High-volume Optical Filter Manufacturing and Optics Problem Solving

The Semrock Advantage
Performance, Reliability, Repeatability

Filter and Optical System Design Capabilities
Versatility, Custom Evaluation, Personalized Service

Optimized Manufacturing
We’re an Optical Engineer’s Best Friend

You need the experts in optical systems and high-volume thin film filters, Semrock is there with on-time delivery when you need it, guaranteed product performance, responsiveness with issues, and collaborative solutions.

When you are developing optical instrumentation you continually face new challenges: new customer requirements and product expectations, evolving technologies, changing markets, and the need for a rapid and decisive response. To help you conquer those challenges, Semrock provides superior products and expert, personalized support.

Semrock specializes in the volume production of optical filters for the life science and analytical instrumentation markets, and also manufactures filters for laser and optical systems applications. Our products exclusively feature hard, thin-film sputtered coatings for proven reliability. These filters will not change or degrade in any way as a result of humidity or temperature variations, nor will they “burn out” with normal use. All of our products are backed by our industry-leading ten-year warranty.

Overall, Semrock filters are brighter, more durable, and spectrally more sophisticated than those made by other coating technologies, driving significant improvements for our customers and their applications: faster measurement times, reduced downtime, repeatable manufacturing, and lower optical component count.

We make our unique products with lot-to-lot consistency in high volumes, providing our OEM customers with a dependable supply. We find solutions “within the box” of our standard catalog, and “out of the box” with the help of our expert design staff, and we apply each strategy in the right proportion.

With thousands of in stock items available for shipment the same day, combined with our ability to custom-size these items (typically in less than a week) and perform custom co-development engineering with fast prototyping, we can quickly provide intelligent solutions that meet your price points.

“These new systems represent the pinnacle of harsh environment Raman spectroscopy sensing,” said Quentin Morgan, CTO of WellDog. “The new systems not only provide better sensing performance, but are more ruggedized and reliable than previous generations.”

WellDog announced that its next generation of Reservoir Raman Spectroscopy™ systems, designed for monitoring challenging in situ coal seam environments and utilizing Semrock’s rugged and reliable RazorEdge® filters, are now in service.

Sit and stay are so old school.
What new tricks can we do for you today?
Our Focus on High-volume Filters

Dedicated high-volume coating facility — We now support the needs of our high-volume customers by producing tens-of-thousands of spectrally complex, sputtered optical filters per month. Building on our renowned filter manufacturing capability, we can now match the volume demands of customers in the medical diagnostic point-of-care healthcare markets where high-volume, miniaturized optics will be an enabling technology.

Rapid prototyping — For design and production of new prototype filters

Industry best lead times — Our >98% on-time delivery to customer request will make you smile. Same day shipping for catalog orders, three to five days for custom-size catalog, and two to four weeks for custom OEM parts.

Consistent performance — Our products are measured and reproducible, from the first lot to the latest.

Scalability — We can quickly design and develop a prototype filter and then produce it accurately in high volume.

Filter and Optical System Design Capabilities

Versatility — Our design engineers are experts in optical science and engineering, physics, electrical engineering, mechanical engineering, computer science, and biology, and all are experienced problem-solvers.

Industry’s fastest design turnaround — We’ve designed and implemented proprietary design software - Firelight. With Firelight we can complete design tasks in minutes that formerly required days or weeks. Now we can typically design and quote a prototype within a week, where previously it could take two to four weeks.

Modeling toolbox — We use our own state-of-the-art software to simulate complex coating runs before they reach manufacturing, yielding greater than 97% confidence in the engineering design.

Custom evaluation — By evaluating the entire optical system we can design and optimize the right filters. This inclusive approach minimizes system redesigns which add cost and delay to your project development.

Personalized service — We are responsive to your needs supplying careful analysis and prompt replies.
Unique Online Tools

Shorten time-to-market, improve your engineering productivity and final system performance by taking full advantage of our proprietary design software - MyLight™ and SearchLight™.

Need to know if your system selections will play nice with each other? Test in a virtual situation by uploading your elements into our powerful SearchLight tool.

MyLight is accessible on every single filter detail page to obtain working performance knowledge.

Supply Chain Management (SCM)

We incorporate best SCM practices into disciplined standard operating procedures.

Rigorous documentation and revision control

Lead time management — monitoring tools keep inventory at levels to satisfy delivery goals

Traceability — complete product histories of each manufactured item

Blanket orders, purchasing contract and just-in-time delivery

Optimized Manufacturing

We stress continuous improvement in our manufacturing processes.

5S — the five dimensions of workplace organization methodology and streamlining practice

Kaizen — system problem solving for continual improvements of our manufacturing processes

Lean principles — continual streamlining to reduce waste
The Semrock Advantage – Performance, Reliability, Repeatability

**Performance** — Semrock optical filters have the highest transmission specifications, yielding better contrast and faster measurements, even at ultraviolet (UV) wavelengths.

<table>
<thead>
<tr>
<th></th>
<th>Bandpass</th>
<th>Edge</th>
<th>Notch</th>
<th>Dichroic Beamsplitter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical Transmission</td>
<td>&gt; 97%</td>
<td>&gt; 98%</td>
<td>&gt; 95%</td>
<td>&gt; 92 – 95%</td>
</tr>
<tr>
<td>Blocking/Reflection</td>
<td>OD 6–8</td>
<td>OD 6</td>
<td>OD 6</td>
<td>Reflection &gt; 98%</td>
</tr>
<tr>
<td>Wavelength Range</td>
<td>230 – 1,700 nm</td>
<td>230 – 1,700 nm</td>
<td>230 – 1,100 nm</td>
<td>230 – 1,700 nm</td>
</tr>
<tr>
<td>Edge Steepness</td>
<td>&lt; 1.0%</td>
<td>&lt; 0.2%</td>
<td>&lt; 1.0%</td>
<td>&lt; 2.0%</td>
</tr>
</tbody>
</table>

Maximum transmission, optimized blocking and the steepest edges give Semrock filters market-leading performance.

Reliability
- Impervious to humidity and temperature induced degradation
- Lasting high level of performance
- Meet or exceed requirements for environmental and physical durability in MIL-STD-810F, MIL-C-48497A, MIL-C-675C, and ISO 9022-2.
- Eliminate replacement costs, decreasing the cost of ownership

**Repeatability** — Whether a filter is from the first lot or the last, its spectral properties are the same. Our OEM customers can rely on a secure and dependable supply line.

**Markets Served and Applications**

We serve key applications across life sciences, analytical instrumentation, science and technology. Much of our business is in the fluorescence instrumentation markets.

**Fluorescence Instrumentation Filters**
Fluorescence microscopy, DNA sequencing, in-vivo imaging, flow cytometry, quantitative real-time PCR, high content screening, microarray readers, point-of-care diagnostic devices, chemical process monitoring, laboratory fluorometers, microplate readers, gel electrophoresis imaging systems

**Raman Spectroscopy Filters**
Raman microscopy, portable and handheld Raman analyzers, Raman microprobes (optical fiber probes), laboratory spectrometers, coherent Raman scattering microscopy, materials characterization, medical diagnostics

**Laser Analytical & Optical System Filters**
Surgical laser systems, scientific research, environmental monitoring, laser materials processing, ultrafast science, remote sensing
Product Capabilities

Types of Filters We Produce
Fluorescence filters; Raman spectroscopy filters; tunable bandpass filters; deep notch filters and laser-line filters; laser diode clean-up filters; filters to combine or separate laser beams; filters to isolate popular mercury lamp lines; polarization filters; dispersion controlled filter designs and laser mirrors

Custom Solutions
• Wavelength functionality to specification, 230 nm — 2000 nm
• Ability to produce 10’s of thousands of parts per month
• Sizes down to 1.5 mm x 1.5 mm and as large as 200 mm
• Spectrally complex custom designs for customers (e.g. LED optimized filter designs)
• Custom sizing – Round, square, or rectangular, from several mm to a few inches
• Product labeling – On-filter laser engraving for easy identification and storage

Our Technology
Thin-film sputtering deposits low-loss, precise-thickness, and reliable optical-thickness layers. Semrock has made it viable for high-volume production using our proprietary processes and optical monitoring technology.

Our manufacturing facilities use state-of-the-art coating chambers in protected cleanroom environments. We are currently expanding to meet increasing demand and planning for continued growth.
Quality Systems

Certifications and Compliance
Semrock products are compliant, without exemptions, with Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011, Restrictive Use of Hazardous Substances (RoHS). We have instituted controls to ensure our suppliers provide only RoHS compliant materials for our products.

At Semrock we adhere to high levels of internal process control and reliability testing that well exceed the industry standard. We have passed 100% of quality audits by our major OEM customers.

Quality Standards in Place with Thorough Process Documentation
The Semrock quality system is modeled on the ISO 9001:2000 Quality System Standard 2. The structure of the quality system is fully documented and controlled by our dedicated Documentation Specialist. In addition to rigorous documentation, many of the quality system processes are controlled via our Enterprise Resource Planning (ERP) computer system.

We are ITAR registered and compliant for customers with sensitive projects that require additional security.

Case Study — Collaborative Engineering Project

The Challenge
- 18 different large diameter filters
- Demanding specifications for transmission, passband, optical density uniformity, wide-angle performance, and scattering for all 18 filters

The Solution
- Designed all filters to meet or exceed specifications
- Re-designed customer's optical cell to solve scattering problems
- Designed and built a unique, high-volume measurement platform for OD testing
- Worked with OEM engineering team to analyze test data and confirm system performance

The Result
- Continuing delivery of high-volume, high-mix sets with uncompromised performance
Semrock, Inc. manufactures optical filters that set the standard for the life science and analytical instrumentation industries, as well as optical filters and mirrors for laser and optical systems. OEM filters are manufactured in volume using thin-film sputtering and proprietary volume manufacturing technology. All Semrock products carry a ten-year warranty.

Founded in September 2000, Semrock is based in Rochester, New York, a well-known world center for optics, and has sales offices throughout the United States. In October 2008 Semrock became a unit of IDEX Corporation.

For additional information about Semrock, its products, and its team of international distributors, visit the company website at www.semrock.com.