends, port options, and manifold integration possibilities.

Shear Valve Technologies

- Compact polymer valves
- Ceramic-on-ceramic valves
- Manifold-compatible valves

Degassers & Debubblers

In many diagnostic instruments, bubbles and gases in the fluid stream can cause false detection readings and dispense anomalies. IDEX Health & Science offers a variety of products for actively removing gases from the fluid stream, whether by debubbling, degassing, or a combination of both.

Degasser/Debubbler Technologies

- Debubblers
- Transfer-line degassers
- Degassing systems



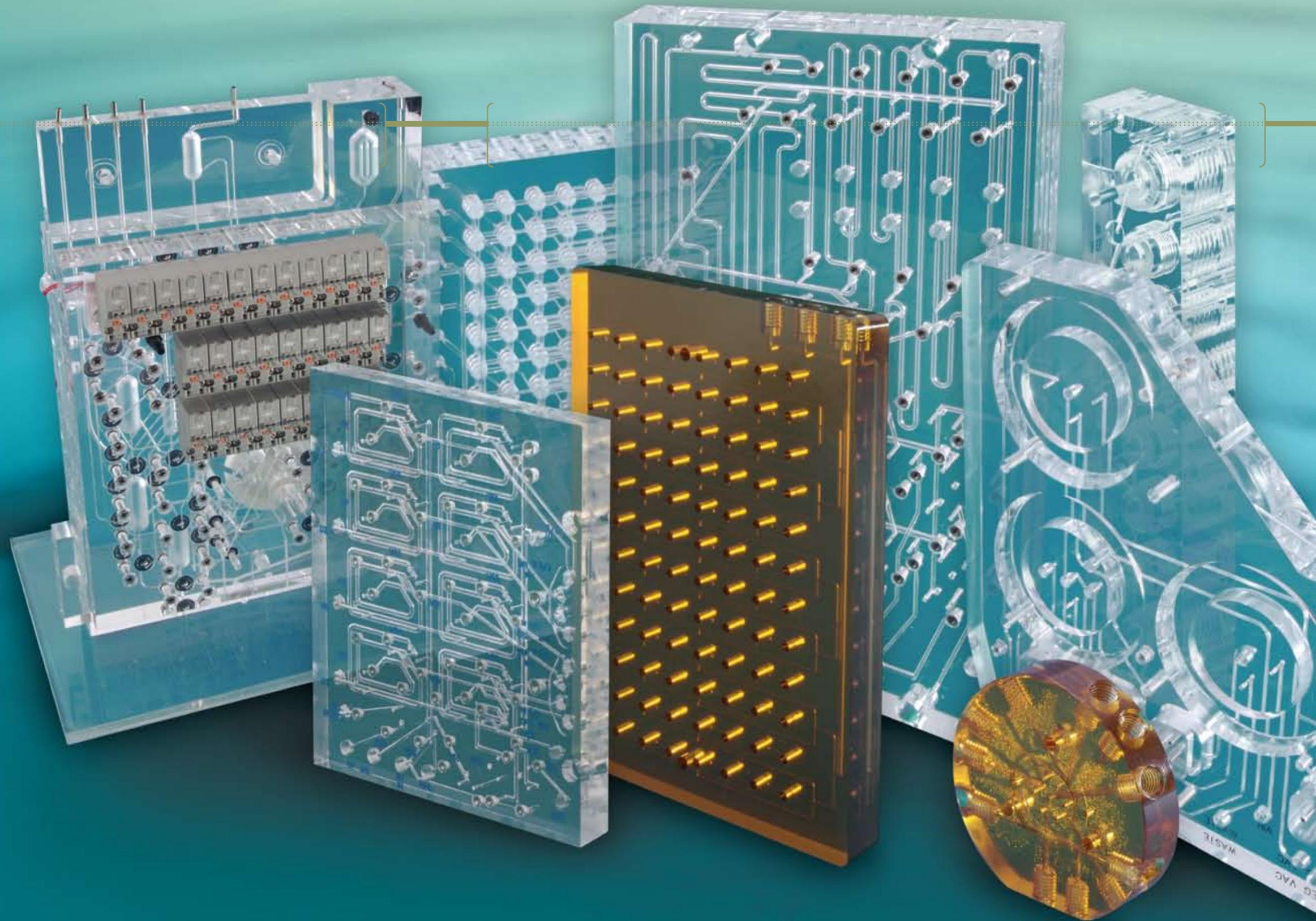
Fluidic Manifolds

Single and Multi Layer

Custom manifolds consolidate instrument tubing, fittings, connectors, valves, and pumps in a single, leak-free unit, reducing the overall size of the fluidic assembly. We pioneered the use of manifolds in this industry and developed the diffusion-bonding process that allows for multiple layers, complex geometries, and very small flow paths. Long the most sophisticated and reliable for diagnostic instruments, Eastern Plastics manifolds are custom designed for each unique OEM application and are available in single or multiple layers, depending on the application requirement.

Manifold Technologies

- No overall size restrictions
- Multiple layers possible
- Long, straight 50:1 aspect ratios possible
- Multiple material choices
- Custom designs from fluid schematics
- Rapid prototyping available



Tubing Assemblies & Fittings

Low Pressure, Flangeless

Designed specifically for IVD applications, Upchurch Scientific® Diagnostic-Grade tubing assemblies and fittings offer the same quality, performance, and long life that OEMs expect from Upchurch Scientific products. Easy to install or service, custom tubing assemblies provide cost-effective connections within the instrument. No more cutting and flanging tubing on the manufacturing floor or in the field. Experienced integration specialists customize each tubing assembly to assure the accuracy and integrity of each part while still meeting rigorous delivery schedules.

Tubing & Assembly Technologies

Fast prototype delivery

Flangeless fitting technology

Assembly, kitting, custom labeling, packaging

Forming, tipping, flaring

CNC tube bending and 3-D configurations

Tested to system requirements





Pneumatic Products

Compressors, Air Motors, Vacuum Pumps

Gast® and Jun-Air air compressors and vacuum pumps provide quiet, clean air or vacuum pressure in a small footprint. Efficient, reliable performance makes our pumps the product of choice among leading instrument manufacturers around the globe.

Air-Moving Technologies

Vacuum pumps & compressors

Diaphragm & miniature diaphragm air compressors & vacuum pumps

Pumps with brushless DC drives

Rocking piston & piston air compressors & vacuum pumps

Rotary vane air compressors & vacuum pumps

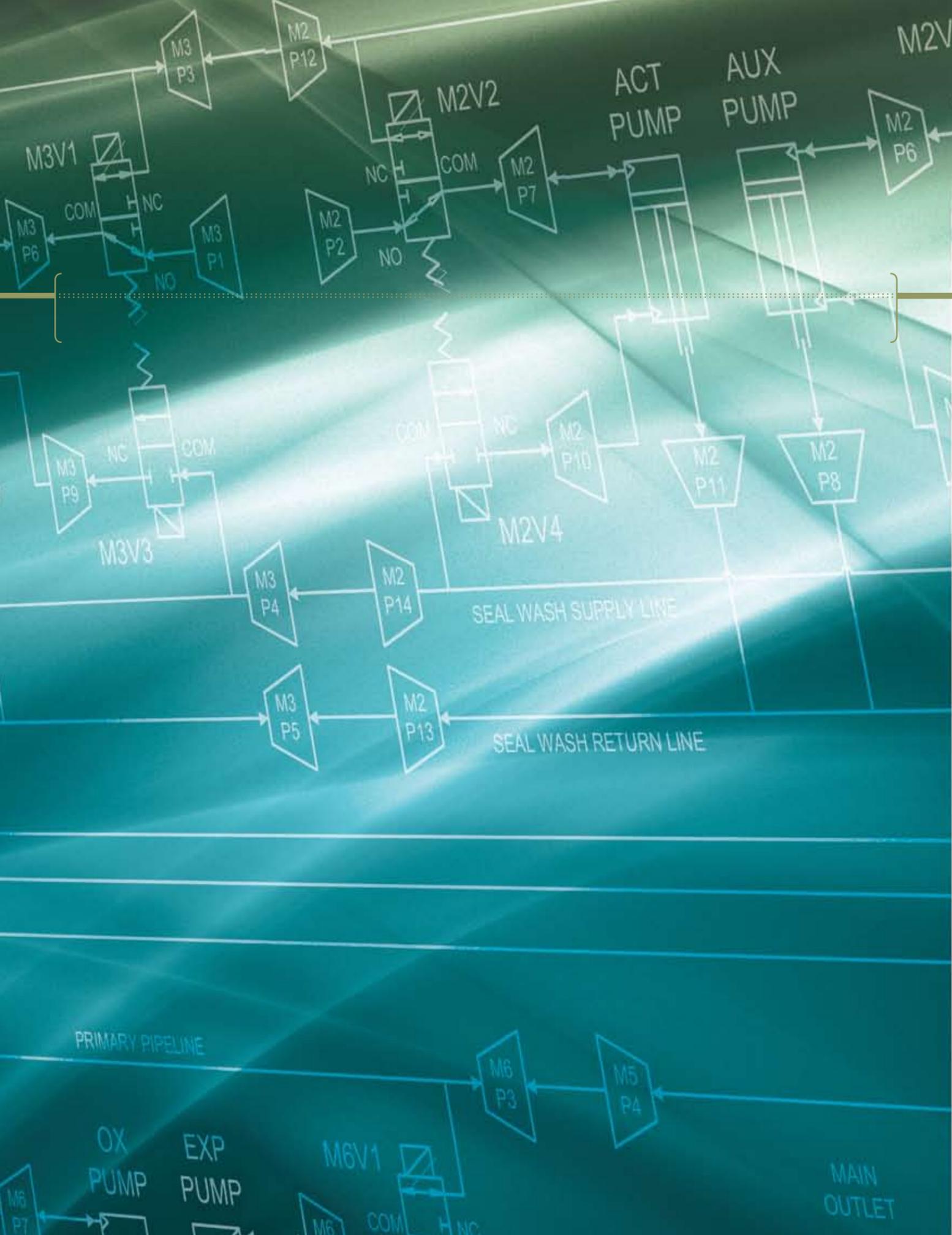
Linear diaphragm air compressors & vacuum pumps

Regenerative blowers

Vacuum generators

Air motors for mixing & automation





A Case in Point

When developing the next generation of their analyzer, a global supplier of diagnostic equipment was challenged to add hardware for increased functionality yet keep the same enclosure and footprint. “Their current instrument contained legacy hardware from prior generations of the analyzer,” described Robert McCarthy, Managing Director, Integrated Solutions Group. “It completely filled the enclosure; there was no room for the additional hardware required for the new instrument.”

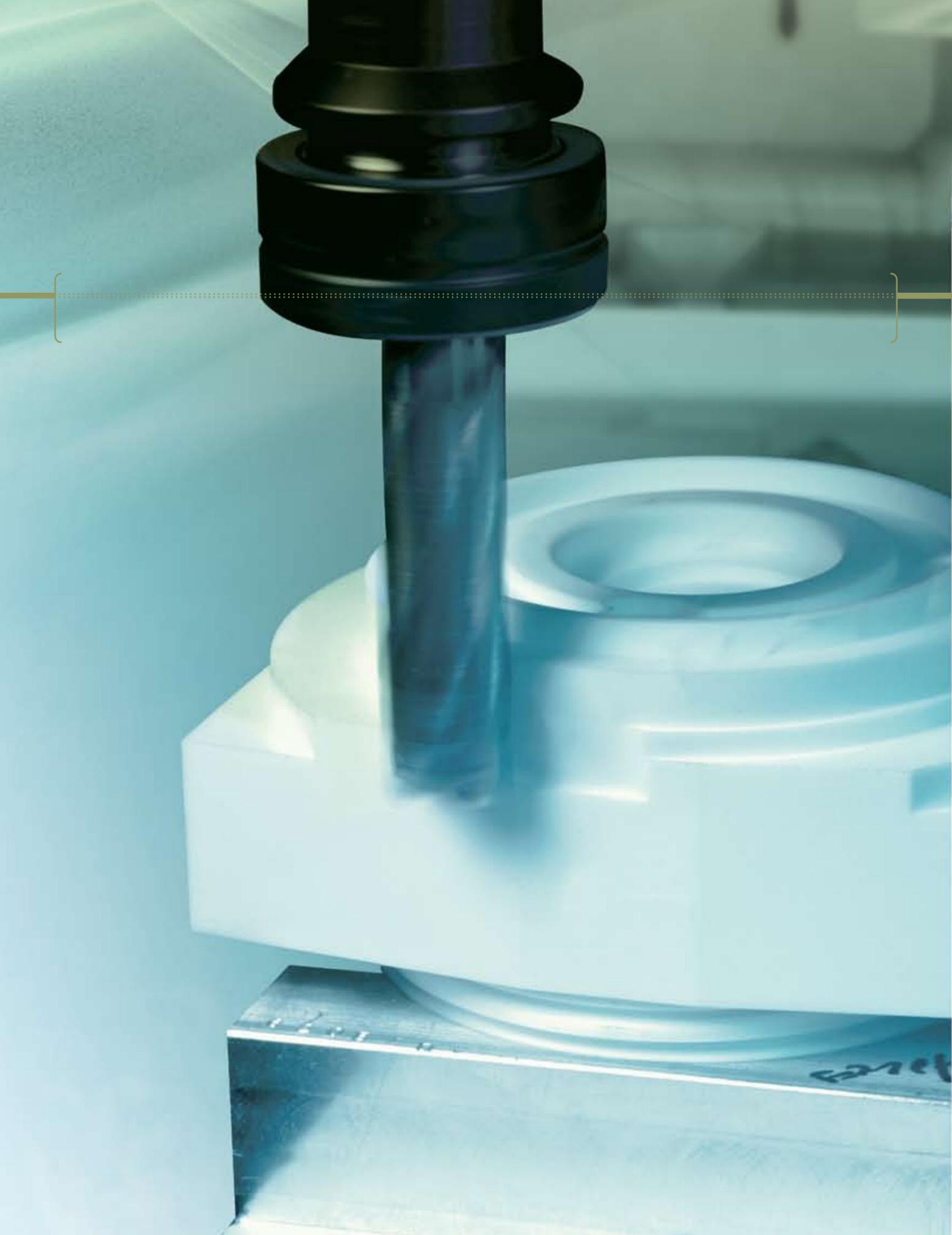
IDEX Integrated Solutions Group traveled to the customer’s site for consultation and recommendations.

“The customer invited us in—our team spent a week onsite—and it was full disclosure. They wheeled in an instrument and gave us the entire fluidics schematic,” McCarthy continued. “We were able to fully examine the current instrument and identify areas that could be improved by our products and technologies. For instance, the need to increase performance, increase reliability, and reduce maintenance costs were big issues they identified. So we focused on bringing new technology in—the latest pieces of hardware like our new pumps versus traditional syringe pumps to decrease both size and maintenance. Their instrument had big syringe pumps which required their customer to replace the seals every three months. We were able to offer a manifold with all the valves, and zero-maintenance pumps which reduced the size by 64 percent. On top of that, in their previous system everything was connected by tubing—there were no manifolds—resulting in 58 connections for their entire dispense pump system. We scaled that down to 22 points of connection. So we were able to reduce the current size by 64 percent, and went from 58 connections down to 22.”

“The customer invited us in... We were able to fully examine the current instrument and identify areas that could be improved by our products and technologies.”

He further explained that additional improvements were made to the system supplying deionized water. “The current instrument used a big, expensive gear pump with an AC drive which ran 24/7. By specifying our smaller, DC-driven gear pump, we were able to address their requirement for reduced maintenance. Our pump turns on and off quickly, eliminating the need for the continuous operation which had burned out pump after pump.”

Another team member reflected, “The big thing for ISG—the thing we’re excited about—is this ability to go in and spec the hardware and help them design the entire fluidics of their system. A few days ‘co-engineering’ with the customer, and we can reduce the overall size of their fluidics, reduce the number of connections, increase performance, reduce the overall cost—address their issues so they can innovate past their competition.”



Capabilities

Precision Machining

We have decades of experience machining a wide variety of materials for use in the diagnostics industry. Our materials and manufacturing expertise allow us to achieve ultraclose tolerances, complex geometries, small channels, and other difficult features that competitors simply can't or won't attempt.

- Machining capabilities up to 9 axis
- CNC milling
- CNC turning/screw machining
- CNC drilling/tapping
- Ultraclose tolerances to +/- 0.000005"
- Surface finishes of 16 microinch or better

Manufacturing

- High-precision machining
- Precision injection molding
- Insert molding options
- Tubing extrusion, including multilumen
- Custom material compounding
- Grinding, lapping, honing, polishing
- Cleanroom assembly; kitting and packaging
- Process management for critical part cleaning and traceability compliance
- High-volume manufacturing
- Process optimization tools for asset management, cost reduction, and high-quality production
- Quick turnaround on production and R & D parts

Materials

- High-performance engineering thermoplastics
- High-performance composites including carbon fiber reinforced plastics (CFRP)
- Sapphire, ceramic, and other ultrahard materials
- Stainless steel, titanium, and metal alloys
- Performance-enhancing surface coatings
- High-performance fluoroplastics
- Most other engineered plastics
- Patented, proprietary processes and long-term strategic partnerships with materials suppliers

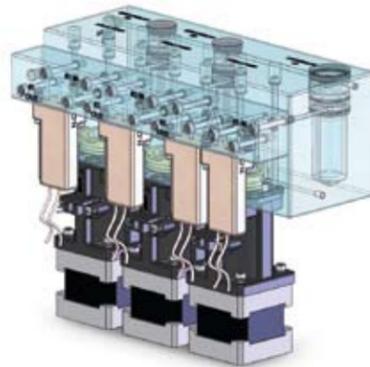
Technologies

- Custom fluidic system and component development
- Integration of liquid and gas handling technologies
- High-precision, low-flow pump technologies
- Ceramic and polymer shear valve technologies
- Ultrahard materials processing for durability and compatibility
- Liquid degassing and debubbling
- Pneumatic technologies
- Micro- and nano-fluidic technologies
- Multi-layer diffusion bonding
- Pump microcontroller and drive development
- Software/hardware interface expertise
- Ultrapure fluid-heating technology
- Chemical vapor, flame, and mechanical polishing
- Rigorous program management for integrated system development

IDEX Advantages

3-D Modeling

Our engineers utilize state-of-the-art 3-D modeling software for advanced part design to quickly validate system form and fit.

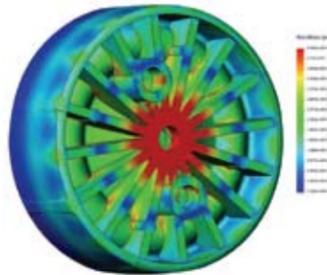


Six Sigma

When problems arise and the solutions aren't so obvious, our team of certified Six Sigma Black Belts go to work to analyze the data, identify the issue, then implement and control the fix.

FEA & CFD

Finite Element Analysis and Computational Fluid Dynamics ensure that parts are designed right the first time.



Cleaning Processes

OEM-authorized cleaning methods backed by rigorous third-party testing to validate effectiveness.

Cleanroom Assembly

Multiple cleanroom locations for critical part manufacturing, product assembly, and packaging means parts arrive ready to use.

Rapid Prototyping

In-house fused deposition modeling equipment produces prototype parts in hours instead of days or weeks to speed product development time.



ISO 9001:2000

For quality management in meeting the high-purity demands of medical manufacturing, many IDEX Health & Science business units are registered to ISO 9001:2000 standards.

Lean/Kaizen

Our businesses employ the latest lean manufacturing practices to drive continuous improvement in cost containment and product quality.

Assembly & Testing

All components and custom Integrated Solutions are fully tested to instrument-manufacturer requirements.

Trademarks

The following trademarks and registered trademarks appear in this brochure:

Gast[®], Ismatec[®], Micropump[®], Rheodyne[®], Sapphire Engineering[™], Trebor[®], and Upchurch Scientific[®] are trademarks or registered trademarks of these respective companies.

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