

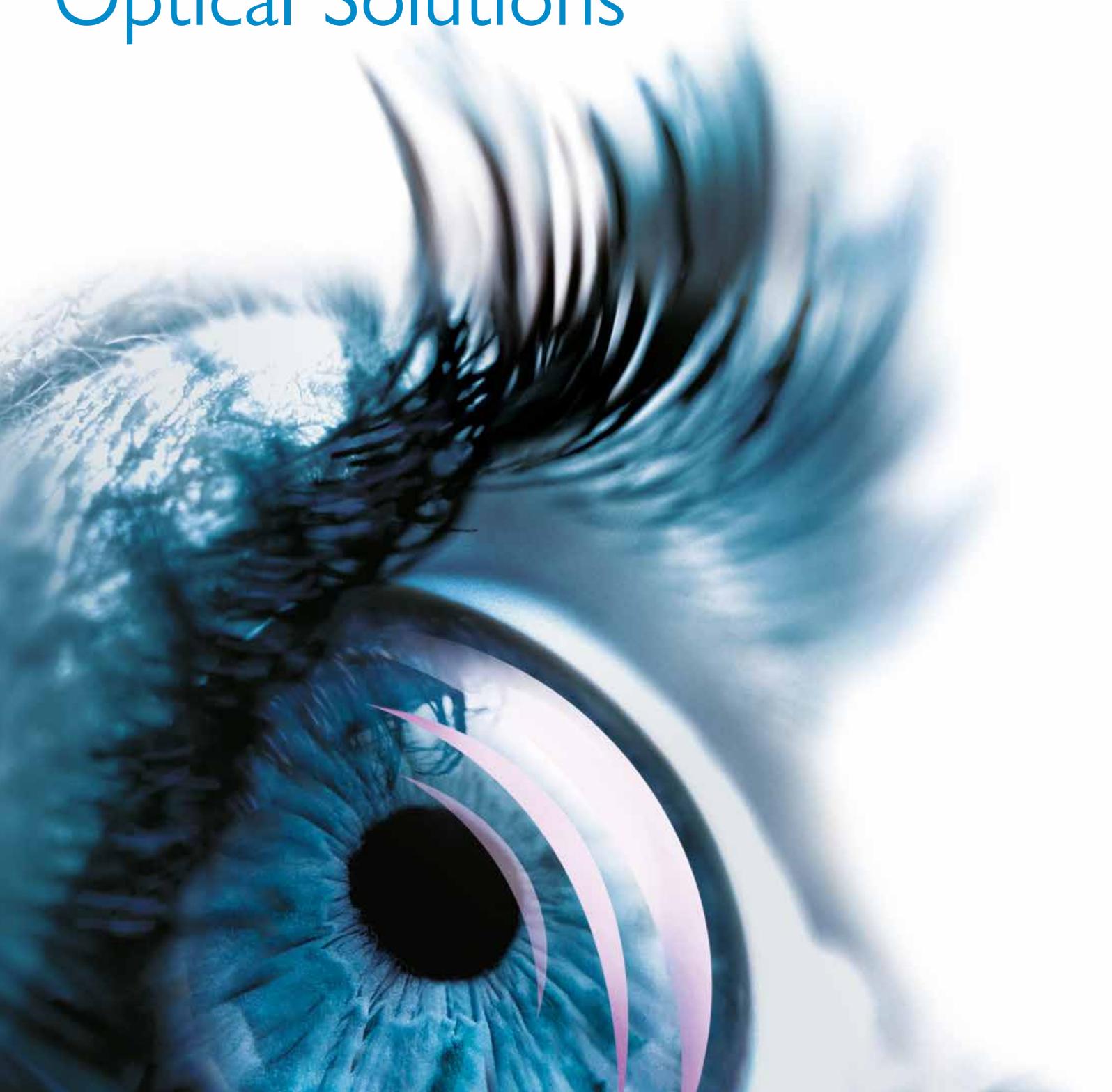


MATERION

// BALZERS OPTICS

Materion Balzers Optics

Enabling Innovative
Optical Solutions





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PRIMARY TARGET

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Materion Balzers Optics emerged in 2020 from Optics Balzers and Materion Precision Optics, creating a premier optical solutions market leader with demonstrated broad know-how in the field of photonics technology.

We are shaping the Century of the Photon

As part of Materion, we share the same visions and values, such as providing exceptional value to our customers globally through innovative technology. Our values also include supporting diversity and inclusion and our stance on environmental and social governance by adhering to the highest possible standards and sustainability in everything we do. The needs of our customers, markets, and employees are at the heart of our international business. We firmly believe that our diversity, experience, and perspectives strengthen us as a global community which in turn helps make our customers more successful.

1946

Founding of Balzers company for production of optical thin films by Dr. Max Auswarter, Prinz Franz-Josef II of Liechtenstein and Emil G. Bührle.



1976 – 2006

Company becomes a subsidiary of Oerlikon-Bührle Holding AG (1976), name changes to Balzers Thin Films (1993), Unaxis (2000) and Oerlikon (2006).



2009

Incorporation of Optics Balzers AG by Management-Buy-Out and local investors.



2010/2016

Optics Balzers acquires mso Jena Mikroschicht-optik GmbH (2010). New facility in Malaysia for volume production (2016).



2020

Materion acquires Optics Balzers AG.



1931

Capitalized with \$500, Brush Beryllium Company was incorporated on January 9, 1931 in Cleveland, Ohio.

BRUSH BERYLLIUM

Brush Beryllium Company - Beryllium - Beryllium Oxide - Beryllium Alloy



1950–1970

Advance into defense, aerospace, automotive, and medical markets (1940) and growth into electronics and computer markets (1970).



2011

Brush rebrands as Materion Corporation. Consolidates thin film coating acquisitions into Materion Precision Optics.



1986 – 2009

Brush acquires Williams Advanced Materials (1986). Williams acquires Thin Film Technology, Inc. (2005) and BARR Associates (2009).



2011

Materion acquires Shanghai based EIS Optics.



Materion Balzers Optics

Materion Balzers Optics, a global leader in optical thin film coating solutions, emerged in 2020 from the union of Optics Balzers and Materion Precision Optics. This collaboration created a premier market leader in optical solutions, showcasing extensive expertise in the field of photonics technology. We have been the preferred partner for providing innovative optical coatings and solutions for over 70 years. From the UV through the Far IR, we custom manufacturer and supply precision optical filters and coatings. As a high-tech company with five production sites worldwide, our focus is on a variety of markets such as Automotive, Consumer, Defense, Industry, Life Science, Lighting, Semiconductors and Space.

With a full range of unparalleled products, services, and support technologies, our customers benefit from our strategically located global facilities that provide regional manufacturing and technical support. Materion Balzers Optics superior quality products are fully supported by a large volume manufacturing environment that produces highly repeatable results, contributing to reduced costs and market advantage. We also have scalable processes that are economical for customers who require small quantities. Our technical expertise and access to broad resources throughout Materion, we are uniquely positioned to offer solutions to our customer's most demanding challenges.



Production Balzers/Principality of Liechtenstein



Production Jena/Germany



Production Penang/Malaysia



Production Shanghai/China



Production Westford/United States

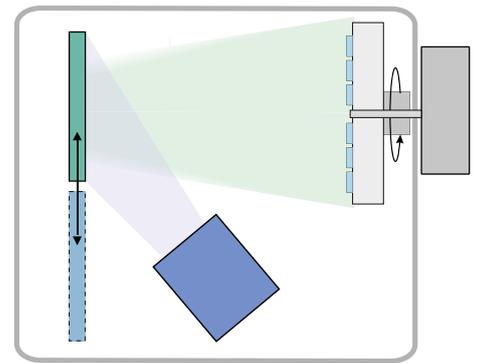
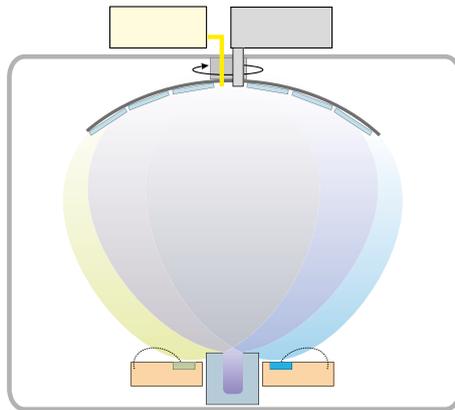
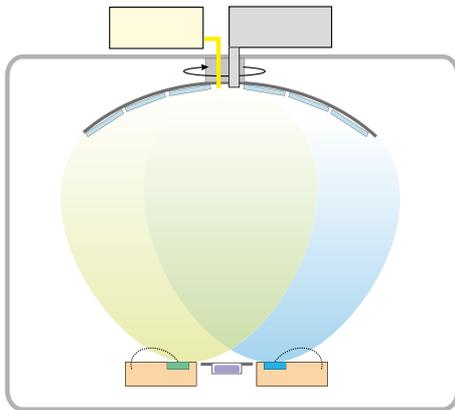
Optical Coating Technologies

Manufacturing high quality optical coatings requires sophisticated process technology combined with in-depth process know-how.

Materion Balzers Optics utilizes several advanced coating technologies for all major thin-film coating types used in the precision optics and photonics industry. A broad range of processes individually optimized for the various coatings and the customer's specific requirements are used for manufacturing of optical components. State-of-the-art facilities with clean room environments together with tailor made cleaning technologies to prepare the surfaces

ensure high quality and consistency of the coatings. Spectral photometry and various other inspection methods are used to ensure that all customer specifications and requirements are met.

All these processes are operated by skilled and well trained operating personnel, supervised by experienced engineering staff.



Evaporation (e-beam and boat sources)

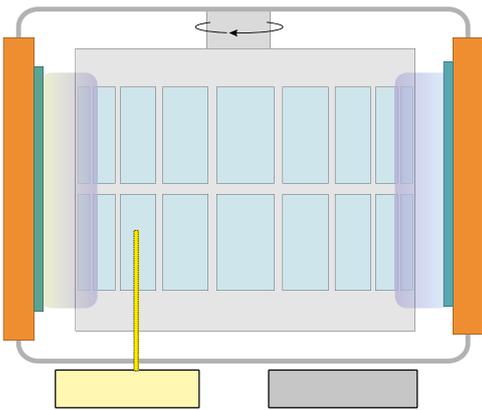
- Highly versatile in materials
- Flexible in substrate shapes
- High quality for antireflection coatings
- High quality for metal coatings
- Medium quality for demanding dielectric filters

IAD Evaporation (Ion Assisted Deposition)

- Evolution of evaporation technology combining the advantages of evaporation technology with plasma processing
- High quality precision filter and antireflection coatings
- Reduced process temperature
- Low-defect optical coating processes
- Plasma pretreatment of substrate surface

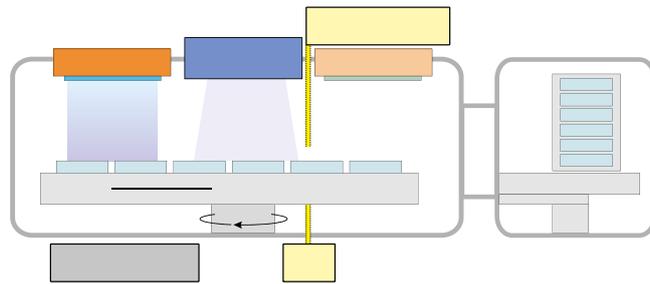
IBS Deposition (Ion Beam Sputtering)

- Highest quality coatings for laser mirrors and filters
- Very smooth and dense layers with minimum optical loss
- Very good reproducibility and consistency of coating quality and optical performance



Magnetron Sputter Deposition

- High quality dielectric filter coatings in volume manufacturing
- High precision and consistency allowing demanding spectral characteristics with narrow spectral tolerance
- Excellent spectral stability and durability
- Optimized for standard sheet substrates
- Low process temperature <math><100^{\circ}\text{C}</math>



Plasma-Assisted Reactive Magnetron Sputter Deposition

- Increased process stability, layer thickness accuracy, and index homogeneity compared with the standard Magnetron Sputter Technology
- High LIDT laser coating
- Suitable for thicker coatings with up to $40\ \mu\text{m}$ overall physical thickness and >300 layers
- Lowest achievable micro roughness
- Rapid-prototyping regime applicable for very complex coating designs
- Low defect capability by load lock concept
- High environmental stability

CoatingPlus™: More Than Just Coating

Sophisticated optical thin-film components and sub-systems require additional process steps beyond coating.

Most advanced thin-film optical components require various additional process steps beyond dedicated coating processes to achieve their full functionality and performance in customer specific applications.

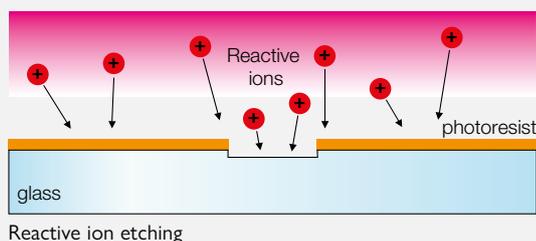
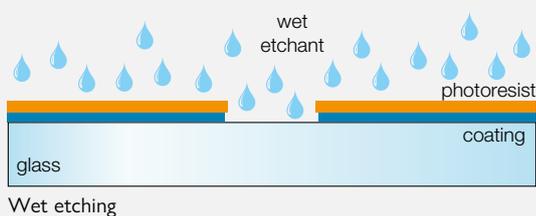
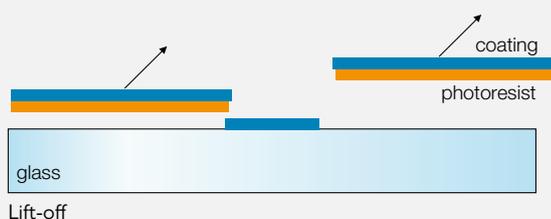
Patterning Solutions

Materion Balzers Optics offers patterning solutions for high quality optical components. Depending on the product and its applications, various patterning techniques such as photolithography, laser ablation or masked coatings are available to meet a broad range of customer requirements for feature sizes and shapes. The lift-off technology allows the deposition of filter arrays onto cover glasses or directly onto photodetector wafers.

Marking Solutions

Application of thin-film optical components may require unambiguous marking and labeling, either on the substrate surface or on the coating. The pattern can be generated according to customers' specific needs.

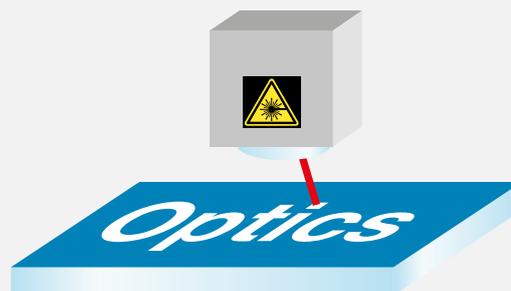
Photolithography



Masked Coatings



Laser Ablation/Marking



Bonding and Sealing

In various applications, thin-film optical components need to be precision-mounted on other components such as sensors or subassemblies. Materion Balzers Optics offers both epoxy bonding patterns as well as solder seed layers with a hermetic sealing quality.

Glass Processing

Efficient light management requires ultra precise surfaces. Therefore, Materion Balzers Optics continuously extends the limits of its polishing and glass handling capabilities. Our experience is based on the manufacturing of products where exceptional surface quality is essential. Further, Materion Balzers Optics applies semiconductor cutting technology on coated glass wafers. This is the way to provide cost effective high volume components with small dimensions.

Varnishing

High-accuracy dispensing technologies enable continuous or selective blackening of optical parts and complement the low reflection, high absorption coating portfolio from Materion Balzers Optics.

Subassembly

Materion Balzers Optics offers customized optical subassemblies to support its customers' ever increasing demands. We develop individual solutions for and together with our customers.

Volume Production

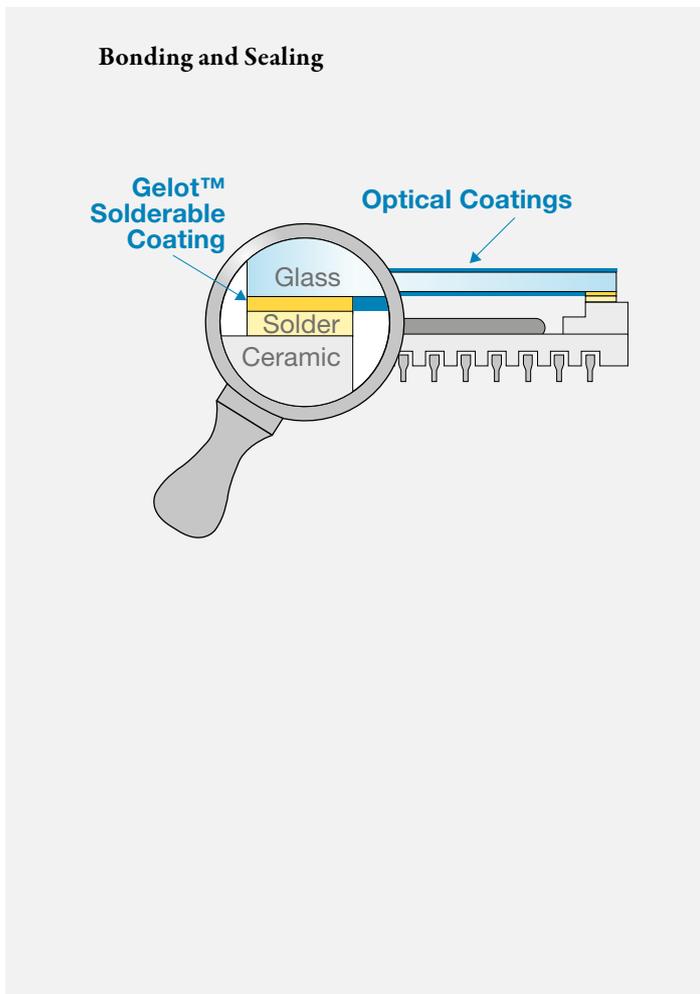
The utilization of high-tech singulation equipment paired with sophisticated manufacturing processes allow for a cost-effective mass production of optical parts with small physical dimensions.

Packaging and Handling

Customized packaging and shipping ensures top quality in surface protection and cleanliness during transportation and in subsequent process steps at the customer's site.

Development Partners

Materion Balzers Optics relies on strong partnerships. Therefore our competence centers in APAC, EMEA and US count on the close cooperation with scientific institutes, universities, and colleges. Those partnerships allow our teams of engineers to develop innovative solutions, tailored to the individual requirements of our customers.

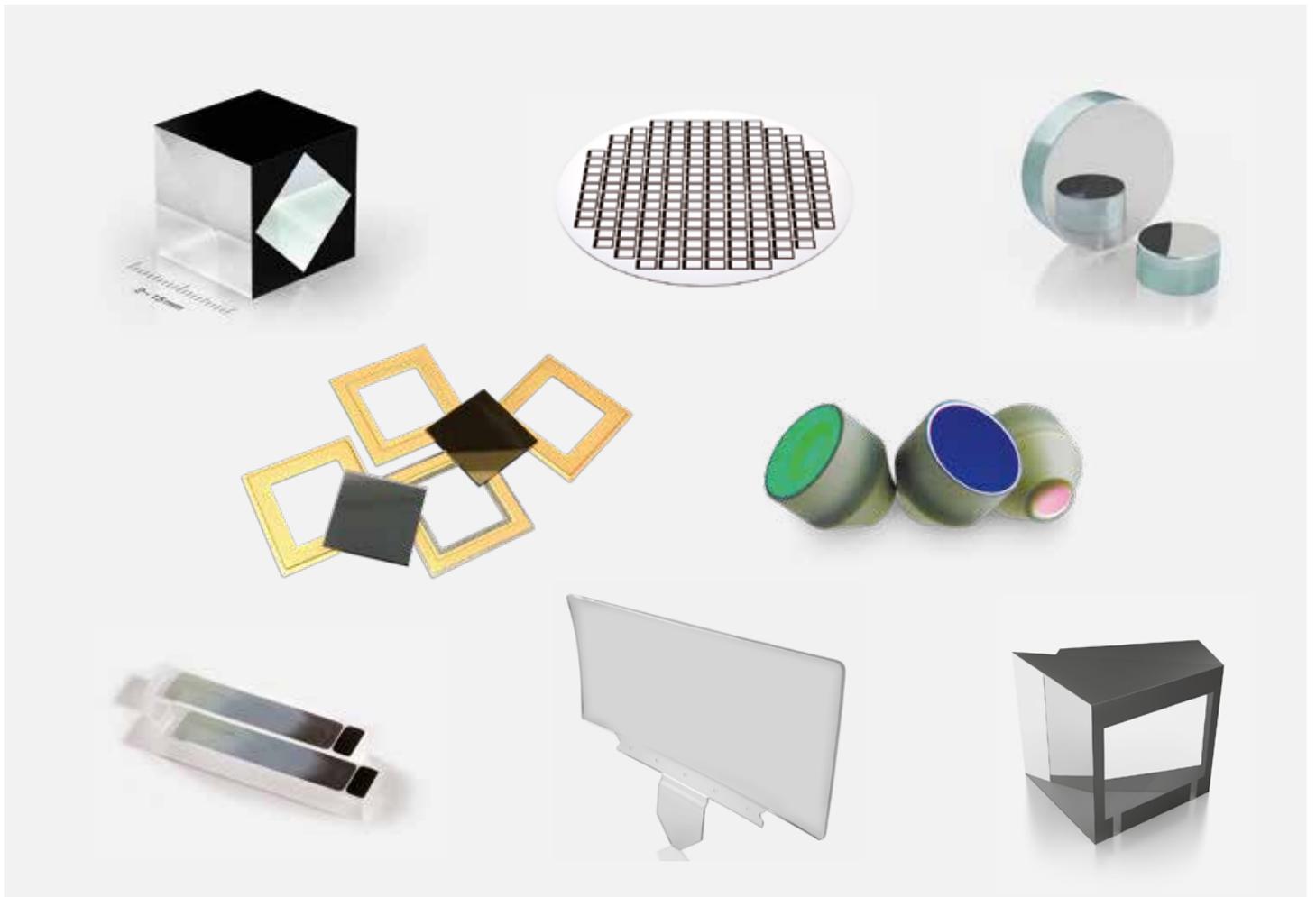


Products for your Performance

OEM thin-film components and subassemblies

We possess comprehensive know-how in optical thin-films, glass processing, photolithography and the production of multiple part components up to optical subassemblies. Our complete range of products and services caters to the precision optical industry and related fields in other application markets, including all the required optical components and assemblies as well as engineering assistance. As a fast, flexible and reliable supplier, we are eager to fulfill or even exceed your demanding requirements for quality, performance and delivery schedules.

Our optical components are manufactured in clean room environments with adapted state-of-the-art vacuum evaporation equipment or advanced high throughput sputter coating systems. A large variety of backend processes for patterning, shaping and dicing complement our manufacturing technology portfolio.



Coating Service

Your preferred supplier for precision optics and more

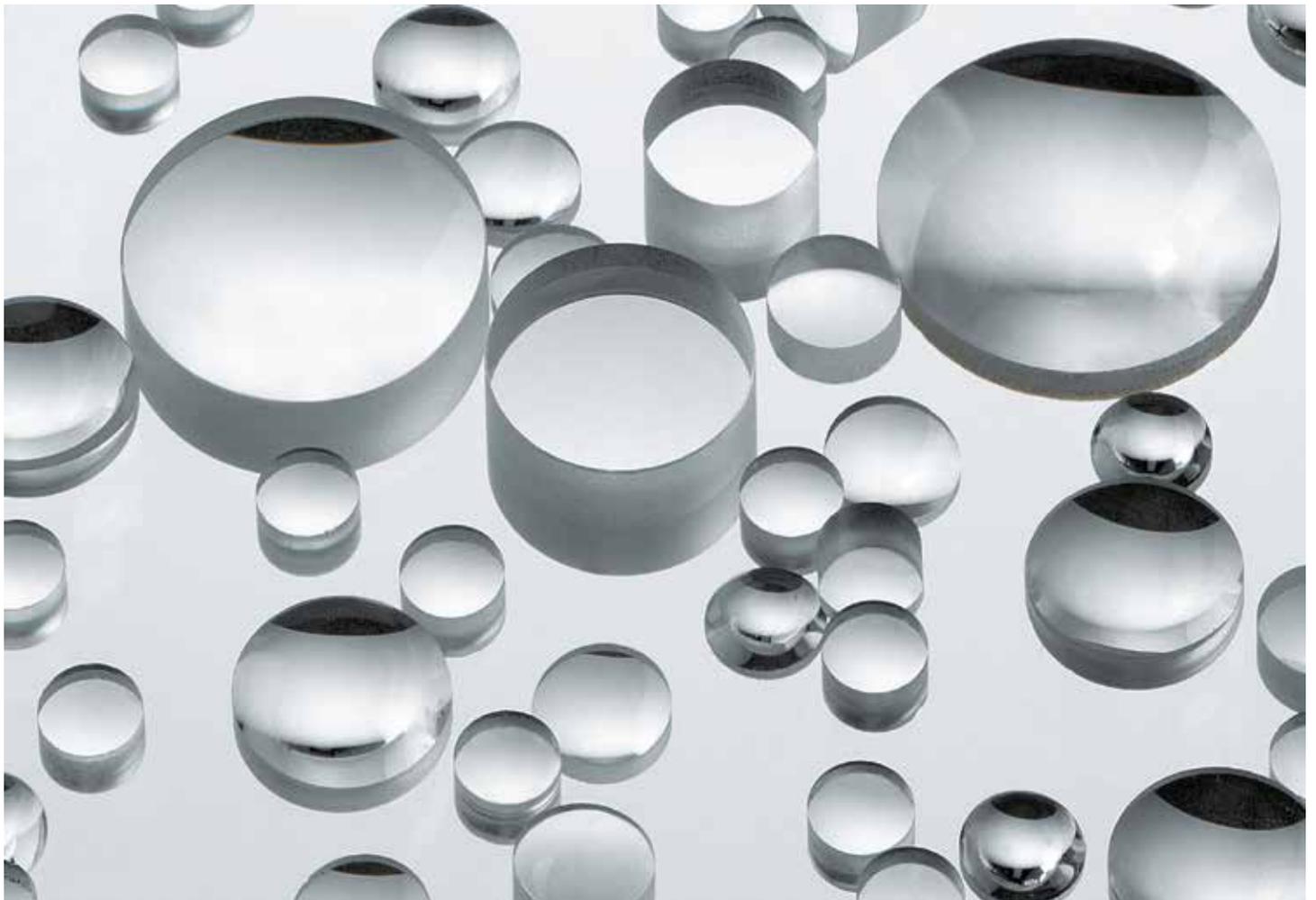
Materion Balzers Optics has combined reliable coating services with a full range of technology and solutions to support your business needs for over 70 years. Make the Materion Balzers Optics coating center your preferred supplier for up-to-date thin-film technology for precision optics and more.

Typical Coatings

- Iralin™: an antireflection coating to minimize reflection loss
- Broadband-AR: for example Triolin™
- Laser-AR: for example Laser Transmax™, Duolin™
- Metallic coatings: Silflex™, Alflex™, Goldflex™, etc.
- Black-Chrome: absorbing layer for the visible range
- Gelot™: a solderable gold coating, either patterned or on the whole substrate
- Patterning: all the various coatings can be patterned as well

Our strengths in the field of coating services

- Fast turnaround
- Very extensive know-how in the field of substrate cleaning and application of advanced cleaning processes
- Continuous monitoring of reliable coating processes by experienced coating engineers
- In-house tool design and specialized tool manufacture using CNC-controlled equipment
- State-of-the-art systems engineering and advanced measurement processes



Attractive Markets

Unlimited applications for your high-tech markets

Are you looking for a concrete solution for optical components and their coatings to increase the performance and reduce the manufacturing cost of your products? Your challenge is our motivation! Our extensive expertise in a wide variety of high-tech markets simplifies the transfer of technology to ever-new segments.

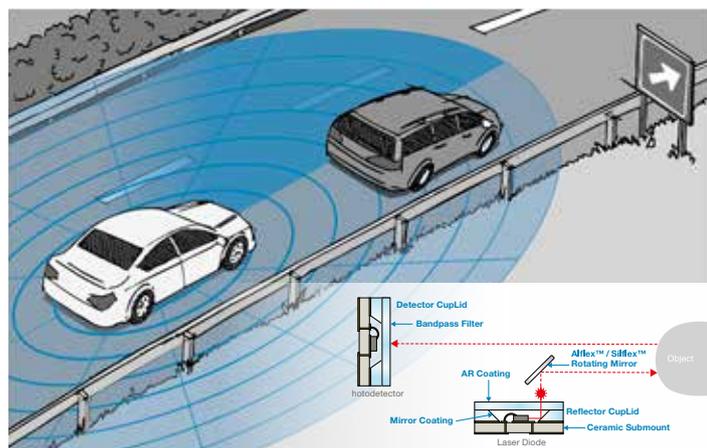


Automotive

- LIDAR
- Cameras
- Head-up-Displays & Digital Instrument Cluster

As requirements for road safety, vehicle comfort and level of autonomous driving increase, the demand for advanced driver assistance systems (ADAS) based on intelligent high-tech sensor and vision systems rises. With precision optics from Materion Balzers Optics innovative systems become a reality. Filters for optical sensors and ultra-thin high performance coatings are key components for the latest generation of digital instrument cluster, Head-up-Displays, LIDAR systems, thermal imaging, vision camera modules and headlights. Semi-Transparent mirror coatings on plastic boost futuristic 3D instrument clusters and enhance driver's "cockpit". LIDAR systems accurately scan the environment with high performance mirror coatings while photodetectors and CMOS image sensor receive the signal through a wavelength selective NIR-Bandpass filter.

Macro-mechanical Scanning Lidar System



Consumer

- Smartphones
- Augmented Reality
- Projection Displays

Consumer Electronic devices incorporate an incredible amount of optical sensors, display components and camera modules for which optical thin-film coatings play a crucial role in their manufacture. Optical coatings deposited and patterned by lithography as well as prisms assemblies are required by our customers to build optical sensors, camera modules or projection displays for the Consumer market. Our portfolio includes solutions for user authentication by facial recognition or fingerprint scan, ambient light sensing, digital photography and projection. Materion Balzers Optics with a network of manufacturing plants in the United States, Europe and Asia has become a leading supplier of customized optical coating solutions to the Consumer Electronics industry.

Optical Sensors in Mobile Devices



Emerging Markets

Shaping the century of the photon

Photonics is one of the most important key technologies for markets in the 21st century. The marriage of photonics with other technologies, including electronics, materials science, manufacturing and biotechnologies, has enabled a vast and ever-expanding array of components, devices and processes that are key enablers of larger systems. Materion Balzers Optics has a more than 70 year old history showing innovative contributions and solutions for emerging markets. Our marketing, engineering, and R&D teams are committed to continuing this tradition.

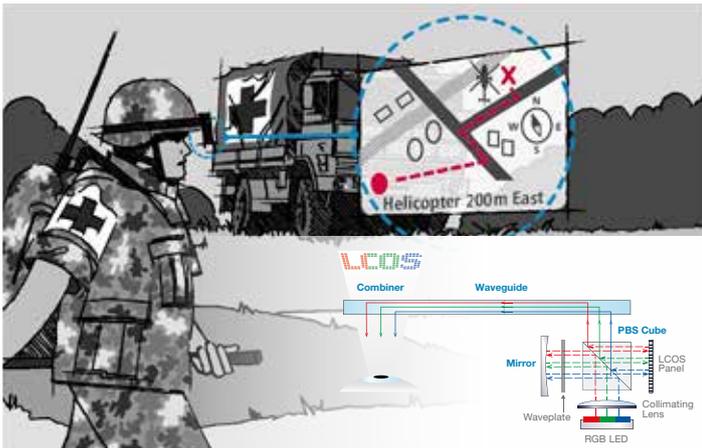


Defense

- ISR
- Laser
- Space and ground-based Defense

In ISR, laser, space & ground-based defense applications the highest optical spectral performance in combination with outstanding stability and survivability requirements are frequently needed. Optical components are designed specifically to meet these demanding requirements, using state-of-the-art coating technologies such as IAD, IBS and advanced magnetron sputtering as well as photolithography and micro-assembly processes. For these demanding applications Materion Balzers Optics develops and manufactures a wide variety of product groups according to customer specifications, such as multiband filter arrays and AR windows, precision optics, enhanced mirrors, and laser components with high laser damage threshold, as well as beam splitters and display windows.

Near-Eye Displays for Defense

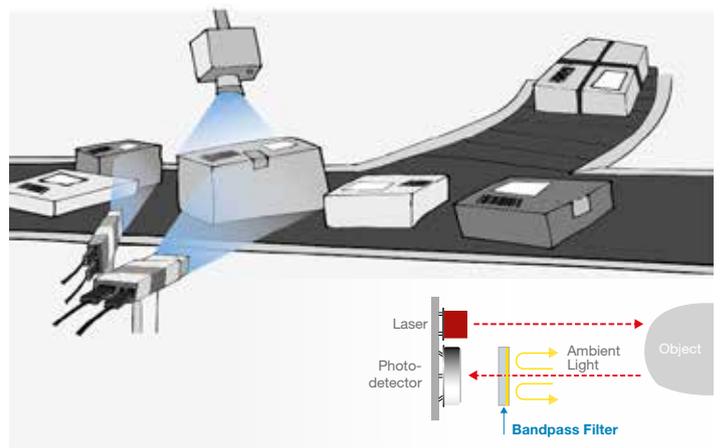


Industry

- Factory Automation
- Metrology & Inspection
- Gas Sensing

We develop a close working relationship with our clients, creating a better understanding of customer needs. This deep insight enables our engineering team to deliver powerful, customized, comprehensive solutions for a surprisingly large number of different market segments and applications. Our coated optical components enable Photonics to work for industrial automation, analytical and measurement instruments, and countless other applications.

Machine Vision



Attractive Markets

Unlimited applications for your high-tech markets

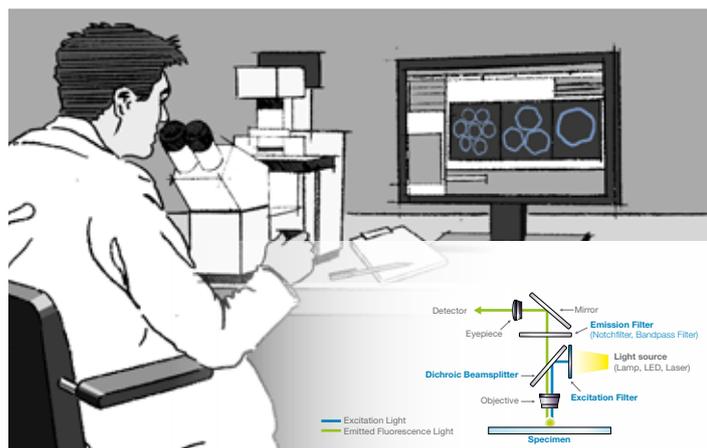


Life Science

- Diagnostics & Analytics
- Microscopy
- Surgery & Treatment
- Endoscopy

Materion Balzers Optics provides unique and scalable optical solutions for the Life and Health Sciences Industry. Our Micro-Array substrates are used for a broad application range both in fluorescence as well as label-free detection platforms. We also manufacture highly transmissive steep-edge bandpass filters and edge filters used in sensitive fluorescence detection applications requiring extremely high signal to noise ratios. Other products include high performance linear variable bandpass and edge filters used with detector arrays for spectroscopic applications, and customized optical filter and optical assembly solutions.

Fluorescence Microscopy



Lighting

- Entertainment Lighting
- Technical Lighting

Consistent, exact colors, special effects and best heat-light management in every possible environment have become a vital part of shows, events, product presentation and many technical applications. Leading entertainment, architectural and technical light manufacturers rely on Materion Balzers Optics color filters, patterned filters, hot mirrors and UV blockers to provide reliable, durable and precise colors, and to ensure moderate temperatures in every application. The integration of Materion Balzers Optics customized as well as standard optical components will result in an efficiency and quality boost.

Entertainment Lighting



Quality Down to the Last Detail

Our customers define our quality

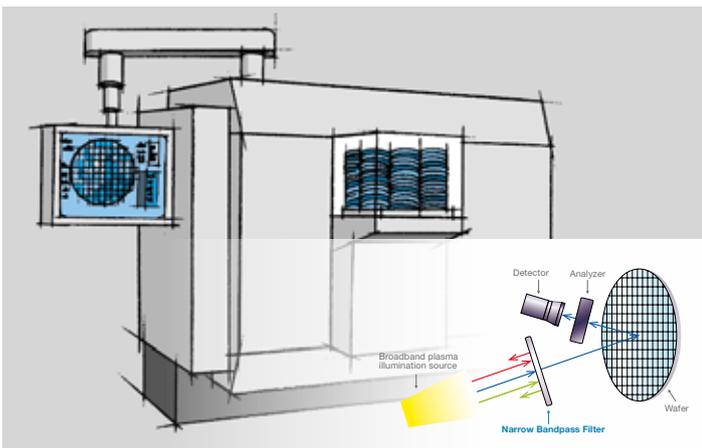


Semiconductors

- Metrology & Inspections
- Manufacturing Equipment
- Lithography

The Semiconductor Industry requires optical components of exceptional performance and quality levels to allow the manufacturing, measurement and inspection of nanometer size features. With Optical components from Materion Optics Balzers optimizing the performance of your systems to handle the stringent demands of the future is today's reality. Ranging from Mirrors, Filters and Beamsplitters in the DUV/UV range to complex Multi-Bandpass and Linear Variable filters Materion Optics Balzers has a solution. Precise patterning capabilities and multiple coating technology platforms provide the design flexibility required for today's manufacturing systems. A global manufacturing footprint allows for supply chain optimization reducing complexity and lead times while providing timely communication and technical interaction during development and production phases.

Wafer Inspection

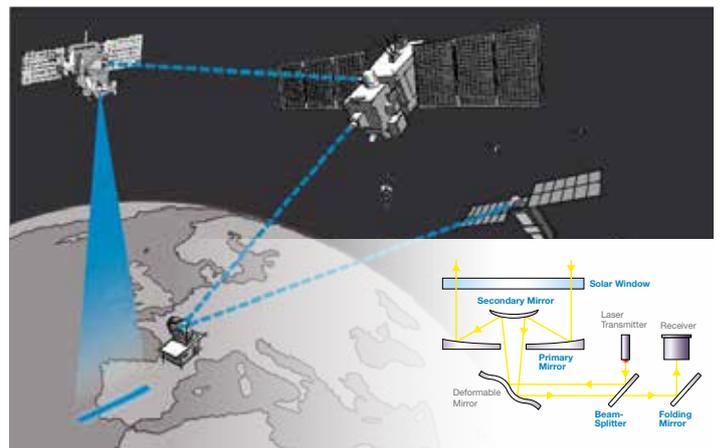


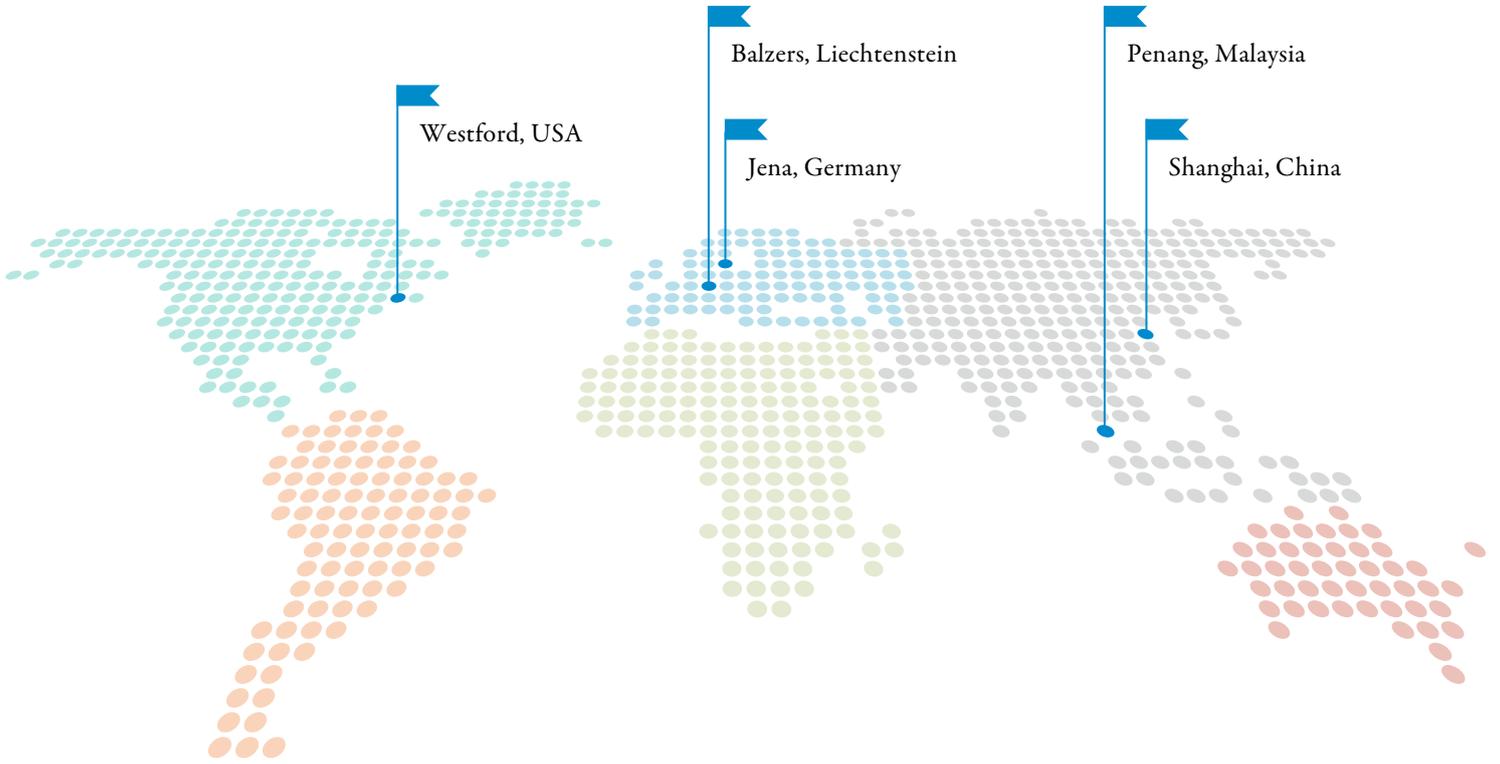
Space

- Earth Observation & Space Exploration
- Satellite (Laser) Communication
- Ground-based Astronomy

Our optical components are designed specifically to meet these demanding requirements, using state-of-the-art coating technologies such as IAD, IBS and advanced magnetron sputtering. For these demanding applications Materion Balzers Optics develops and manufactures a wide variety of product groups according to customer specifications, such as multiband filters and AR windows, precision optics and laser components with high laser damage threshold, as well as display windows. MBO has delivered key optical components to various space mission such as Landsat, VIIRS, JWST, Sentinel 2, ExoMars, Euclid, Sentinel 5.

Satellite (Laser) Communication





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