

FITOK

Products for Semiconductor Applications

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Specialized products and professional services
Meeting your needs in semiconductor applications

FITOK, Inc.
Manufacturing & Global Sales Center
- Texas, USA

FITOK Corporation
Manufacturing Center
- Osan, South Korea

FITOK GmbH
Manufacturing Center
- Offenbach, Germany

FITOK Middle East
Regional Sales & Service Center
- Dubai, UAE

FITOK (Wuhan) Incorporated
Manufacturing Base
- Wuhan, China

FITOK Incorporated
Manufacturing Base
- Shenzhen, China

FITOK (Suzhou) Metal Products Co., Ltd
Manufacturing - Tubing
- Suzhou, China

About FITOK

Founded in 1998, FITOK Group has been a global leading supplier of valves and fittings, having our factories in Germany, USA, South Korea and China (Wuhan, Shenzhen, Suzhou), and inventory and sales service centers in Germany, USA, China, South Korea and UAE.

Our Advantages:

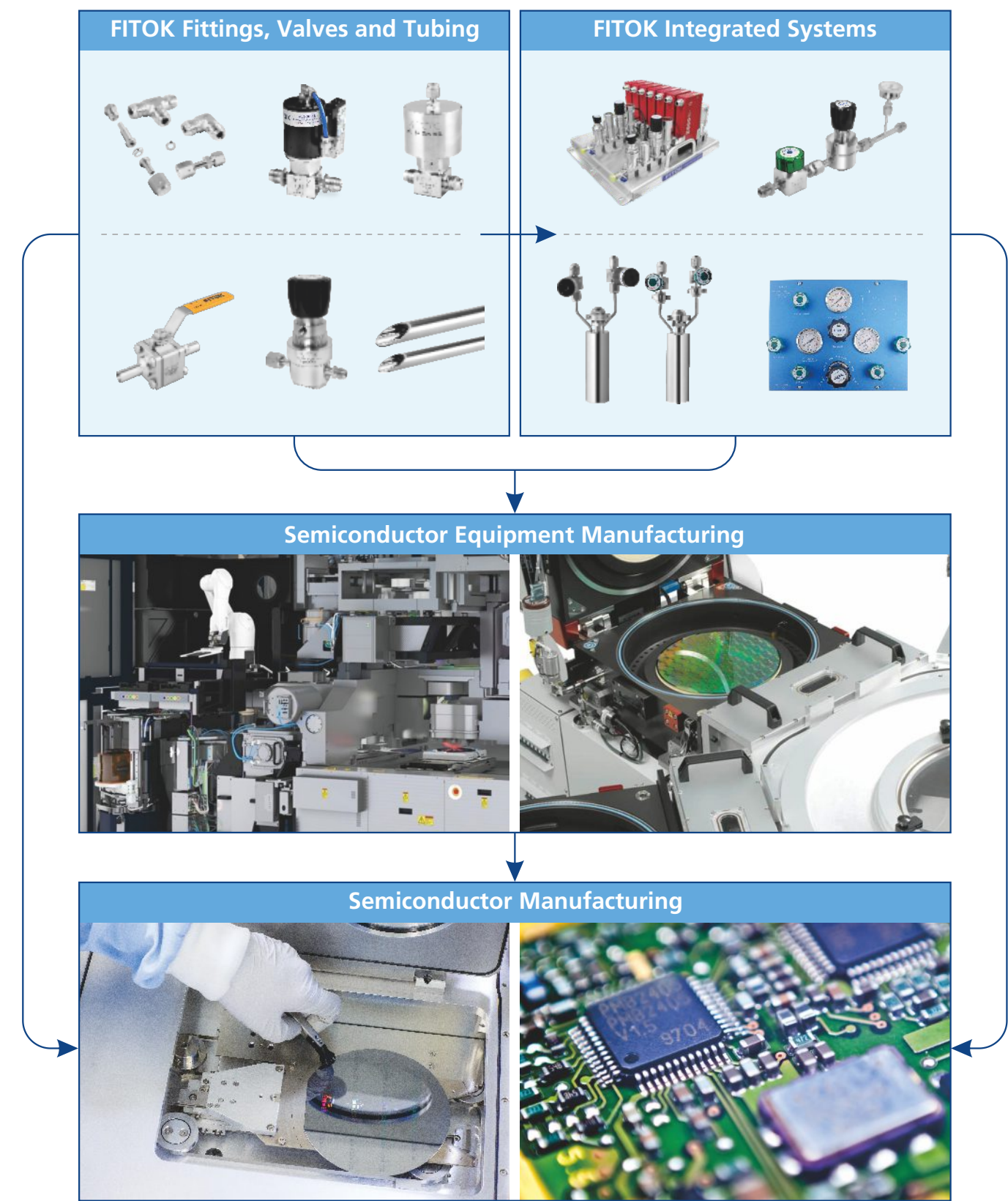
1. Specialized in instrumentation valves and fittings: 25+ years of rich design and manufacturing experience, products sold in 100+ countries and regions.
2. Industry-leading R&D capabilities: 100+ professional engineers and 80+ patents.
3. Lean and reliable quality management: a variety of management system certifications and product certifications.
4. Fast and efficient product delivery: manufacturing bases and service centers globally for faster product delivery and timely response to customers' needs.

<p>25+ years industry experience in instrumentation valves and fittings</p>	<p>Sales centers and manufacturing bases in 5 countries</p>	<p>5 product lines cover the need for instrumentation valves and fittings</p>
<p>600+ ton raw materials in stock</p>	<p>Products sold in 100+ countries and regions</p>	<p>80+ patents</p>



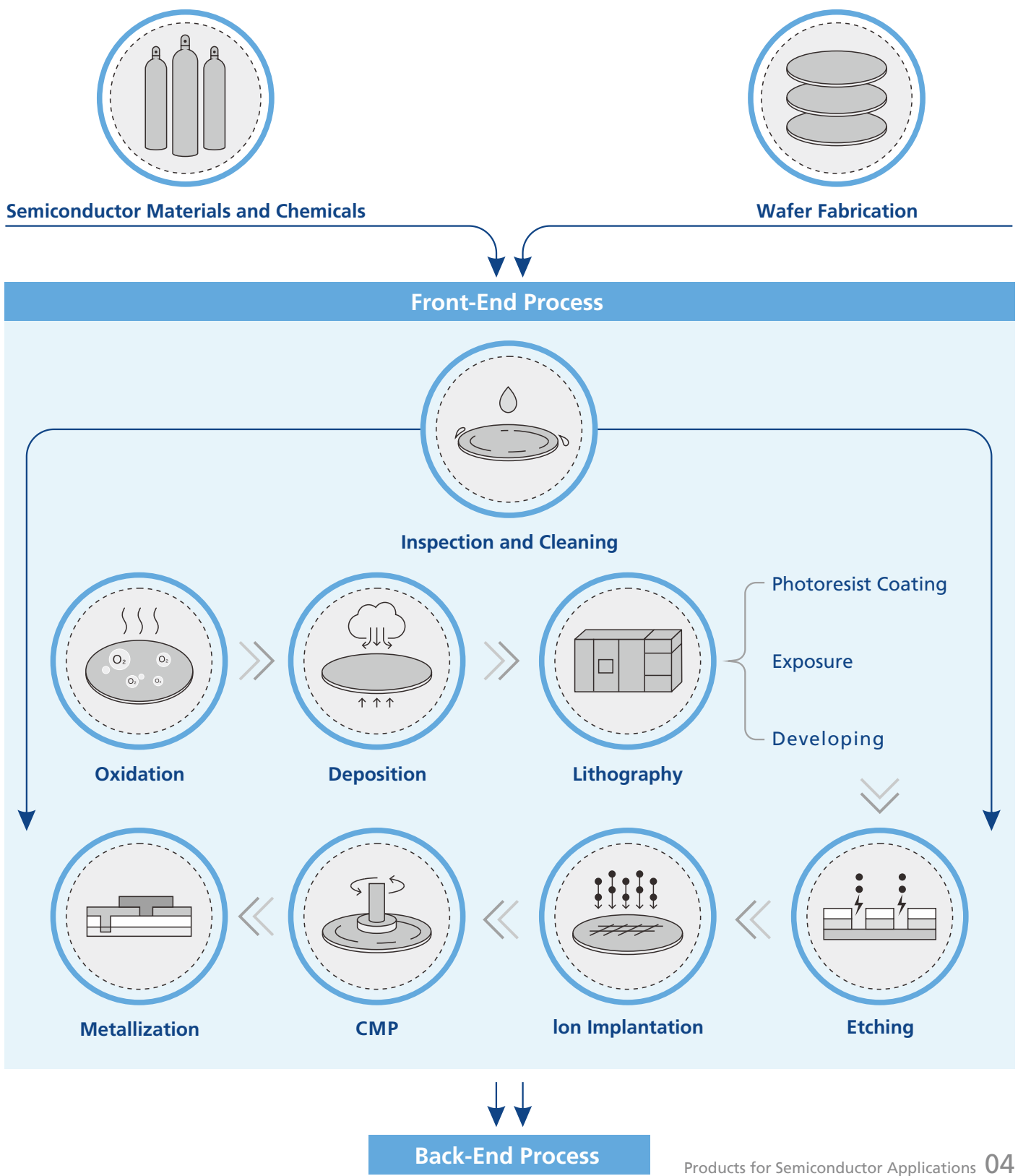
Single-Source Supplier of Fluid Systems for Semiconductor Industry:

FITOK can provide one-stop solutions for fluid systems in the semiconductor industry, from ultra high purity components such as fittings, valves and tubing to the integrated systems, and from the system design to the installation site service.



Application of FITOK Products in Semiconductor Manufacturing Process:

As a global leading supplier of valves and fittings, FITOK provides a full range of valves and fittings for semiconductor raw material production, semiconductor equipment manufacturing, semiconductor manufacturing process and the piping system construction and maintenance of semiconductor facility.



Products for Semiconductor Applications

Features

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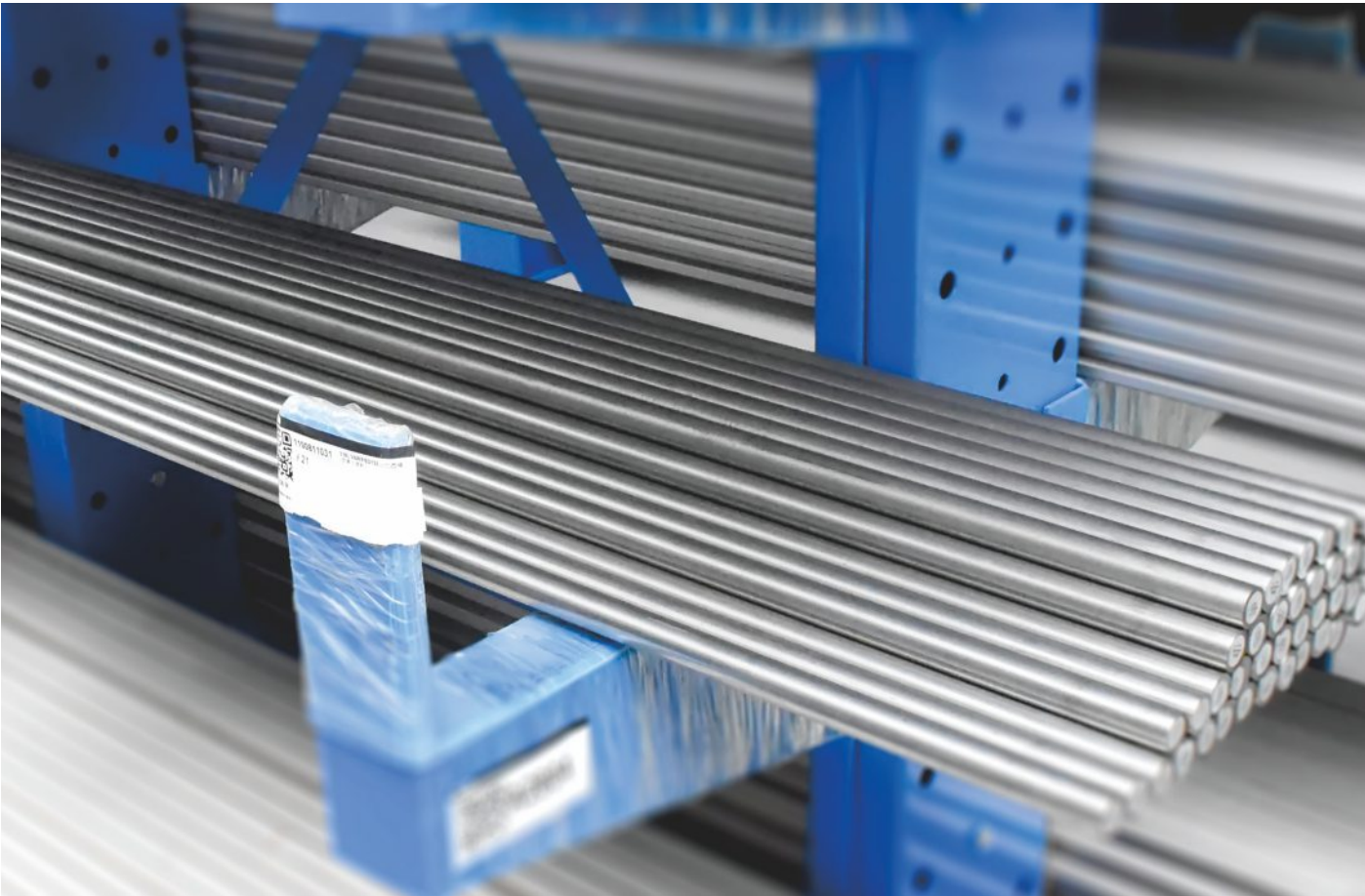
Raw Materials

Process cleanliness is one of the semiconductor industry's top concerns, and the material purity of fluid system components is critical to achieving the required process cleanliness. FITOK has customized 316 SS, 316L SS VAR or 316L SS VIM-VAR as the valve body material meeting SEMI F20 standard for semiconductor industry applications. As a commonly used material for high purity (HP) and ultra high purity (UHP) products, AISI 316L (UNS S3160) stainless steel has excellent corrosion and oxidation resistance. Stainless steel materials will obtain higher purity and better performance after AOD (or VOD) and VAR processes, known as 316L VAR. VOD materials after VIM and VAR processes to minimize C, Mn, Si, P, and S in the material are known as 316L VIM-VAR.



Cobalt Alloy

FITOK adopts cobalt alloy complying with AMS 5876 standard or Hastelloy complying with ASTM B575 standard as diaphragm material to achieve high corrosion resistance and excellent durability.



316L VIM-VAR

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Ultra High Purity Process

1.

Electropolishing

The internal surface of ultra high purity products for the semiconductor industry is electropolished to improve the smoothness of the flow path and to form a chromium-rich layer on the metal surface to improve corrosion resistance, and the electropolished products are passivated to remove free iron ions. After electropolishing, the following testing standards can be achieved.

Test Item		Test Standard
Oxide layer thickness		SEMI F72
Surface defect analysis	max. defect counts per area within 5 sample areas	SEMI F73
Cr/Fe		SEMI F60
CrO/FeO		
Surface roughness (Ra)		SEMI F37



2.

Cleaning

Ultra high purity products for the semiconductor industry are rinsed with ultrasonic DI water in the NEBB-certified ISO Class 5 cleanroom and dried in an enclosed oven. The technical specifications of the DI water comply with SEMI E49 standard.



3.

Welding, Assembly and Testing

- ◆ Cleaned products are welded, assembled, tested and inspected in the NEBB-certified ISO Class 4 cleanroom
- ◆ Helium leak test for products as required by SEMI F1. INFICON helium leak detector with a minimum detectable leak rate (vacuum) < 5x10⁻¹² mbar·L/s.

4.

Packaging

- ◆ Ultra high purity products are packaged in the ISO Class 4 cleanroom and the product packaging complies with SEMI E49 standard.
- ◆ Products are end-capped and double bagged with inner vacuum-sealed clean polyethylene bag and outer polyethylene bag.



Common Products



Fittings



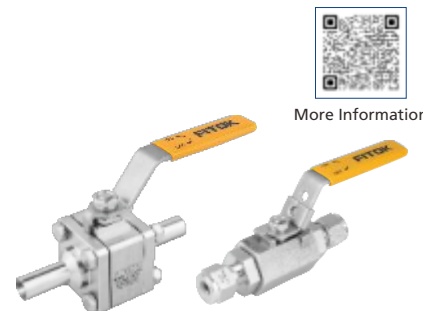
Diaphragm Valves



Atomic Layer Deposition Diaphragm Valves



Ultra High Purity Regulators



High Purity Ball Valves



Bellows-Sealed Valves



Check Valves



High Purity Tubing



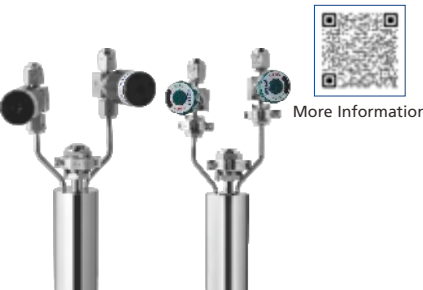
Vacuum Generators



Integrated Gas Systems



Gas Stick Assemblies



Canister Assemblies

Featured Products

★ Atomic Layer Deposition Diaphragm Valves

FITOK ALD series atomic layer deposition diaphragm valves are used in the atomic layer deposition process to deliver precise doses of gases during the deposition process for semiconductor manufacturing, to achieve the highly consistent film deposition required for advanced technology.



ALD Series Atomic Layer Deposition Diaphragm Valves

 Response time Less than 5 ms	 Flow Coefficient (Cv) Consistency $\pm 3\%$	 Temperature up to 392 °F (200 °C)	 Flow Coefficient (Cv) 0.27 or 0.62	 Cycle life more than 40 million times
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※ Tested under ideal conditions in the laboratory, the performance in actual application is subject to test under actual working conditions.

- ◆ Ultrahigh cycle life of over 40 million times with high-speed actuation
- ◆ Quick response capable of valve opening or closing time of less than 5 ms
- ◆ Thermal actuator extends the life in applications where the body is heated
- ◆ Contained seat to provide excellent resistance to swelling and contamination
- ◆ Cobalt alloy diaphragm to provide high strength and corrosion resistance to ensure long cycle life
- ◆ High-purity grade PFA seat with broad range of chemical compatibility
- ◆ Minimum particle generation and dead space to facilitate purging
- ◆ Valves with inductive sensors, solenoid valve assemblies, heater cartridge and thermocouple holes are available

★ Pneumatic Diaphragm Valves with Locking Device

As surface mount diaphragm valves, pneumatic diaphragm valves with locking device are suitable for high purity and ultra high purity fluid systems in the semiconductor industry and others.

- ◆ Manual and pneumatic operating mechanisms prevent misoperation better than traditional pneumatic diaphragm valves
- ◆ Cv 0.3 with compact design
- ◆ Comply with SEMI PR 3.1 seal specification
- ◆ W-seal and C-seal available



Surface Mount Size	Material	Cv	Temperature	Working Pressure	Internal Surface Roughness	Internal Leakage (Helium)	External Leakage (Helium)
1.125"	Body: 316L VAR	0.3	14 ~ 140 °F (-10 ~ 60 °C)	150 psig (10.4 bar)	Ra≤5 μin. (0.13 μm)	≤1x10 ⁻⁹ std cm ³ /s	
	Seat: PCTFE						
	Diaphragm: cobalt alloy						
	Actuator: aluminum						



★ Two-Step Pneumatic Diaphragm Valves

Two-step pneumatic diaphragm valves are used in the semiconductor industry to prevent fluid from flowing rapidly into the cavity and other internal areas of the semiconductor processing machine, which may cause particles to fly around to contaminate the cavity.

- ◆ Pneumatic actuated
- ◆ With high and low flow gas connections, high and low flow can be accurately switched to moderate the pressure rise in the cavity
- ◆ With cobalt alloy diaphragm
- ◆ High flow Cv 0.27, low flow Cv 0.02 ~ 0.12



Size	Material	Low Flow Cv	High Flow Cv	Temperature	Maximum Working Pressure	Internal Surface Roughness	Internal Leakage (Helium)	External Leakage (Helium)
1/4"	Body: 316L VAR	0.02 ~ 0.12	0.27	14 ~ 302 °F (-10 ~ 150 °C)	145 psig (10 bar)	Ra≤5 μin. (0.13 μm)	≤1x10 ⁻⁹ std cm ³ /s	
	Seat: PCTFE							
	Diaphragm: cobalt alloy							
	Actuator: aluminum							



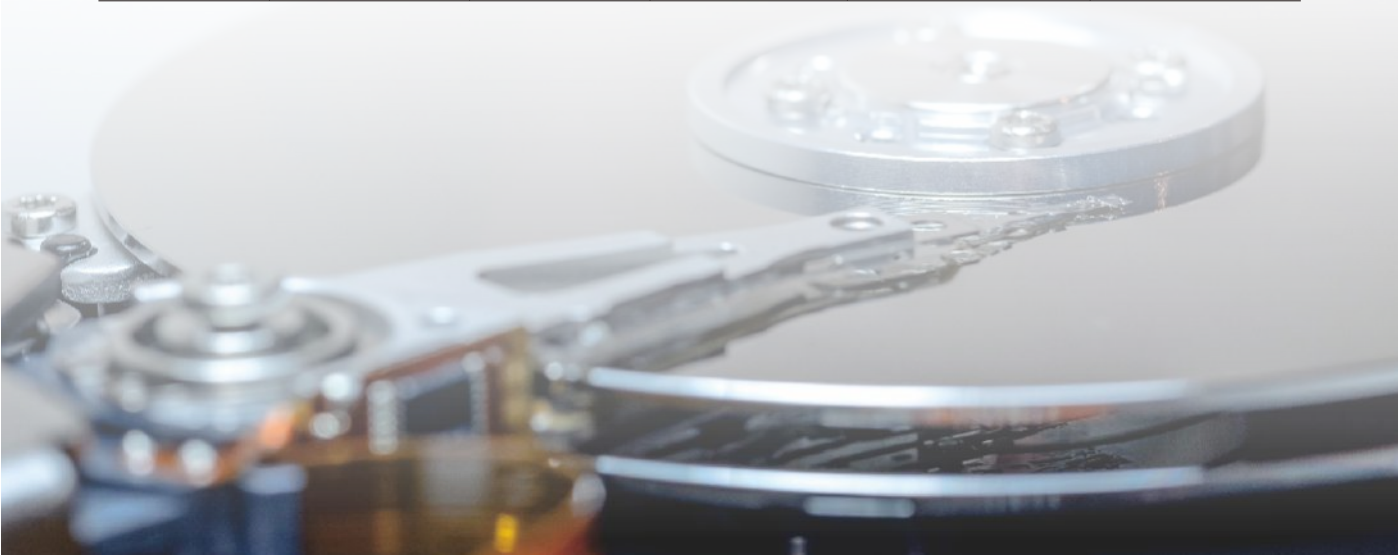
★ Stainless Steel Electropolished Tubing (EP Tubing)

EP tubing is processed from bright annealed tubing (BA tubing) by electropolishing the internal surface. FITOK has been adopting strict specifications for raw materials, electropolishing process, cleaning and packaging, etc. to achieve better roughness, cleanliness, corrosion resistance and weldability of stainless steel EP tubing, resulting in its wide application in the semiconductor industry.

- ◆ **Materials:** 316L, 316L VAR, 316L VIM-VAR
- ◆ **Inspection:** visual inspection, surface roughness measurement, particle testing, moisture testing and a series of tests with scanning electron microscopy (SEM), Auger electron spectroscopy (AES), electron spectroscopy for chemical analysis (ESCA or XPS)
- ◆ **Sufficient Inventory:** FITOK can provide customers with one-stop solutions and professional services to help customers save procurement and inventory costs with flexible manufacturing systems and sufficient finished goods inventory in global warehouses
- ◆ **Prefabrication services:** fabricated EP bent tubing and EP tubing assemblies are available upon request to improve the installation efficiency for customers



Product	Standard	O.D.	External Surface Roughness	Internal Surface Roughness	Length
TEP Series	ASTM A269/A632	1/4" ~ 2 1/2"	Ra≤40 μin. (1 μm)	Ra≤5 μin. (0.13 μm)	4m, 6m, 20ft
PEP Series	JIS G3459	6A ~ 50A		Ra≤7 μin. (0.18 μm)	4m, 6m
	ASTM A312	NPS 1/8 ~ NPS 2		Ra≤10 μin. (0.25 μm)	4m, 6m, 20ft



★ Gas Stick Assemblies

FITOK gas stick assemblies integrate a ball valve, a diaphragm valve, a regulator, a pressure gauge and etc. into one stick to reduce site connections for easier site installation. FITOK gas stick assemblies, including AGH series high purity gas stick assemblies and AGL series general gas stick assemblies, are widely used in the semiconductor industry.

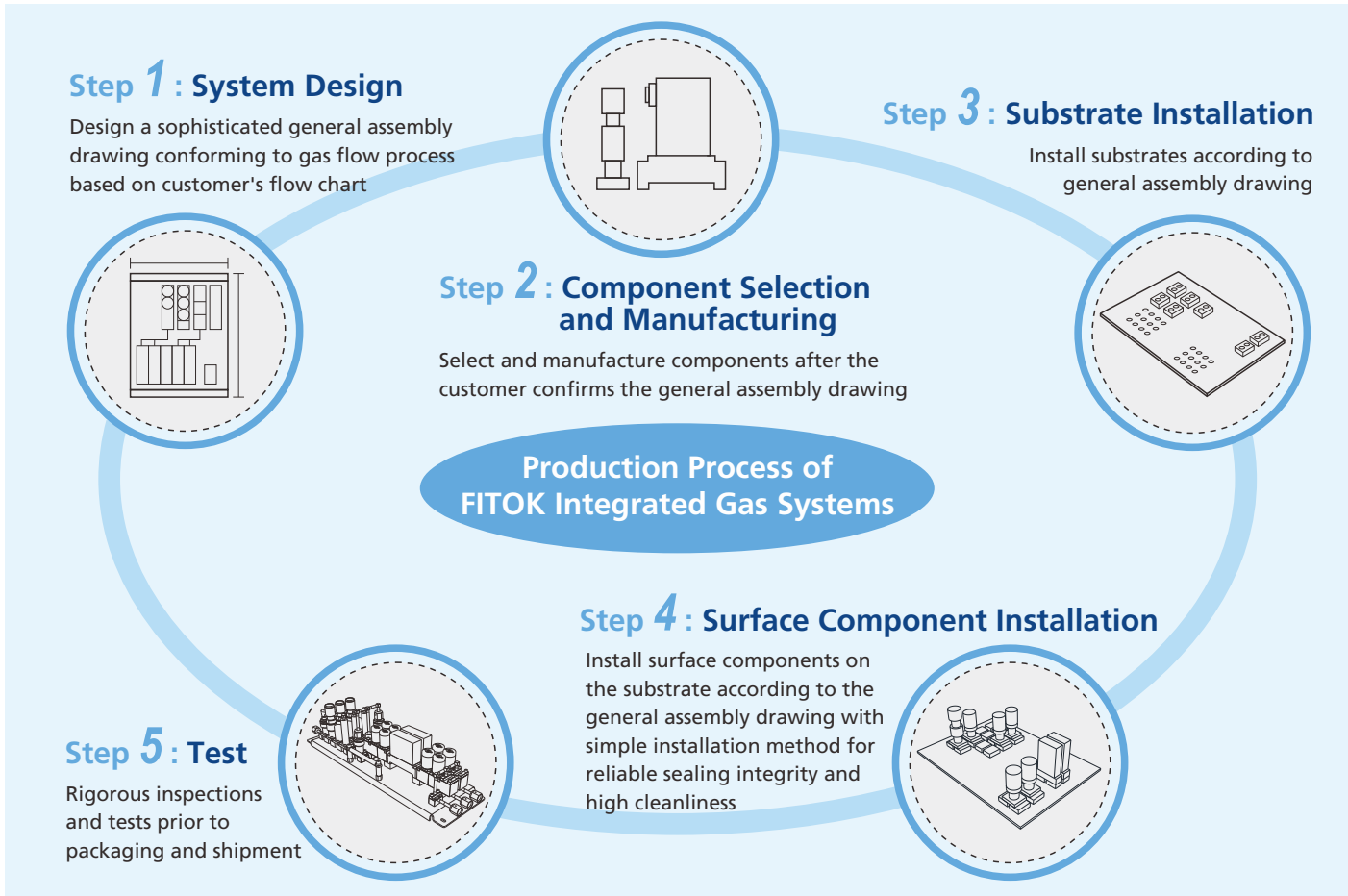
- ### AGH Series
- ◆ Applicable to high purity gas systems in the semiconductor industry
 - ◆ Integrated from a diaphragm valve, a regulator and a pressure gauge
 - ◆ Alloy diaphragm improves strength and corrosion resistance for long cycle life
 - ◆ T series tubular fittings optional for pressure gauge connection (customized lengths available)
 - ◆ Cleaned, welded, assembled, tested, packaged and marked following Ultra High Purity Process Specification
 - ◆ Sizes from 1/4" to 1" optional



- ### AGL Series
- ◆ Applicable to general gas fluid systems and oxygen-enriched environments
 - ◆ Integrated from a ball valve, a regulator and a pressure gauge
 - ◆ Excellent sensitivity and set point pressure stability for precise pressure control and fluid shutoff
 - ◆ Alloy diaphragm improves strength and corrosion resistance for long cycle life
 - ◆ Special Cleaning and Packaging Process Specification ensures the product cleanliness meets the requirements of ASTM G93 Level C
 - ◆ Sizes from 1/4" to 1" optional

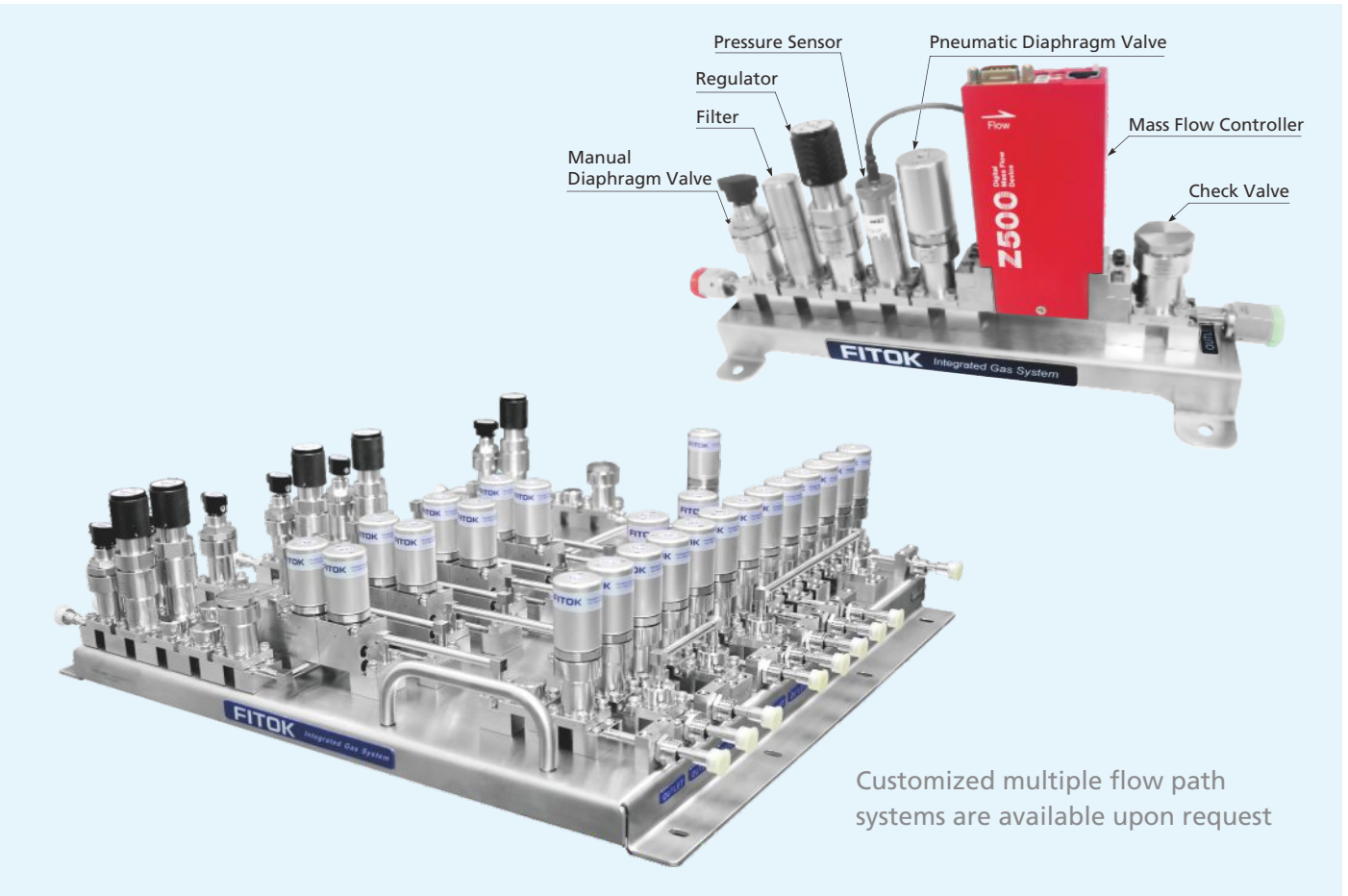
★ Integrated Gas Systems

Integrated Gas Systems are used for gas control in the semiconductor industry. As semiconductor manufacturing process develops, the requirements for gas control device become higher. FITOK Integrated Gas Systems use SEMI compliant surface-mounted components and are modularly designed. While reducing the size of the device, installation and maintenance become easier.



- ◆ **Modular design - shorten design time**
According to the customer's P&ID diagram, the design can be completed by installing standard substrates, valves (diaphragm valves, check valves, regulators), flowmeters, filters, pressure sensors and other components on the panel.
- ◆ **Surface mounting - easy installation and maintenance**
All components are surface mounted in accordance with SEMI standard, and installation with silver-plated screws and later maintenance can be completed with simple tools.
- ◆ **Miniaturization**
The size is about 1/3 the traditional panel, and the corresponding flow path size is also reduced for better contamination control.
- ◆ **SEMI standard materials, electropolishing process and orbital welding**
Wetted components are made of SEMI standard materials with electropolished flow paths (Ra 5 μin. / Ra 0.13 μm) and orbital welded connections.
- ◆ **W-seal / C-seal**
W-seal or C-seal between components and substrates. Metal-to-metal seal with the sealing surface isolated from components receiving external force to achieve optimal sealing effect.

FITOK can design and supply integrated gas systems according to customer P&ID diagrams, in which filters, pressure sensors and MFC can be provided by customers or purchased by FITOK under customer-provided brands.



Main Components	Features
Diaphragm Valves	Cobalt alloy diaphragm Manual and pneumatic actuators available Body materials of 316L SS, 316L VAR and 316L VIM-VAR Wetted components electropolished to a surface finish of Ra 5 μin. (0.13 μm) max
Check Valves	Body materials of 316L SS, 316L VAR and 316L VIM-VAR Wetted components electropolished to a surface finish of Ra 5 μin. (0.13 μm) max
Regulators	Hastelloy poppet and diaphragm Reinforced diaphragm design improves sealing performance and service life Body materials of 316L SS, 316L VAR and 316L VIM-VAR Wetted components electropolished to a surface finish of Ra 5 μin. (0.13 μm) max
Substrates	Non-fixed installation to ensure the sealing effect Body materials of 316L SS, 316L VAR and 316L VIM-VAR Wetted components electropolished to a surface finish of Ra 5 μin. (0.13 μm) max
Gaskets	W-seal and C-seal optional Sealing surfaces isolated from components receiving external force Electropolished to a surface finish of Ra 5 μin. (0.13 μm) max