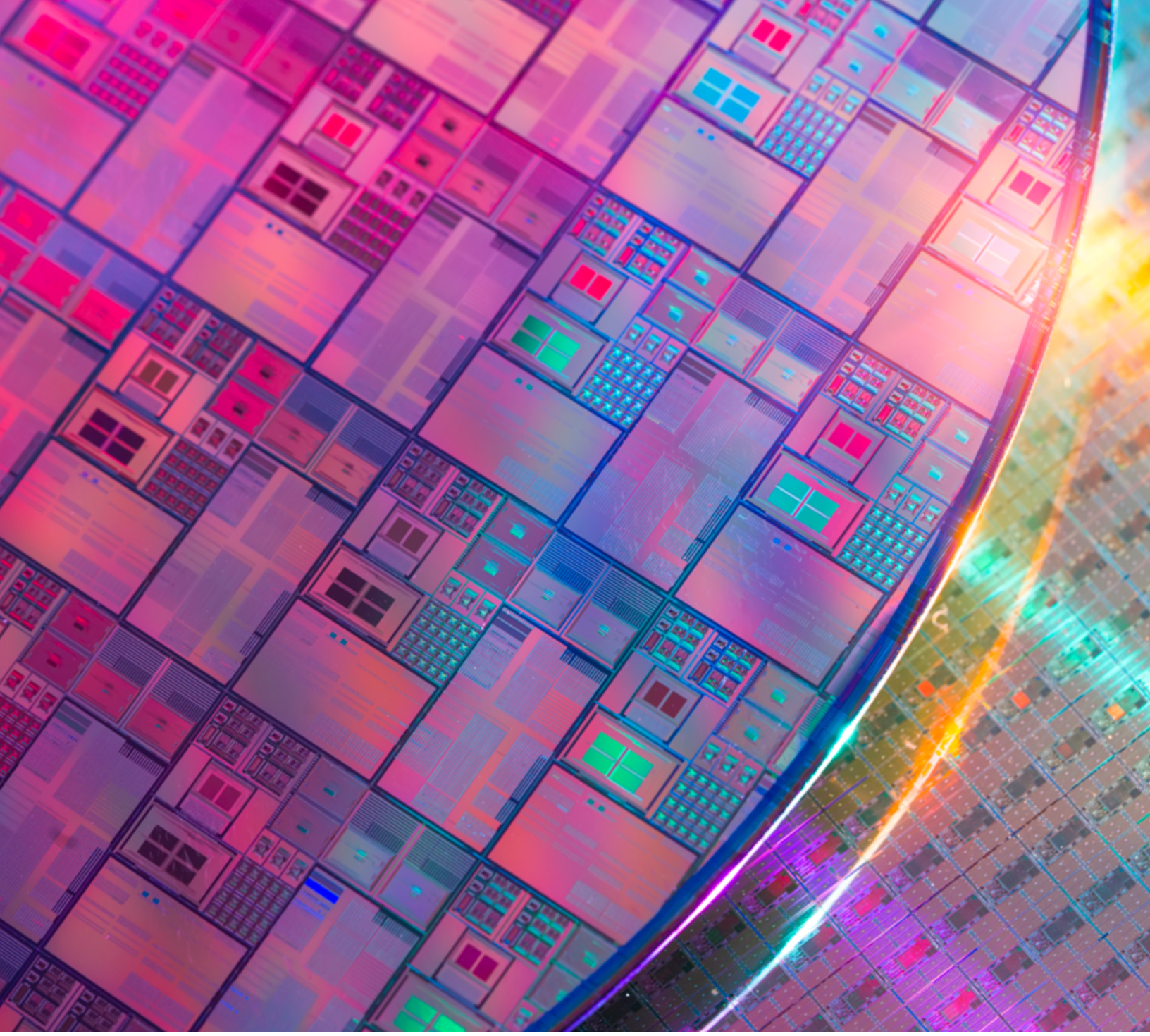


Semiconductor Microelectronics

Innovative solutions for improved performance and profitability

Parker Veriflo

ENGINEERING YOUR SUCCESS.

PARKER

...are the FLOW CONTROL EXPERTS

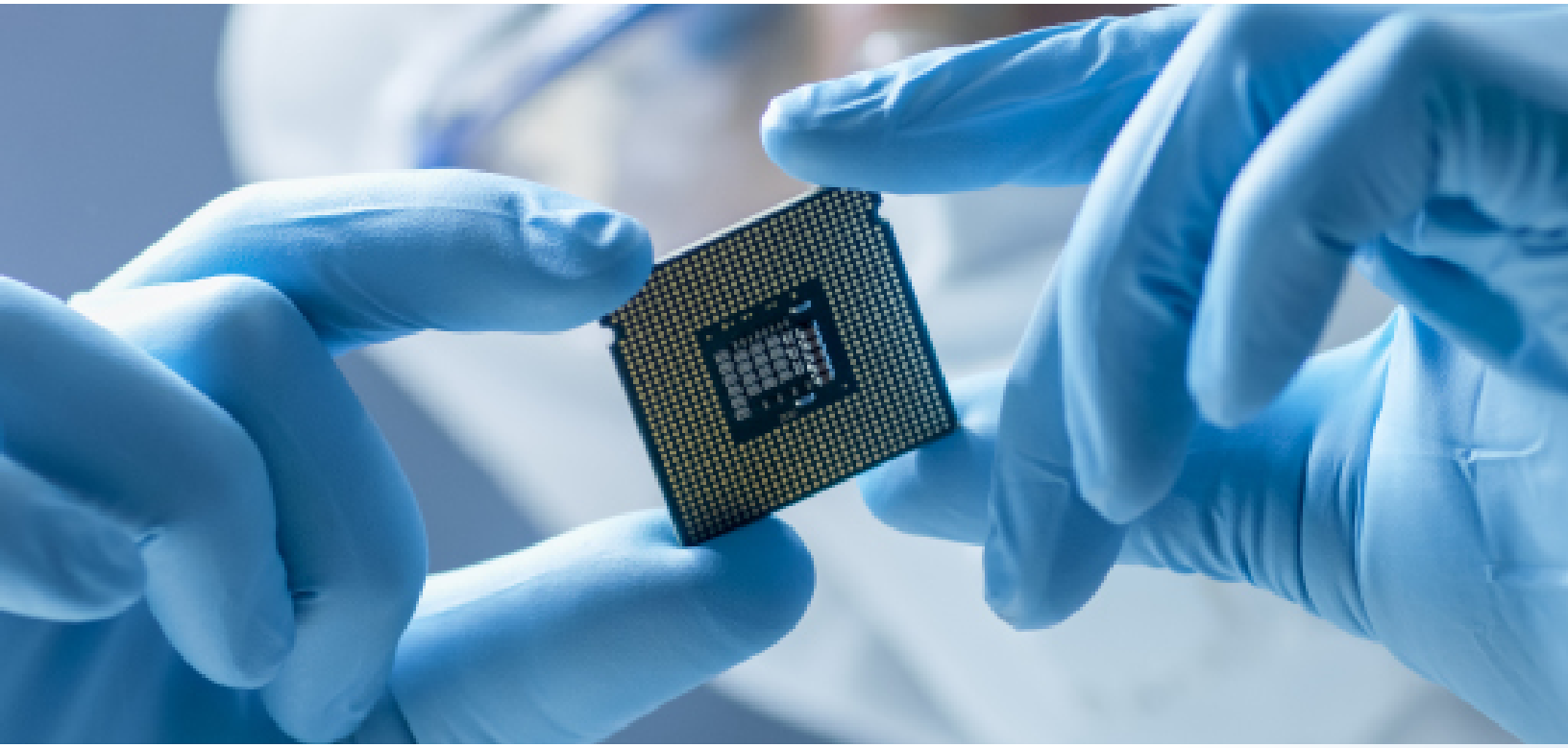
For nearly 30 years, Parker Hannifin's Veriflo Division has been the global leader in semiconductor gas and chemical delivery devices and systems.

We have been the primary single-source provider to the semiconductor industry ensuring unmatched safety, reliability, technical service and support, fast turnaround times, and complete systems to help manage the supply chain.

Headquartered in Richmond, California, the division operates additional manufacturing facilities in Tucson, Arizona, and Jangan, South Korea.

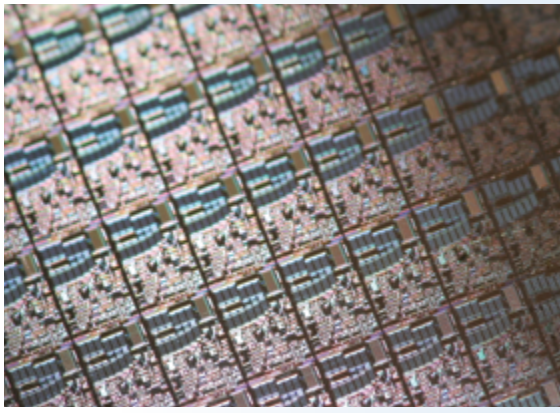
VERIFLO

…is your partner if you want to stay on top of advanced processes that require greater, more precise gas and liquid delivery, evolving materials, and the technology innovations that will drive the industry forward.



As the technical experts in gas and chemical delivery systems and wafer processing systems, we can provide you support to develop solutions to prepare for tomorrow's challenges.

From fab builds to process tools, we offer an end-to-end range of product solutions in ultra-high purity stainless steel and fluoropolymer regulators, valves, fittings, and manifolds that will help you improve safety, reliability and productivity.



Emerging Market Trends

- Semiconductor technology advancements are driving wafer line sizes to below 3nm.
- More global semiconductor fab localization initiatives as semiconductors play larger role in countries' advanced defense systems, critical infrastructure, supply chains, and economy.
- 5G devices and infrastructure, digital transformation, IoT, high performance computing, and EV applications are leading demand drivers for new specialized semiconductor chips

Customized solutions

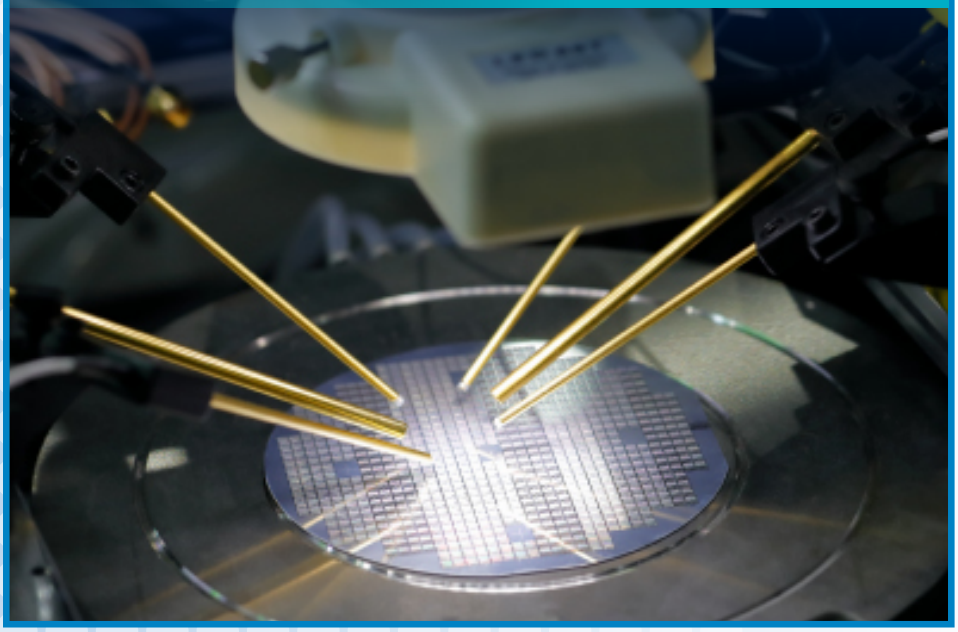
Parker has the ability to integrate multiple technologies into unique, customer-focused solutions for both gas and chemical systems that offer improved module reliability in smaller, more cost-effective packages, such as this fluoropolymer manifold solution. Contact Parker Veriflo at **(510) 412-1100** to find out more or email us at: **vfo.support@support.parker.com.**

Why Parker in today's facility

PROVEN. SAFE. RELIABLE. RESPONSIVE.
We have been the primary supplier of ultra-high purity (UHP) regulators and valves for leading semiconductor fab builders and tool manufacturers for over 30 years.

- Proven ultra high purity gas and liquid delivery devices and assemblies
- More stainless steel and fluoropolymer regulators, valves, fittings, and manifolds than any other supplier
- Customized solutions and ability to integrate technologies into unique, customer-focused systems that offer improved module reliability and smaller packages: weldments, manifolds, CASYs.
- Collaborative product development services from concept through production, including application and validation support as needed

SUSTAINED EXCELLENCE AND RELIABILITY
With microelectronic process applications and semiconductor manufacturing becoming more advanced, Parker Veriflo's products continue to meet stringent manufacturing standards and ever-rising customer requirements.

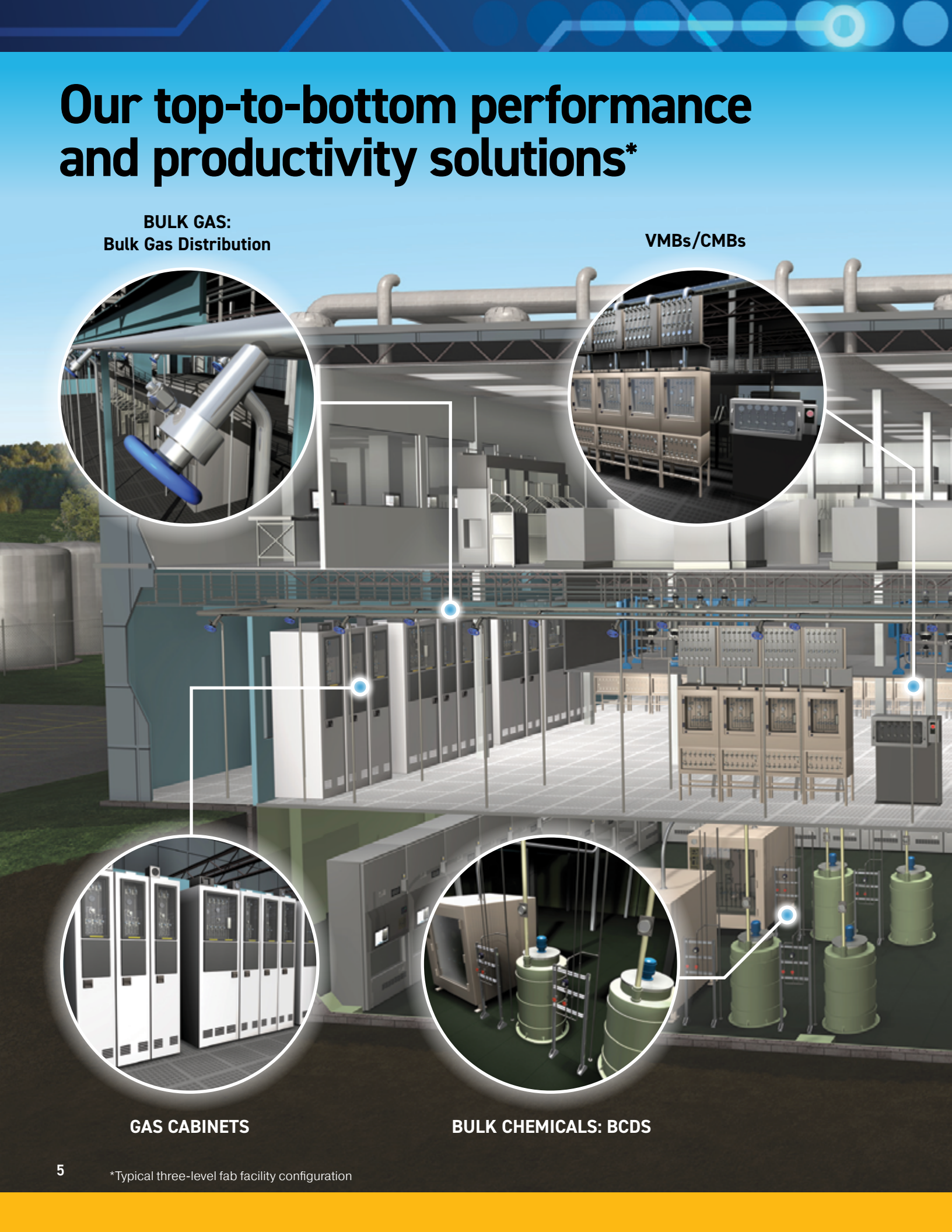


SEMI
F57-0301
COMPLIANT
22 SERIES

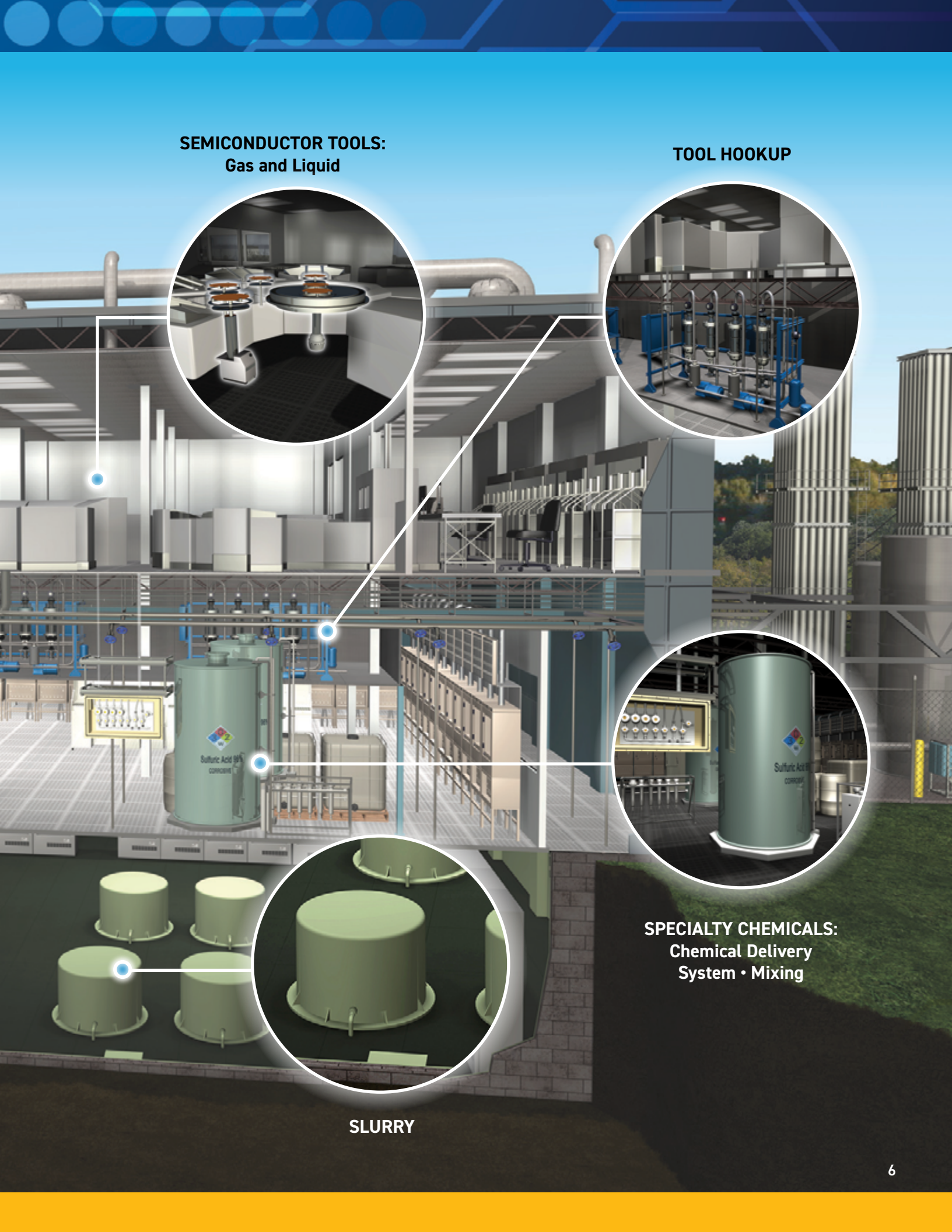
GLOBAL CONNECTIVITY AND LOCAL AVAILABILITY
Our global footprint assures local availability, no matter where you develop, assemble, manufacture or operate.

Parker Veriflo has manufacturing locations in North America and Asia, along with sales offices in North America, Asia, and Europe.

Our top-to-bottom performance and productivity solutions*



*Typical three-level fab facility configuration


SEMICONDUCTOR TOOLS:
Gas and Liquid
TOOL HOOKUP
SPECIALTY CHEMICALS:
Chemical Delivery
System • Mixing
SLURRY

From **bulk chemical** and **gas delivery** to **wafer cleaning**, **specialty gas**, and **tool hookup** to **OEM equipment**, Veriflo products outperform the competition.

Ultra High Purity FR Series Regulators

Applications: *Valve manifold boxes, point-of-use tool hookup and gas cabinets*

Parker's FR 1000, FR 1200, FR 1300, and FR 1400 Series of ultra high purity regulators provide precise, stable control of process gases in downstream point-of-use applications, reducing short- and long-term costs for semiconductor OEMs, integrators, and fab facilities. Each offers metal-to-metal seals for enhanced leak integrity; Hastelloy® C-22® diaphragms for increased cycle life and corrosion resistance; single-melt or double-melt 316L stainless steel construction.

- FR / FRN* 1000 Series – Low flow capacity with 0.09 Cv and 0.15 Cv versions; sealed cap and bonnet port standard on double-melt 316L stainless steel models
- FR / FRN 1200 Series – High flow capacity with 1.2 Cv; low inlet pressure (300 psig) and high inlet pressure (1700 psig) models available
- FR / FRN 1300 Series – High flow capacity with 1.2 Cv with a max inlet pressure up to 600 psig
- FR / FRN 1400 Series – Tied diaphragm design with 0.5 Cv high flow capacity; low inlet pressure (300 psig) and high inlet pressure (3000 psig) models available

*N=NPT thread

Ultra High Purity Metal Face Seal and Weld Fittings

Applications: *Valve manifold boxes, gas cabinets and tool hookups*

Specifically designed for ultra high purity (UHP) semiconductor applications. Compact design allows for system miniaturization and close coupled spacing. Permanent heat code marking on wetted components provides full material traceability. All new products are available in SEMI F20 compliant material.

- UHP Metal Face Seal fittings available as glands, nuts, caps and plugs in 316, 316L and 316L double-melt stainless steel; pressures up to 8000 psig
- UHP Weld fittings available in 316L and 316L double-melt stainless steel in elbows, tees, crosses and reducers; pressures up to 8500 psig

The new **gas and chemical delivery** products needed for tomorrow's wafer manufacturing.

INNOVATIONS IN ACTION

With the world's appetite for electronics and mobile devices continuing to grow, our newest solutions will help you meet the challenges they create.

New Corrosion Resistant Series P22 Valves

Applications: *Wet etch and wafer cleaning*

New ultra clean manual and pneumatic valves offer increased flow and provide better seat sealing for enhanced leak-free performance and greater safety.

- Deliver high cycle life in acids and slurry with reduced maintenance
- True lock-out, tag-out design on manual valves
- Compact footprint
- Meet SEMI F57-0301 standards

Ultra High Purity Stainless Steel BDV Series Valve

Applications: *Bulk gas distribution*

The BDV Series is a positive-retraction diaphragm valve that provides superior control of gases and liquids under high flow, low pressure conditions where absolute purity is essential.

High Cycle, High Speed HCS1 Series Valve

Applications: *High speed switching for process gases*

The HCS1 Series is a UHP stainless steel diaphragm valve with a demonstrated cycle life up to 100 million cycles and a response time of 10ms.

CASYs (Custom Assemblies)

Application: *All*

Parker will design custom assemblies for all your applications. Products offer typical space savings of 70% while eliminating many connections, minimizing dead legs and reducing installation costs and labor.

Gas Delivery, Mixing and Distribution

REGULATORS:

BFR5K Series:

Compact High Flow Bulk Gas Regulator

Applications:
Bulk gas. Maintaining outlet pressure setting regardless of upstream pressure changes.

Flow Capacity (Cv): 4.5
Max Inlet pressure: 500 psig

New! BPRMicro Series:

Compact Back Pressure Regulator

Applications:
Point-of-use. Upstream pressure control over a large flow range.

Flow Capacity (Cv): 0.06
Control Pressure Range: 1 - 30 psig

New! FR 1000 Series / FRN 1000 Series:

Precise Control Pressure Reducing Regulator

Applications:
Valve manifold boxes, gas cabinets, point of use applications.

Flow Capacity (Cv): 0.09 (std), 0.15
Max Inlet pressure: 3500 psig

New! FR 1200 Series / FRN 1200 Series:

High Flow Pressure Reducing Regulator

Applications:
Point of use bulk and specialty gas applications.

Flow Capacity (Cv): 1.2
Max Inlet pressure: 1700 psig

New! FR 1300 Series / FRN 1300 Series:

High Flow Pressure Reducing Regulator

Applications:
Point of use bulk and specialty gas applications.

Flow Capacity (Cv): 1.2
Max Inlet pressure: 600 psig

New! FR 1400 Series / FRN 1400 Series:

High Flow Pressure Reducing Regulator

Applications:
Cylinder or point of use bulk and specialty gas applications.

Flow Capacity (Cv): 0.5
Max Inlet pressure: 3000 psig

QRM & QRMHF Series:

Miniature Pressure Regulator

Applications:
Faster purge times and extended seat life. Precise gas regulation and performance.

Flow Capacity (Cv): 0.1 (QRM), 0.17 (QRMHF)
Max Inlet pressure: 250psig & 500 psig

SMQRM & SMQRMHF Series:

Surface Mount Miniature Pressure Regulator

Applications:
Faster purge times. Extended seat life, precise gas regulation and performance.

Flow Capacity (Cv): 0.1 (SMQRM), 0.17 (SMQRMHF)
Max Inlet pressure: 250psig & 500 psig

SQ Series:

High Flow Point of Use Regulators

Applications:
Point of use. Process gas cabinets. Control process gas pressure at or near the tool.

Flow Capacity (Cv): 0.054 to 1.5
Max Inlet pressure: 250 to 1000psig

SQ2MICRO Series:

Miniature Pressure Regulator

Applications:
Point of use. Step function changes. Closer spacing of components, process lines.

Flow Capacity (Cv): 0.06
Max Inlet pressure: 250

SMSQ2Micro Series:

Modular Surface Mount Regulator

Applications:
Highly responsive to step function changes.

Flow Capacity (Cv): 0.06
Max Inlet pressure: 250 psig

New! SQMicroLVP Series:

Low Vapor Pressure Regulator

Applications:
Point-of-use. Step function changes for low vapor pressure gases.

Flow Capacity (Cv): 0.15
Max Inlet pressure: 250 psig

VALVES:

New! BDV Series

Positive Retraction Diaphragm Valve

Applications:
Control of gases and liquids under high flow, low pressure conditions

Flow Capacity (Cv): 2.8
Max Inlet pressure: Vacuum to 300 psig

New! QHT Series

High Temperature Diaphragm Valve

Applications:
Chemical delivery systems ar high-temperature UHP, fully immersible

Flow Capacity (Cv): 0.6
Max Inlet pressure: 30 psig

F9 Series:

Welded Check Valves

Applications:
Conserve panel space, reduce inventory requirements.

Flow Capacity (Cv): 0.45 or 0.90
Maximum Pressure: 1000 or 3000psig

Veriflo's gas delivery products are all ultra-high purity and made with stainless steel.

HT Series:

High Temperature Diaphragm Valve

Applications:
Semiconductor processes with both high temperature and high flow requirements.

Flow Capacity (Cv): 0.30, 0.50, 0.55
Operating Pressure: Vacuum to 125 psig

HCS1 Series:

High Cycle Speed Valve

Applications:
Faster response times, more consistent flow performance, high-speed switching for process gases.

Flow Capacity (Cv): 0.35
Operating pressure: Vacuum to 75 psig

17R Series:

High Flow High Pressure Diaphragm Valve

Applications:
Positive shut off for high-purity fluid systems.

Flow Capacity (Cv):
0.75 (pneumatic) or 0.8 (manual)
Operating Pressure: Vacuum to 3000 psig

18R Series:

High Flow High Pressure Diaphragm Valve

Applications:
Positive shut off for high-purity fluid systems.

Flow Capacity (Cv):
1.0 (pneumatic) or 1.3 (manual)
Operating Pressure: Vacuum to 1500 psig

500 Series:

Bulk Gas Distribution Bellows Valve

Applications:
Maximizing gas transfer through main and lateral lines inside fab plant.

Flow Capacity (Cv): 4.8 or 17.4
Operating Pressure: Vacuum to 250 psig

930 Series:

High Cycle Life Diaphragm Valve

Applications:
UHP applications for Semiconductor OEM and process wafer manufacturing.

Flow Capacity (Cv): 0.22 or 0.3
Operating Pressure: Vacuum to 300 psig

930Y Series:

Diaphragm Y Valve High Flow Manifold

Applications:
Mixed operator combinations, reduces space requirements.

Flow Capacity (Cv): 0.18, 0.22, or 0.3
Operating Pressure: Vacuum to 300 psig

SM930 Series:

Surface Mount Diaphragm Valves

Applications:
Modular surface mount systems.

Flow Capacity (Cv): 0.25
Operating Pressure: Vacuum to 250 psig

945 Series:

High Pressure Diaphragm Valve

Applications:
Semiconductor process control, improved dimensional control.

Flow Capacity (Cv): 0.18 or 0.25
Operating Pressure: Vacuum to 3500 psig

945Y Series:

Diaphragm Y Valve High Pressure Manifold

Applications:
Mixed operator combinations, reduces space requirements.

Flow Capacity (Cv): 0.17, 0.18 or 0.25
Operating Pressure: Vacuum to 3500 psig

955 Series:

High Flow Diaphragm Valve

Applications:
UHP systems, low vapor pressure gas delivery systems.

Flow Capacity (Cv): 0.55
Operating Pressure: Vacuum to 250 psig

955Y Series:

Diaphragm Y Valve High Flow Manifold

Applications:
Mixed operator combinations, reduces space requirements.

Flow Capacity (Cv): 0.35 or 0.43
Operating Pressure: Vacuum to 250 psig

970 Series:

High Flow High Cycle Life Diaphragm Valve

Applications:
Optimize flow capacity with unique porting shape. Variety of manual operators to fit system requirements.

Flow Capacity (Cv): 0.7
Operating Pressure: Vacuum to 250 psig

FITTINGS:

MiniButtweld™:

Leak-free fittings for UHP applications

Applications:
Compact for use with orbital weld equipment. Prevent outgassing and inhibit corrosion.

Pressure Rating: Up to 8500 psig

VacuSeal™:

Leak-free fittings for UHP applications

Applications:
Metal-to-metal seal from vacuum to positive pressure.

Pressure Rating: Varies

Click on specific product names for additional information.

Chemical Delivery, Mixing and Distribution

REGULATORS:

PR-01 Pressure Regulator:

1/4" Modified PTFE Regulator

Applications:
High purity semiconductor applications and ultra-pure water and aggressive chemicals

Max Primary Pressure: 120 psig
Secondary Pressure: 0-30 and 0-60 psig

PR-08 Pressure Regulator:

1/2" Pressure Regulator

Applications:
High purity fluid handling applications, including aggressive chemicals and slurry.

Max Primary Pressure: 120 psig
Secondary Pressure: 60 psig

BR-08 Back Pressure Regulator:

1/2" Back Pressure Regulator

Applications:
High purity fluid handling applications, including aggressive chemicals and slurry.

Max Primary Pressure: 120 psig
Secondary Pressure: 60 psig

VALVES:

22 Series Valves

1/4" and 3/8" Fluoropolymer Valves

Applications:
Suited for UHP chemicals, acids, plating, and slurry chemicals.

Flow Capacity (Cv): 0.33 (1/4") or 0.82 (3/8")
Operating Pressure: Vacuum to 80 psig

CV-1 Check Valves

1/4" - 1" PTFE Check Valve

Applications:
High purity semiconductor applications, and for ultra-pure water and aggressive chemical or gas applications.

Cracking Pressure: 0.25 - 0.75 psig
Back Check Pressure: 5.0 psig
Pressure Range: 27" Hg vacuum - 120 psig

CV-32 Check Valves:

2" Bulk Chemical PTFE Check Valve

Applications:
Largest fluoropolymer check valve in the industry for bulk chemical transfer.

Cracking Pressure:. 1 psig
Back Check Pressure: 5 psig - 8 psig
Pressure Range: 80 psig

MV-13 Series Needle Valves:

Molded High Purity PFA Body/Stem

Applications:
For aggressive chemical and gas applications.

Max Primary Pressure: 120 psig
Pressure Range: 27" HG vacuum - 100 psig

RV Series Relief Valves:

High Life Cycle Relief Valves

Applications:
Prevent over pressurization in high purity semiconductor applications. Suited for ultra-pure water and aggressive chemicals.

Flow Capacity (Cv): 0.24, 0.7, or 0.78
Pressure Range: 15 psig - 120 psig

MANIFOLDS:

CASYs (Custom Manifold Assemblies):

Specialty and Custom Assemblies

Products include:

- Manifolds
- Welded Assemblies
- Surface Mounts
- Valve Assemblies
- Special Customer Components
- Miscellaneous Assemblies

HEAT EXCHANGERS:

HPX1 Heat Exchanger:

Submersible Heat Exchanger

Applications:
High resolution process temperature control of processing chemicals or high purity water.

Flow Capacity (Cv): 2.3, 2.7, 3.0, or 4.2
Pressure Ranges:
See Pressure vs Temperature Chart

Veriflo's chemical delivery products are all ultra-high purity and made with modified PFA and PTFE.

FITTINGS:

Parbond:

Parbond PFA Fusible Pipe Fittings

Applications:
Any ultra-pure or corrosive chemical application.

Pressure Range:
See Pressure/Temperature Chart

Parflare:

Parflare PFA Tube Fittings

Applications:
Any ultra-pure or corrosive chemical application.

Pressure Ranges: 125 psig, See Pressure/Temperature Charts

Pargrip:

Pargrip PFA Tube Fittings

Applications:
Suited for use in corrosive environments and chemical applications.

Pressure Ranges: 125 psig, See Pressure/Temperature Charts

Tubebond:

Pargrip PFA Tube Fittings

Applications:
Any ultra-pure or corrosive chemical application.

OTHER:

PFA Gauge Protectors:

PFA In-line Gauge Protectors

Applications:
Suitable for high purity semiconductor applications, and for use in ultra-pure water and aggressive chemicals.

Pressure Ranges: 27 Hg vacuum to 160 psig

PPV Series

6" PFA Pressure Vessels

Applications:
For use in dispensing chemical delivery systems utilizing vacuum/pressurization techniques.

Pressure Ranges:
80 psig at 68°F, 48 psig at 158°F

SG-1 DI Water Spray Gun:

PFA DI Water Spray Gun

Applications:
Suitable for high purity semiconductor applications.

Pressure Ranges: 0 to 80 psig

SMU-1 Series:

Inline Static Mixers

Applications:
Quick and convenient mixing of chemicals, CMP slurry and deionized water.

Pressure Ranges: 27 HG vacuum - 120 psig

TS Series:

Thermocouple Sensor Assembly

Applications:
Increases the longevity of the sensor and reduces pressure drop.

Pressure Ranges:
See Pressure vs. Temperature Chart

Click on specific product names for additional information.

Parker Hannifin Corporation
Veriflo Division
250 Canal Blvd.
Richmond, CA 94804
phone 510 412 1100
fax 510 412 1263
vfo.support@support.parker.com