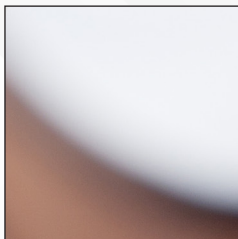
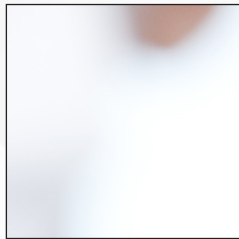
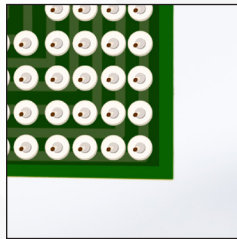
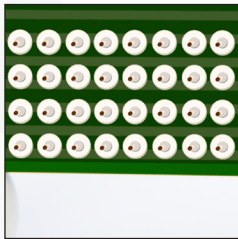
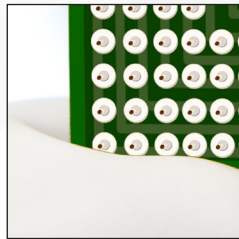
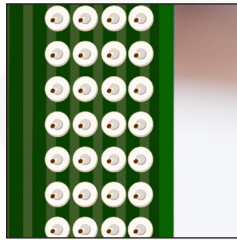
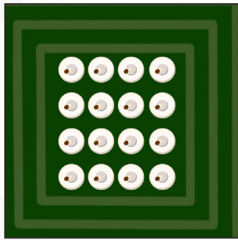
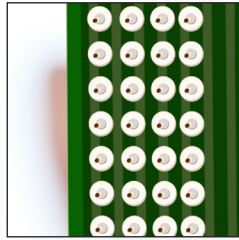
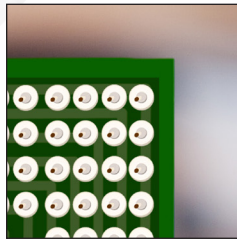
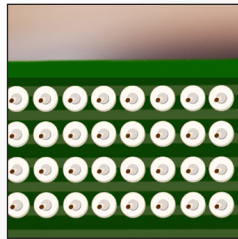
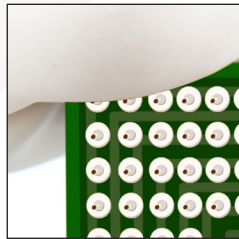
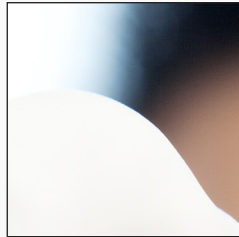


Microelectronics

Liquid and Gas Filtration Products for the
Microelectronics and Semiconductor Industry



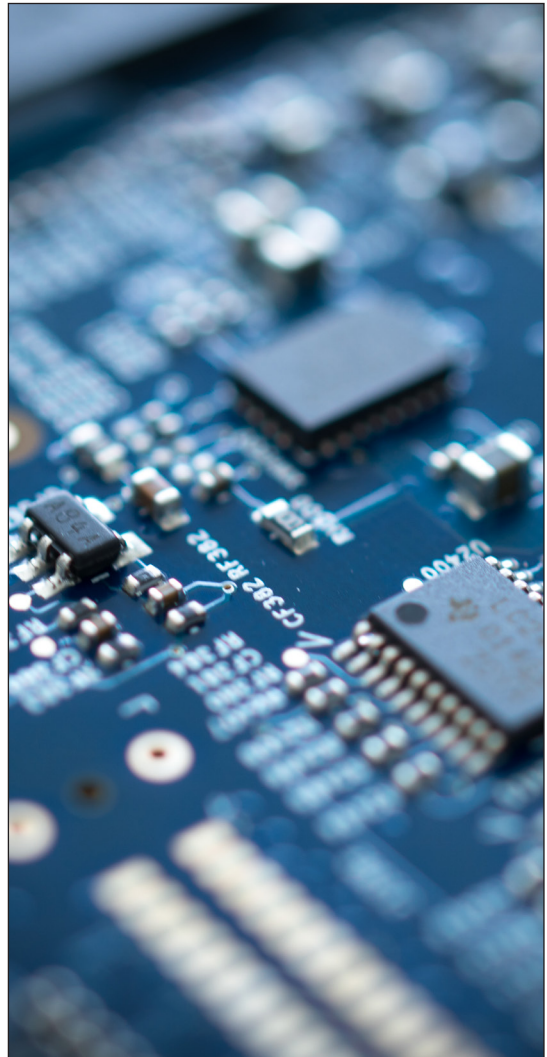
Porvair Filtration Group

Porvair Filtration Group is an international leader in the development and supply of materials and products for applications in filtration and separation.

Porvair manufactures in the UK, USA and China, and has an extensive network of sales offices and distribution channels throughout the World. Our expertise is wide and varied, with products used in markets such as:

- Aerospace and Defence
- Food and Beverage
- Gasification
- Microelectronics
- Nuclear
- Oil and gas
- Pharmaceutical
- Porous Media and OEM Materials
- Printing
- Process
- Transportation
- Water

Our ongoing success is based on a dedication to technical excellence and exceptional customer service. Our future will continue to be built on our investment in research and development to provide innovative new products that exceed the expectations of our customers in solving the challenges they face.



Porvair Filtration Group in the Microelectronics Industry

Porvair manufactures a wide range of high purity porous media and reliable, high efficiency filtration products.

These products ensure extreme cleanliness in critical semiconductor and microelectronics gas handling and delivery applications.

We can custom engineer solutions for the most demanding applications using porous PTFE membrane, Sinterflo® F sintered metal fiber and Sinterflo® P sintered powder metal media.



Gas Handling

The GasPro™ range of products ensure extreme cleanliness in critical semiconductor and microelectronics gas handling and delivery applications, including:

- Gas safety management
- Exhaust venting systems
- Flow control
- Mass flow control
- Needle valve replacement
- Laminar flow diffusing
- Pressure snubbing
- Flame arresting.

We can custom engineer solutions for the most demanding applications, using porous PTFE membrane, Sinterflo® F sintered metal fibre and Sinterflo® P sintered metal powder media.

Materials of construction

Our wide range of porous media includes a variety of pore sizes and material properties. These high efficiency filters are offered in:

- PTFE membrane
- 316L stainless steel Sinterflo® F sintered metal fibre
- 316L stainless steel Sinterflo® P sintered metal powder
- Nickel Sinterflo® F sintered metal fibre
- Nickel Sinterflo® P sintered metal powder
- Hastelloy® C22 Sinterflo® P sintered metal powder.



Service in severe environments

Our GasPro™ filter media provides excellent mechanical strength, enhanced corrosion resistance and elevated temperature service in severe environments.

Mechanical strength

The filter media and supporting structure are designed to withstand the highest pressure differential. The mechanical strength of the 316L stainless steel filter housings will provide reliable service.

Temperature resistance

316L stainless steel or nickel construction provides elevated temperature service up to 500°C (930°F). Hastelloy® C22 construction is rated for 700°C (1290°F) in reducing or inert gas applications. With PTFE filter media, the filters are rated up to 120°C (250°F).

Corrosion resistance

Our GasPro™ filter hardware features electro polished surfaces to prevent corrosion and particle formation for years of reliable service. Robust construction and excellent corrosion resistance allow for service in a wide range of processing gases.



Semiconductor Manufacture

Point-of-Use (POU) filters are manufactured in a state-of-the-art Cleanroom using an ISO 9001 Certified Quality System. The filters are precision welded with atmosphere purification. A deionized water flush, followed by a high pressure, filtered nitrogen flush removes particles and reduces particle shedding.

Applications

- Wafer production
- Microelectronics for computers, tablets, cell phones, IoT sensors and control devices
- Micro-electromechanical systems (MEMS)
- Data storage devices.

Solar Power Panel Manufacture

Porvair Filtration Group GasPro™ high purity filters are selected for critical gas distribution and delivery systems that are part of the thin film deposition process used to make photovoltaic devices.

Applications

- Process gases used in Plasma Enhanced Chemical Vapour Deposition (PECVD) systems for the manufacture of solar cell panels
- Dopant gases used for deposition on CDs, disc drive and optical devices, as well as gases used in modified Chemical Vapour Deposition (CVD) process for optical fibre manufacture
- Processing gases for manufacturing the front glass used for photocells and solar panels.

LED Screen Manufacture

Porvair Filtration Group GasPro™ filters provide high efficiency removal of sub-micron particles when handling the process gases used in the manufacture of Light Emitting Diodes (LEDs) for lighting, display and electronic applications.

- **High flow filters**
for superior particle removal when delivering bulk gases, on-site generated gases, specialty gases and process gases
- **Gas cabinet protection**
filters extend service life of mass flow controllers, regulators and valves
- **Process equipment protection**
protection of process equipment such as vacuum pumps when growing crystals, in EPI reactors and in other metal organic chemical vapour deposition (MOCVD) process gas handling equipment



GasPro™ High Purity Gas Filters

GasPro™

Porvair GasPro™ high purity filters are selected for critical gas distribution and delivery systems that are part of the thin film deposition process used to make photovoltaic devices.

Our GasPro™ filters for the solar power panel industry are offered in PTFE membrane, Polypropylene, 316L Sinterflo® F sintered metal fiber, 316L Sinterflo® P sintered powder, Nickel fiber, Nickel sintered powder and Hastelloy® C22 sintered powder.

Applications

- Filtration of inert gases used in load locks and process chambers
- Point-of-use filtration of CVD (chemical vapor deposition), epitaxial, diffusion, plasma etch, and other critical dry processes
- Instrument and component protection
- Reduction of pump-down cycle times and particle contamination in load locks, as well as cooling and process chambers.
- Process gases used in Plasma Enhanced Chemical Vapor Deposition (PECVD) systems for the manufacture of solar cell panels.
- Processing gases for manufacturing the front glass used for photocells and solar panels.

Features and Benefits

- **Increased yield and efficiency** of thin film deposition process.
- **Protection of process equipment** PECVD process gas handling equipment.
- **Particle removal** remove toxic and abrasive particles from exhaust gases.
- **High efficiency filtration of gases** high efficiency filtration of bulk and specialty gases such as N₂, H₂, Ar, F₂, NF₃, He and Silane.
- **Maximum cleanliness** deionized water washed and filtered N₂ flush to maximize out of box cleanliness.
- **Application and service environment** available with less stringent wetted hardware surface specifications and with larger filter grades depending on the application and the service environment.



Flow Restrictors

Porvair GasPro™ Flow Restrictors are designed with hundreds of small, interconnected pore passageways which offer significant benefits compared to single bore restrictive flow orifices.

Flow limiting devices are often installed in compressed gas supply lines and gas distribution manifolds to prevent unintentional high gas flow caused by a ruptured gas line, malfunctioning valve or pressure regulator.

Features and Benefits

- **Improved gas safety**
limits the maximum flow when handling hazardous gases.
- **Tamper proof flow control**
individually calibrated for accurate, repeatable flow with a set pressure. They provide a fixed flow without moving parts or adjustments.
- **Provide laminar flow**
reduce turbulence in gas lines and for low velocity gas delivery applications.
- **Corrosion resistant**
corrosion resistant porous and hardware fitting materials 316L stainless steel and Hastelloy® C22.
- **High pressure N2 pulse flush**
with 0.003m filtered Nitrogen to remove particles and prevent shedding.
- **Vacuum dried**
to less than 1ppm moisture content as needed.
- **Laser marked**
with flow details for easy identification.



Gas Diffusers

Porvair GasPro™ Diffusers ensure a smooth, laminar gas flow and remove sub-micron particles when handling inert gases used wafer load lock vacuum/purge cycles. Diffusers prevent turbulence that can stir up particles in a vacuum chamber.

Porvair GasPro™ porous media is also used by OEM purifier manufacturers to support and to retain the fine, purifier media used to prevent contamination in bulk gas delivery and gas distribution systems.

The porous media can be custom manufactured to meet the critical pore size, pressure differential and flow requirements for each OEM design.

Features and Benefits

- **Faster venting and cost savings**
reduce both purging and pressurization time.
- **Reduced turbulence and laminar flow**
minimize particle disruption for vent load lock and vacuum chamber purging applications.
- **Improves temperature uniformity**
less heat build-up than traditional orifice style flow restrictors.
- **Superior corrosion resistance**
316L stainless steel, nickel and Hastelloy® C22 materials for handling reactive process gases.
- **High purity cleaned**
minimize potential interactions with the process gases as extensively cleaned and dried to low ppb levels.



High Purity Chemical Filtration

Our LiquiPro™ range focuses on the delivering improved performance within the semiconductor industries, by reducing process defects and to achieve an increased lifespan of the filter.

The LiquiPro™ range includes cartridges, capsules and their respective housings. The Filtration hardware format comes in standard cartridges as well as disposable or capsule form. The filter media of Polypropylene (PP), Polyethersulfone (PES), Fluoropolymer (PTFE), Nylon (NL), PVDF are available at selected pore sizes.

The products are suitable for the following applications:

- CMP
- PVD copper plating
- Wet etch clean
- Photolitho
- Chemical delivery system
- General Filtration
- Final Cleaning and DI Water filtration
- Plating, Etching, Stripper chemicals
- Chemicals of acid, bases and solvents (selected applications)
- Engineering or Equipment companies requiring cartridge housings



Our LiquiPro™ range of filters and filter housings are designed specifically for the following applications:

Chemical Mechanical Polishing (CMP)

This is a critical microelectronics process step in STI, Copper, Oxide or Tungsten. These advanced CMP processes require filters that meet the stringent demands of scratch reduction improvement as well as efficient removal rate.

Our LiquiPro™ SL filters are compatible with chemical slurries ranging from aluminas, colloidal and ceria types. These are applicable at Point-Of-Use (POU) or Bulk Slurry Delivery System (BSDS).

POST CMP Clean

In post CMP cleaning process, Dilute HF or Ammonia Solution are normally used in Applied Material Reflexion tool series. This is a cartridge filter with hydrophilic PES membrane. Our LiquiPro™ BU filters are designed for this specific purpose.

PVD

Copper Plating filters are specific to LAM's advanced Cu SO4 plating tools for the Damascene and TSV processes. The Electro-Chemical Plating bath chemistries comes installed with a 10inch Cartridge ECP filter. Our LiquiPro™ CO series is designed for fine particle removal and brings about plating consistencies in the Copper Sulphate plating solution. The Hydrophilic PTFE membrane works well with a broad range of plating additives and eliminate plating causing defects. The tool also has a Single Anode Chamber (SAC) which has a 5 inch disposable filter installed. Our LiquiPro™ SL filters are suitable for this purpose.

Wet Etch Clean (WEC)

These filters are predominant in many front or back end chemical processes of cleaning or etching or stripping. A wide range of acids, bases and solvents are used in ambient or elevated temperatures require different adoptions of the filters in filter media and hardware.

We recommend all-fluoropolymer cartridges for many of these applications. The family of LiquiPro™ F2, F3 and SH filters come with Hydrophobic PTFE membrane and PFA core, cage, endcap hardware that will meet all requirements.

In etching or stripping processes where less aggressive chemicals are used, the Fluoropolymer membrane with Polypropylene hardware would be applicable. Our LiquiPro F2™ series would be well suited for this application. Similarly in CDA filtration found in many

tools, the adoption of mainly cartridge filters with the PTFE membrane and PP hardware construction. The LiquiPro™ FG series of filters are designed for this purpose.

Photolitho

In the Lithography process, high viscosity photoresist together with developer and stripping process employ a variety of membrane materials to eliminate contaminants in the bath chemistries. In developer process, chemicals such as TMAH or KOH and DI water used Hydrophilic PES membrane in disposable type filter formats. The LiquiPro™ MI series of capsule filters are made of PES membrane with HDPE support are suited for both developer and DI water filtration.

Advanced photoresist system consists of typically of solvent, photo acid generator (PAG), acid quenchers, additives and surfactants. Both the LiquiPro™ MI (PTFE) and PN (Nylon) series have excellent filtration performance to remove the gels present in most photoresist chemicals.

Chemical delivery system

In bulk chemical delivery systems, a diverse range of cartridge filters are normally employed for slurries, acids, bases and solvents. Typically, filter cartridges from 10", 20" and 30" are installed with PP, PFA and stainless steel housings.

Water cleaning

This is made in reference to systems that use Direct or Recirculation DI Water for cleaning and rinsing. The LiquiPro™ DI cartridge filter is constructed of pleated PES membrane and PP hardware. For disposable type, the LiquiPro™ MI PP series are available.

General filtration

We have a range of PP filters whether it is melt blown or pleated type cartridge made available for general filtration, including LiquiPro™ PA with pleated media.

Filtration housings

We offer a selected range of cartridge housings for aggressive chemicals at elevated temperatures, solvents, weak acids, bases, slurries and water.

For detailed information and ordering, please refer to respective datasheet.

Porvair Filtration Group has a policy of continuous improvement in all areas of its business. Listening to the customers' present and future requirements is a vital part of our operations and a key part of driving change.

We understand that product development involves building multidisciplinary teams, not only within the company, but often in partnership with our customers, improving project efficiency and ensuring complete customer satisfaction. This continuous development of products and materials is vital to enable us to offer new and better solutions to applications. **Porvair** has implemented various methodologies to drive out waste and process variance across the company to achieve the ultimate goal of zero defects.

We have a dedicated team of scientists, engineers, production and quality professionals working towards the best possible filtration solutions for our customers. We have a fully equipped test house and laboratory, and our experienced design engineers use the latest AutoCAD® technology, with 3D solid modelling, integrated with a finite element analysis system, to give full structural assurance capability.

Quality is at the heart of every stage of our operation and a fundamental part of our culture. We are ISO9001 approved at a number of our manufacturing facilities and hold many other accreditations for the various industries we serve.

Research and Development

Continuous development of products and materials are vital to enable **Porvair** to offer new and better solutions to applications. Development plays a fundamental part in our operations and, as a result, we have developed a number of new bespoke products based on our established porous polymeric materials (Vyon®) and sintered metal media (Sinterflo®).

Although we operate across many filtration and separation markets there is significant interaction between each division in terms of product research and development. The new product development team is drawn from scientists and engineers from across all divisions encouraging new ideas and new solutions. The success of this approach has been in the interaction of chemists and engineers working together to find practical solutions to some extremely complex scientific challenges identified in the chosen market areas.

Engineering

From initial concept design through manufacture and validation to in service support, our highly experienced team of dedicated engineers work to develop the optimal filtration solution. Our team utilises the latest engineering tools of 3D AutoCAD®, Finite Element Stress Analysis, Computational Fluid Dynamics (CFD) and bespoke pressure vessel design software (PD5500, ASME VIII, EN13445). This is combined with over 30 years of proven experience and a knowledge and strong ethos of working closely with our customers, ensuring filtration solutions that meet customers' requirements.



Manufacturing

Porvair Filtration Group produce filters and filtration systems, as well as a range of porous materials based on sintered polymers and metals, at production sites within the UK and the USA. We manufacture for a wide variety of industrial, pharmaceutical and biomedical applications, as well as supplying filtration solutions for extreme conditions of temperature, pressure and corrosion for the aerospace and nuclear markets.

Our production capabilities include the complete element or cartridge construction, along with the build of entire tubeplate and vessel assemblies. We boast specialist fabrication skills and techniques in all of our manufacturing sites around the world as well as extensive ISO Class 5 cleanroom facilities.

Testing and Laboratory

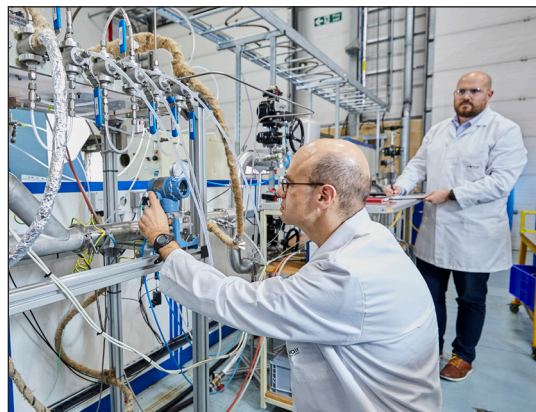
Our dedicated test, development and laboratory services underpin our design and development activity, from filtration media and material characterisation, product verification testing to customer systems simulation trials and in service performance evaluation. Our capabilities include filtration characterisation, environmental testing and analysis.

Quality

Our policy is to provide products and services that consistently satisfy the commitments made to our customers by complying with their requirements, working together as a team and by achieving continual improvement in our skills, systems, processes and performance.

We have a dedicated team of quality professionals with many years' experience in definition, implementation and maintenance of quality management systems meeting multiple industry requirements. This extends across the workforce through a strong quality culture and a philosophy of 'getting it right first time' driven from the top of the organisation.

Our quality management systems are regularly audited internally and by customers and regulatory bodies. We hold ISO9001 at a selection of our manufacturing sites along with, AS9100D at our Ashland facility and EN9100 and EASA Part 21 Subpart G at our Segensworth facility. We are NQA1 capable subject to specific project requirements.





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