



MATERION

// BALZERS OPTICS

Automotive Optical Solutions for the Automotive Industry



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 manufacture 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, make us uniquely positioned to offer solutions to our customer's most demanding challenges.



Balzers / Principality of Liechtenstein



Jena / Germany



Penang / Malaysia



Shanghai / China



Westford / United States

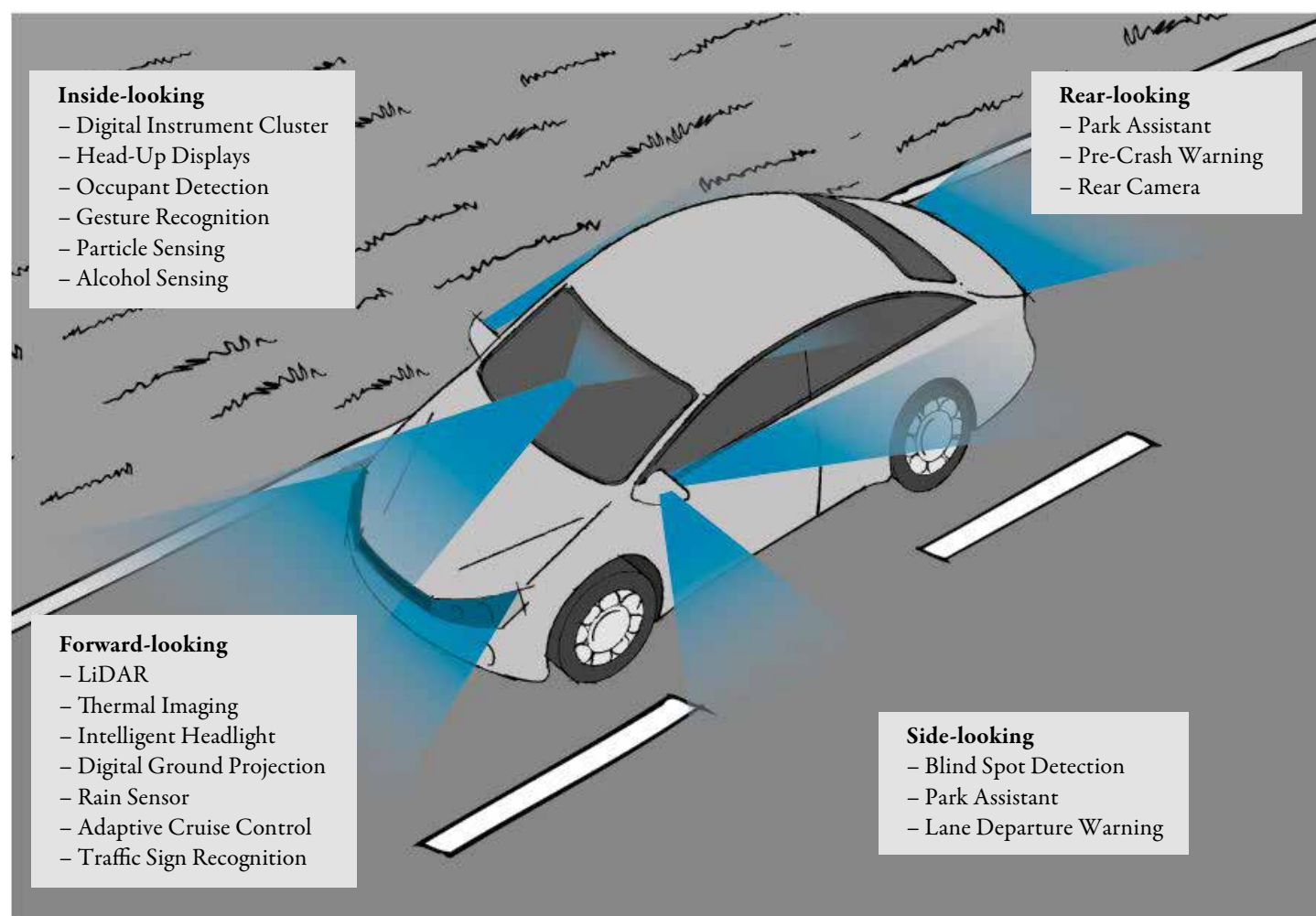
Automotive Solutions

Our optical components are designed to improve the safety and the comfort of driving by guiding, reflecting, selecting and altering light.

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, Camera & Sensor Modules, Headlights and Ground Projection Displays.

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 from Materion Balzers Optics. Passenger monitoring cameras use bandpass filters which excel with a minimal wavelength shift for a large field of view providing accurate depth information required for reliable recognition. Prisms, mirrors and filters enable the integration of projection technology into headlights and digital ground projection.



Head-Up Displays & Digital Instrument Cluster

Materion Balzers Optics drives you to the future

Thin-Film Coatings for Automotive Displays

Initially developed for military aviation, head-up display technology (HUD) and digital instrument clusters are widely adopted display solutions in today's passenger cars.

Materion Balzers Optics designs state-of-the-art thin-film coating solutions and manufactures key components enabling automotive industry suppliers to present appealing display solutions to the car manufacturers.

Coatings for Digital Instrument Clusters

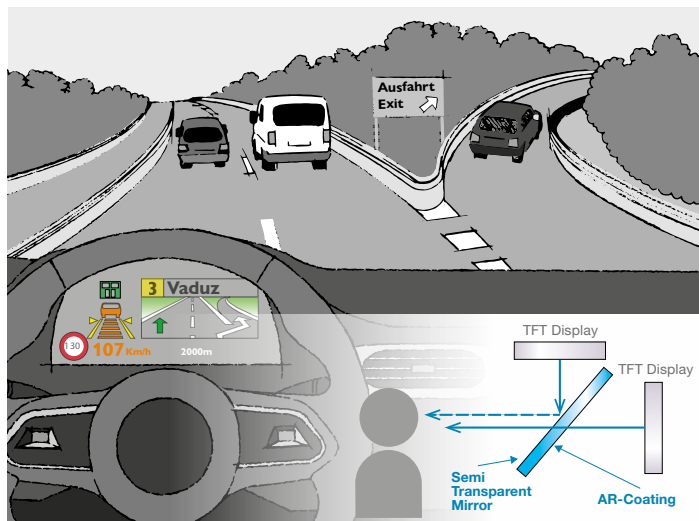
In a trend towards digital and custom-configurable instrument clusters cars are equipped with 3D generating displays that increase road safety by bringing critical information to the driver's attention.

The newest generation of displays in instrument clusters consist of an arrangement of two TFT displays and a plastic blade with a semi-transparent mirror coating deposited onto its surface. The integration of the mirror blade adds depth to the display system providing a convincing illusion of a 3D image unaffected by blur and a lack of depth as seen in earlier display generations.

With additional broadband anti-reflective coatings on the backside ghost images and unwanted reflections can be almost entirely eliminated from the system.

On all outer surfaces of the plastic mirror blades Materion Balzers Optics applies organic hardcoating as an interlayer between substrate and PVD coatings. The result is an automotive-qualified package that fulfills the demanding environmental and optical requirements for automotive display applications.

Other useful features that can be designed into our coating stacks include black screen printing, anti-gloss and antistatic films to reduce dust accumulation on display covers or our hydrophobic TopFlex™ coating that makes the display surface repellent to liquids.

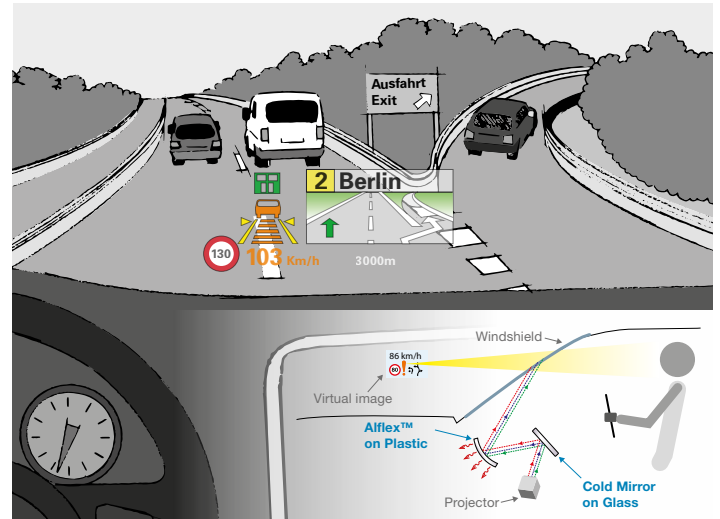


Instrument Cluster with 3D feature



Coatings for Windshield Head-up-Display

Windshield- or Augmented Reality-HUDs greatly increase driver safety. The driver can read relevant information inside the windshield's perimeter without getting distracted from the traffic situation. The information in a HUD is cast from a digital projector device and a number of mirrors that project a distortion-free virtual image onto the curved surface of a passenger car's windshield. The image quality of AR-HUD systems benefits greatly from Materion Balzers Optics Alflex™ or Silflex™ mirror coatings that can be deposited onto suitable form-stable and high-grade optical plastic substrates that meet the stringent automotive environmental requirements (e.g. COC- and COP-Polymers such as Topas® or Zeonex®). Automotive HUDs are typically integrated into the car's dashboard and regularly exposed to high temperatures due to heat dissipation from projection light sources and direct exposure to sunlight. The use of Cold- or Hot Mirror Coatings (transmit or reflect infrared thermal radiation) in the optical system therefore is a common strategy for thermal management in a projection system.

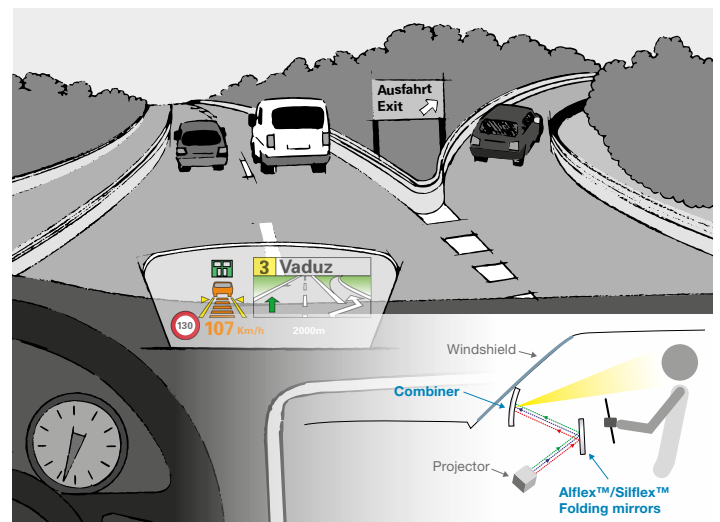


Windshield Head-Up-Display

Coatings for Combiner Head-up-Display

The Combiner HUD is another version of an automotive head up display. It consists of a transparent substrate (the combiner) that handles the image reflection in front of the windshield. Combiner HUDs are particularly suitable for vehicles with steeply curved windshields and in more confined spaces.

Materion Balzers Optics custom-designed and color-neutral combiners provide the crisp and high-contrast images required for an automotive display application. The combiner coatings are applicable on a range of automotive-qualified optical plastics and can be deposited on injection molded parts in various forms and sizes. Complementary broadband multi-layer AR coatings further eliminate ghost images from the combiner backside.



Combiner Head-Up-Display

For both, front- and backside coating Materion Balzers Optics applies organic hardcoatings as interlayer between substrate and PVD coatings that protect the plastic surfaces and make them resilient to abrasion.

Other useful features that can be designed into our coating stacks include antistatic films to reduce dust accumulation on the combiner or our hydrophobic TopFlex™ coating that makes the display surface repellent to liquids.

Automotive LiDAR

Our optical components are made for filtering, guidance and selection of light for LiDAR applications

Thin-Film Coatings in LiDAR

Advanced Driving Assistance Systems (ADAS) take over an increasing number of functions in driving of passenger cars and commercial vehicles, thus increasing driving comfort and road safety. Autonomous driving is impossible without the implementation of highly complex ADAS. The interaction of the utilized systems and the occurring external light and signal interferences pose a great challenge to the creators and integrators of these systems. LiDAR sensors play a crucial role in the ADAS. Thanks to Materion Balzers Optics coated optical components such as NIR bandpass filters without angular sensitivity and high-reflectivity beam steering mirrors, ADAS always perform with top reliability.

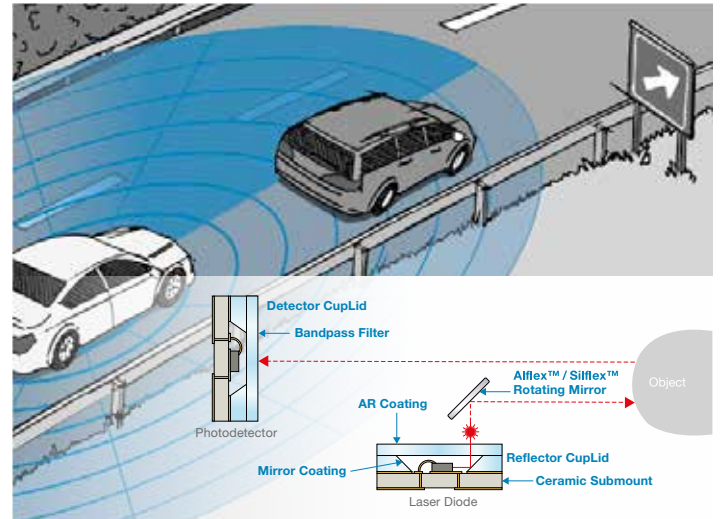
Macro-Mechanical- and MEMS-Scanning LiDAR

Despite the recent emergence of solid-state LiDAR systems, macro-mechanical scanning LiDARs are still the most technically mature and hence the most widely deployed LiDAR types in ADAS, Robotic Vehicles and industrial LiDAR applications.

At the heart of a macro-mechanical or MEMS-Scanning LiDAR is a fast rotating or oscillating mirror that with the light from multiple laser diodes scans the surrounding environment. Newer generation LiDARs avoid large mechanically moving parts in order to mitigate the risk of failure due to fatigue. A common approach is to replace the spinning mirror of a traditional scanning LiDAR with a MEMS-Mirror (MEMS: Microelectromechanical Systems).

Materion Balzers Optics Alflex™ and Diflex™ mirror coatings provide excellent reflectance values at the required wavelength of the laser diodes. We can optimize the peak reflectance of our coatings for all of the commonly used laser wavelengths (e.g. 850 nm, 905 nm, 940 nm, 1064 nm, 1550 nm) and deposit them on a range of suitable mirror substrates made from glass or automotive-qualified plastics. For MEMS-Scanners we are also able to deposit and pattern the mirror coatings directly on the Si-Wafer and further increase the achievable reflectivity of the MEMS-Mirror.

MEMS-Mirrors are fabricated on a Silicon-Wafer with Semiconductor processes and are often encapsulated in a hermetically sealed package with a transparent glass lid as a cover. For hermetic sealing of the MEMS chip we offer cover lids with suitable antireflective or filter coating and a metallized and solderable seal ring as an option. The cover lids can be supplied either as discrete part or on a full 8" wafer to support cost-effective wafer-level packaging, which is state-of-the-art in high volume sensor manufacturing.



Scanning LiDAR and solid-state LiDAR



Scanning LiDAR with Polygon Mirror

The LiDAR Polygon Mirror is a critical component in the mechanical scanning LiDAR system that affect the range, resolution, repeatability and scanning angles of the system. Materion Balzers Optics' LiDAR polygon mirror provides excellent scanning performance for Long Range LiDAR system. Our integrated solution of unique thin film coating technology and mechanical polygon enables LiDAR devices to achieve superior performance and durability.

Coatings for Flash LiDAR

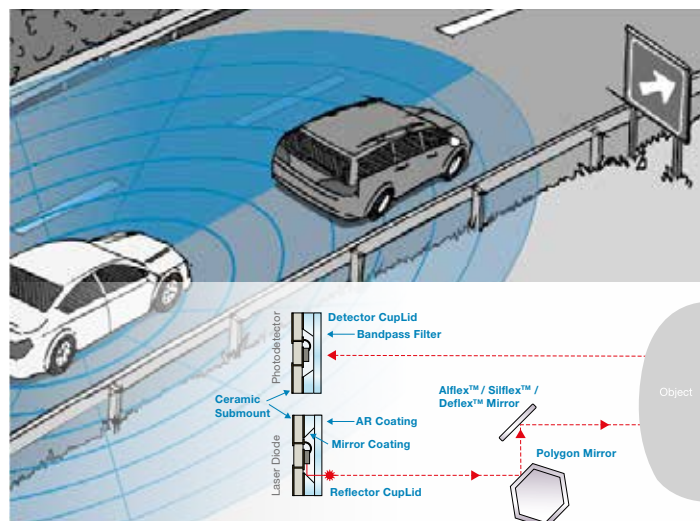
Flash LiDAR avoids using mechanically moving parts. In a Flash LiDAR near infrared laser diodes actively illuminate the car's surrounding through suitable beam spreader optics (consisting of a number of collimator lenses, diffractive elements, diffusors, and/or optical filters). Like most of the LiDAR types Flash LiDARs use pulsed ToF (time-of-flight), a sensing technique that resolves the distance between the photodetector and its surrounding by measuring the round trip time of the reflected laser light for each pixel of the detector array. Our antireflective-coatings applied on micro-lenses and diffusors in the beamspreader optics in particular help to greatly improve the overall efficiency of pulsed ToF sensors and therefore the effective working range of the Flash LiDAR.

Protective Windows for LiDAR Enclosures

LiDAR system have to work reliably under all kind of weather conditions. The protective window is the key component as it's the interface to the external side of the car. Materion Balzers Optics offers several functional coatings such as heating functions, high efficient AR coatings and hydrophobic TopFlex™ coatings completes the technical solution, reducing the maintenance costs of the cover by supporting the cleanability of the surface exposed to the weather conditions. The wavelength optimized AR coating enhances the efficiency of the system over a wide range of FOV (up to $\pm 60^\circ$) by depositing the AR coating on covers, lenses or any other surface inside the optical path.

Filters & Lids for LiDAR Phototdetectors

Materion Balzers Optics near infrared bandpass filters were specifically developed with LiDAR applications in mind. Our NIR coating technology allows us to design the passband of the filter for large angles of incidence at only minimal wavelength shift. This enables narrow filters that effectively block unwanted ambient- and sunlight from the photodetector. The NIR bandpass filters can be spectrally shifted to match all of the commonly used laser wavelengths (e.g. 850 nm, 905 nm, 940 nm, 1064 nm, 1550 nm) found in LiDAR applications. Deposited on discrete cover glasses or full 8" wafers our NIR bandpass filters are used to form a sensor package bonded onto the sensor die.



Scanning LiDAR with Polygon Mirror

Cameras & Sensors

Our optical components brighten your view



Thin-Film Coatings in Automotive Cameras

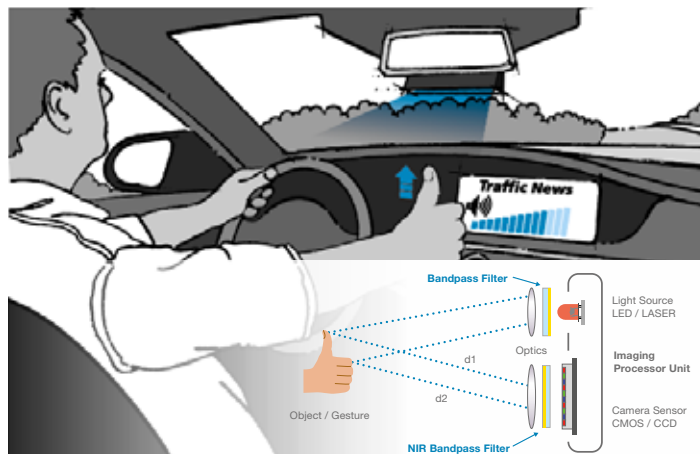
ADAS supported by camera applications take over more and more functions in the Automotive sector, thus increasing driving comfort and road safety. Autonomous driving is impossible without the implementation of highly complex ADAS. The interaction of the utilized systems and the occurring external light and signal interferences pose a great challenge to the creators and integrators of these systems. Thanks to Materion Balzers Optics functional, coated optical components for the visible and NIR wavelength range, ADAS always perform with top reliability.

Gesture Recognition

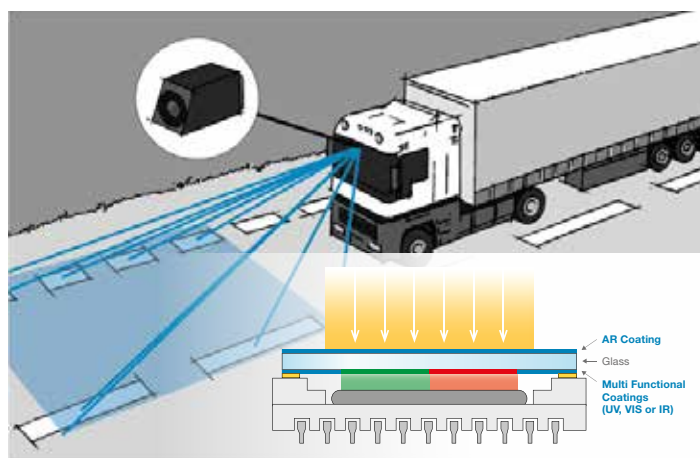
The sensor optics for gesture recognition and ToF 3D imaging requires best transmission performance in the range of the illumination wavelength. Outside the bandpass an extraordinary blocking is required to suppress the ambient illumination for a better contrast. Our NIR bandpass filters excel in this domain with a minimal wavelength shift for a large field of view providing accurate depth information required for reliable gesture recognition.

All-weather vision for Automotive Safety

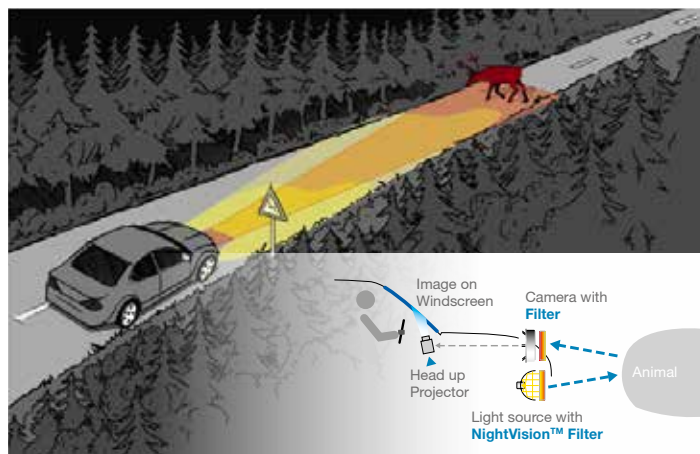
Extended NIR camera uses monochrome CMOS photodiodes with a cut-off wavelength close to $1\text{ }\mu\text{m}$. It detects the reflective visible and NIR light from the scene. It thus requires an illumination by sun, moon or night glow or an illuminator positioned on the vehicle. Extended SWIR camera is based on InGaAs III-V material and extends from a wavelength of $0.6\text{ }\mu\text{m}$, red to human eye, to $1.7\text{ }\mu\text{m}$ in the SWIR infrared band. SWIR spectral band is typically used for active (reflective) vision in very dark condition with a good contrast as SWIR light is generally more reflective than visible light. LWIR sensor is an array of microbolometers. It detects the thermal radiation in the spectral band extending from $8\text{ }\mu\text{m}$ to $14\text{ }\mu\text{m}$. Any object emits radiations which depend on its temperature. For a human or an animal at ambient temperature, the maximum of emission corresponds to a wavelength close to $10\text{ }\mu\text{m}$. LWIR is used for the detection of a temperature contrast and do not require an illuminator.



Gesture Recognition



Driver Assistance Camera



Night Vision Camera

Headlights & Digital Ground Projection

Our optical components pave your way



Thin-Film Coatings in Headlights

The time when car headlights were just used to light the street ahead is over. The situation is similar for rear and internal lighting concepts. The light is no longer just used to light up the environment. State-of-the-art car lighting concepts are digital, intelligent, precisely predict the driving situation, control and shape the light accordingly, accentuate the interior or exterior of the car either in a functional or decorative way and enable easy brand recognition. Sensor and cameras are integrated in high resolution headlights enabling automated driving functions. Materion Balzers Optics designs state-of-the-art thin-film coatings and manufactures coated optical components, helping automotive industry suppliers to present novel lighting concepts to the car manufacturer.

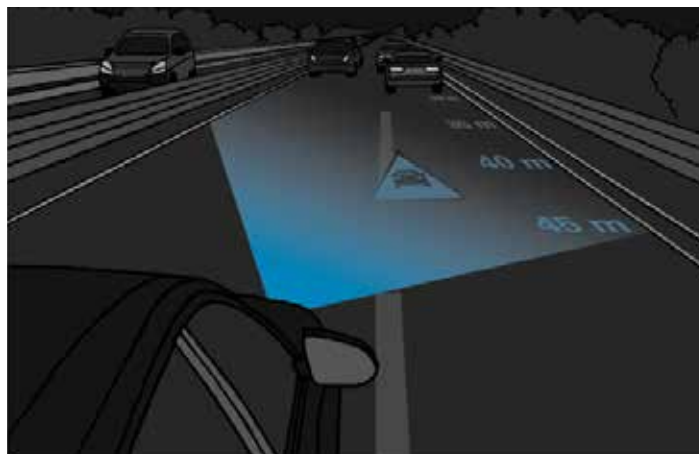
Coatings for Laser Based High Beam Light

The use of connectible, laser-based high beam modules for headlights has become a reality by now. Depending on the traffic situation, we can light up the road over a distance of more than 500 m, basically turning night into day.

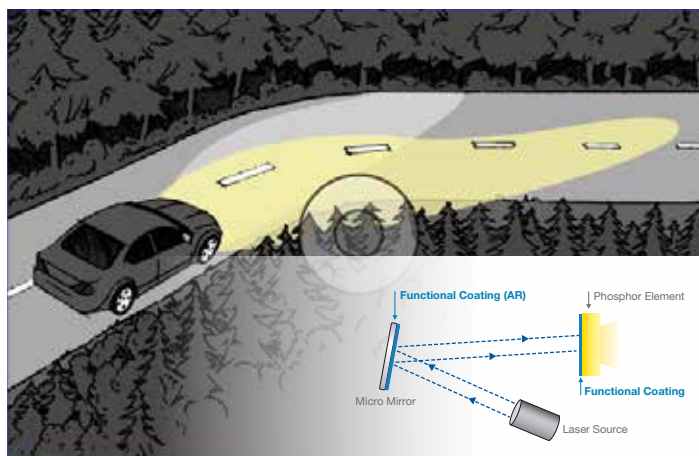
The utilized beam sources illuminate a phosphor element via a tiltable mirror module, thus creating a bright, directional light which can be pixelated and steered as needed. Such high tech headlights pose great challenges for the optical components, in terms of laser beam steering as well as with regard to the utilization of safety check sensors. Materion Balzers Optics coated optical components increase the efficiency of laser-based high beam modules and facilitate the implementation of reliable safety concepts.

Coatings for Lighting Projection System

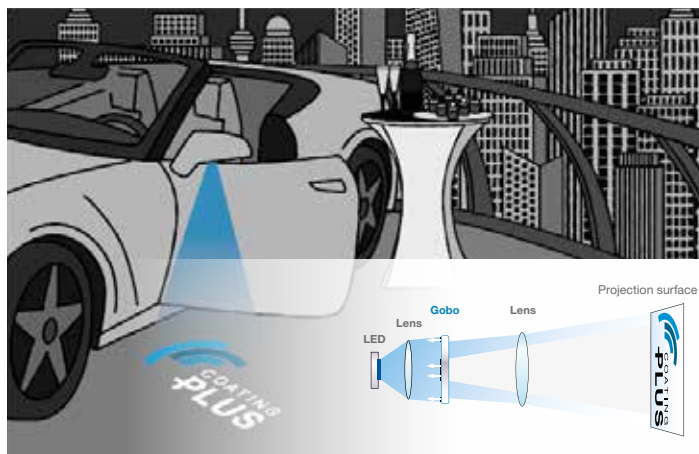
Digitalization of the headlamp moves fast into the automotive segment. Headlights integrate more and more optical sensor systems to enable an all-round vision of the vehicle. Optical sensor systems such as LiDAR, infrared or multispectral cameras, CMOS and digital light modules require a broad portfolio of thin film coatings that Materion Balzers Optics can offer as a one-stop-shop.



Headlight Projection System



Intelligent Headlight



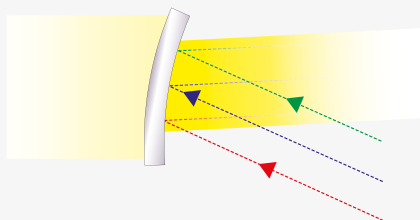
Digital Ground Projection

Optical Coatings & Components

The core competencies of Materion Balzers Optics are the design and manufacturing of high precision thin-film optical coatings and their integration into sophisticated optical components. Materion Balzers Optics' coatings and components are characterized by excellent spectral performance, low defect quality and superior environmental stability. The coatings are produced with state-of-the-art evaporation and sputtering equipment platforms with process and product specific adaptations. The components are both customized to the specific product requirements and optimized for high yield production. Continuous process control, like monitoring of the coating process or customer specific component characterization, ensures consistent and high quality in volume manufacturing.

	 Head-Up & Digital Instrument Cluster	 Automotive LiDAR	 Cameras & Sensors	 Headlights & Digital Ground Projection
Alflex™ Protected Aluminium Mirrors	x	x		
Anti-reflective Coatings	x	x	x	x
Cold Mirrors	x			
Combiner & Semi-transparent Coatings	x			
CrBlack™ Narrowband & Broadband Absorbers™		x	x	x
Filters for Thermal Imaging			x	x
Gelot™ Solderable Coatings			x	
Hardcoatings on Plastics	x			x
Heating Wire Solution		x		
LED ColorDichroics™	x			x
LiDAR Cover Windows		x		
LightGate™ for DLP Projection	x			x
Mini Light Funnel				x
NIR-Bandpass Filters		x	x	
NIR Blocking Filter for Image Sensors		x	x	
NIR Conductive Layer Solution		x		
Patterned Chrome		x	x	x
Polarizing Beamsplitters for Wearable Devices	x			x
Polygon Mirrors		x		
Reflector and Detector CupLid		x		
Silflex™ Protected Silver Mirrors	x	x		
Static Phosphor				x
Thin-Film Coatings on Plastics	x	x	x	x
TopFlex™ Hydrophobic Coatings	x	x	x	

Coatings on Plastic & Antireflective Coatings



Combiner & Semi-transparent Coatings

A beamsplitter, applied on the front side of the combiner, reflects the image generated by the PGU. The driver can easily read car relevant information on the combiner while being able to see through the combiner at the same time. Reflectance to transmission ratio can be adjusted to the customers need. A broadband AR coating on the substrate's rear side enhances the overall combiner performance. All coatings are produced with Materion Balzers Optics robust magnetron sputtering technology.



Hardcoatings on Plastics

Plastic substrates often need a hardcoating in order to improve the surface hardness and to enable additional thin film coatings on top. Materion Balzers Optics offers different types of hardcoating solutions depending on the application and the substrate type (e.g. PC, PMMA, COP/COC). The hardcoating solutions developed by Materion Balzers Optics are optimized for dielectric and metallic top coating and meet the harsh environmental requirements of different industries.



Thin-Film Coatings on Plastics

Materion Balzers Optics offers customized coating solutions and components using all major optical plastics. Depending on the requirements, Materion Balzers Optics applies state-of-the-art coating technologies such as IAD evaporation or sputtering to customer supplied substrates and to full turnkey components.



Anti-reflective Coatings

Materion Balzers Optics offers a range of different anti-reflection coatings to cover a large field of applications. These include multi-layer AR-coatings designed for maximum efficiency in the visible and near-infrared range. The designs can be optimized for wavelength range, down to 350 nm, or into the near-infrared range, up to 1550 nm. All our evaporated and sputtered AR coatings can be deposited on most commercially available glass substrates and many plastic substrates.





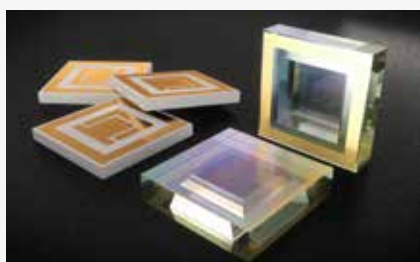
LiDAR Cover Window

Materion Balzers Optics' LiDAR cover window products will provide the excellent protection for the LiDAR sensors. Our coating technology and integration solution enables your projects to achieve great optical and durability performances. We provide customized color solution, best transmittance solution for large AOI application, with integrated anti-fog and easy-to-clean solutions. Materion Balzers Optics technology platform is flexible in handling various substrate geometries and materials, enabling window designs to fulfill vehicle stylish design demand.



Static Phosphor

Materion Balzers Optics offers various custom-configured Static Phosphor Assembly designs for different applications including projectors, solid-state illumination, head-up displays, professional lighting, etc. The Static Phosphors Assembly can handle the high laser power density with excellent laser light converting performance while meeting the requirements of the compact size for new generation laser projectors or laser phosphor illumination system.



Reflector and Detector CupLid

For hermetic packaging of laser diodes and LEDs Materion Balzers Optics has developed CupLids, a space-saving surface-mount photonic package with integrated mirrors on 45°-angled side-walls. CupLids form a fine-leak hermetic package by solder bonding a window cavity onto a flat ceramic submount (alumina or AlN) under vacuum or inert gas atmosphere. CupLids are available with different anti-reflective coatings in UV, Visible or Near Infrared and can be shipped fully-furnished with tack-welded solder preforms for easy handling and assembly. For prototyping we provide several reference designs of AlN submounts for either wire bond or flipchip die-attach.



Polygon Mirrors

For macro mechanical scanning LiDAR system, Materion Balzers Optics has developed the high reflection polygon mirror which is able to provide the highest reflectivity in order to minimize the laser light loss by achieving an excellent surface smoothness for the minimal impact of laser scanning. Materion Balzers Optics' polygon mirror is based on dielectric coating solution, it will help customer for addressing the long life and environmental durability challenges for the LiDAR sensors.



LightGate™ for DLP Projection

New abilities have enabled Materion Balzers Optics to improve the standards in Light-Gate™ manufacturing (aka. TIR- and RTIR-Prisms). Our bonding technology reduces the airgap height to 2 μm and provides complete airgap sealing, resulting in less long-term image degradation by preventing dust or gas from entering the gap. Precision blackening technology allows accurate positioning and patterning of the absorptive paint. Envisioning a growing market, all processes have been automated to meet high quality standards at large production volumes.



Optical Components



Polarizing Beamsplitters for Wearable Devices

Materion Balzers Optics understands the considerations of lumens, weight, and size when it comes to optical systems for wearable devices. We have therefore developed technologies to miniaturize the Polarizing Beamsplitter (PBS) without compromising its excellent light throughput characteristics. Chamfer-free manufacturing and our edge-to-edge coating procedure reduce the non-functional area to zero. This improved utilization of substrate surface also enables smaller component design. Patterned or uniform black chrome coating may be added to eliminate unwanted stray light.

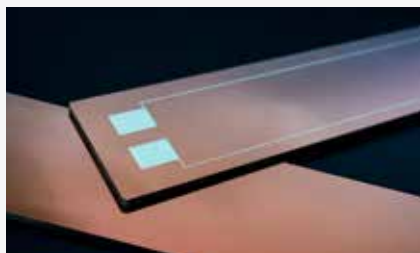


Mini Light Funnel

Materion Balzers Optics hollow integrator Light Funnel creates enhancement of light uniformity by outstanding reflection. Using the step structure Light Funnel light integration technology, its compact design established a new standard for portable lighting systems or portable projection display system. We apply our patented 400 Deflex™ 75 dielectric coating to the internal surfaces of the Light Funnel which gives it unique advantages to provide the best light uniformity and reliability performance for automotive application.



Functional Coatings



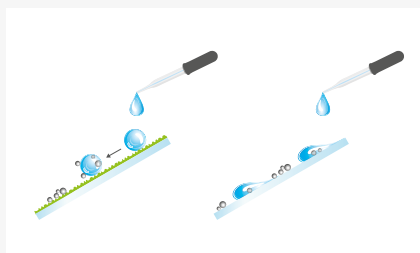
Heating Wire Solution

Materion Balzers Optics' LiDAR cover window products provide the excellent protection for the LiDAR sensors. With the accurate printing technology, Materion Balzers Optics' heating wire solution offers an economic solution while also achieving the excellent fast heating performance to fulfill the anti-fog requirement. With its minimal impact to the transmittance performance of the LiDAR window, our heating wire solution enables the best working condition for LiDAR window.



NIR Conductive Layer Solution

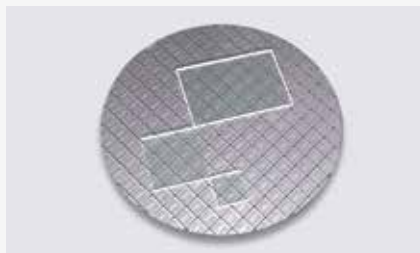
The NIR conductive layer is a thin film coating with electrically conductive and optically transparent properties at near infrared wavelengths. Materion Balzers Optics' NIR conductive layer solution enables uniform heating of the LiDAR front window providing anti-fogging and defrosting features for the LiDAR system. These are critical to the function of the LiDAR system during bad weather conditions.



TopFlex™ Hydrophobic Coatings

TopFlex™ hydrophobic coatings are chemically resistant to water, oil and grease. This UV to IR transparent top-layer is easy to clean and dirt-repellent. The coating exhibits good adherence to the substrate and other coatings, and is highly resistant to various forms of cleaning processes.





NIR Blocking Filter for Image Sensors

High performance digital image capture with CMOS or CCD sensors requires efficient blocking of the near-infrared range (NIR) in a broad wavelength range. The edge shape of such a filter depends very much on the application and is therefore custom designed. Furthermore, only a low defect density can be tolerated as every defect may lead to pixel loss. Finally, some high-end applications require cover glass apertures to mask sensor framework.



Filters for Thermal Imaging

Materion Balzers Optics offers coatings for active and passive night vision systems, helping drivers when encountering critical situations while traveling during nighttime. Our well established NightVision™ filters are optimized for active systems, enabling maximum NIR throughput while reducing the visible light by a factor of 1000 with no visible red leakage, while the LWIR filters are vital for uncooled bolometer detector in IR cameras to accurately and precisely measure forehead temperatures. With the capability to offer wafer coatings up to 8 inch, we support your WLP process to meet demanding cost solutions.



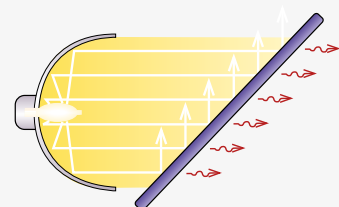
NIR-Bandpass Filters

3D imaging applications such as Gesture Recognition, Structured Light and Time-of-Flight (ToF) depth sensing require best transmission performance when it comes to illumination wavelength (Laser or LED source) over a wide field of view. Outside the passband an extraordinary blocking is required to suppress sun- and ambient light for better signal-to-noise ratio of the 3D sensor. Our bandpass filters, designed with extremely low wavelength shift over a large AOI, are ideally suited for 3D imaging applications.



LED ColorDichroics™

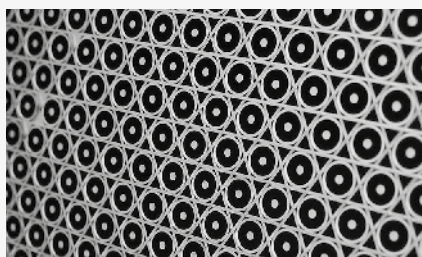
Materion Balzers Optics LED ColorDichroics™ dichroic filters/mirrors are used to efficiently transmit and/or reflect the light from light emitting diode (LED) sources. These dichroic filters/mirrors are designed to combine light emitted from different color LEDs into one beam. The thin film coatings of these LED ColorDichroics™ are specifically optimized for random polarized light. Both the high reflection and the high transmission wavelength ranges are specifically adapted to LED spectral emission characteristics.



Cold Mirrors

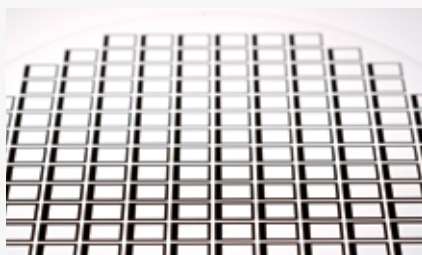
Cold mirrors reflect visible light and allow the transmission of infrared radiation. In general, these mirrors are used at an angle of incidence of 45°, thus reducing the temperature load from a light source by heat-light separation. Plane cold mirrors are an additional component of a high performance heat management system.





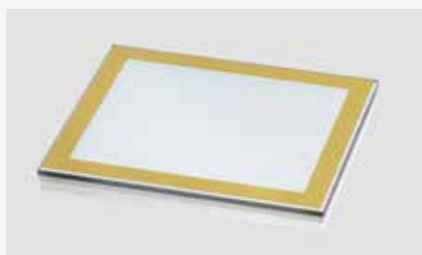
CrBlack™ Narrowband & Broadband Absorbers™

In almost any demanding optical setup minimum scattered light is required for each part of the optical setup. This includes pinholes, apertures for lenses, filter arrays or cover lids. Materion Balzers Optics' CrBlack™ is the ideal solution for this purpose. CrBlack™ is an optical black coating, characterized by high absorption and low reflection in the VIS and near-infrared range. This product is manufactured in the clean room to achieve a minimum defect/pinhole level. CrBlack™ can also be (micro)patterned by lift-off techniques, and the color impression and optical density can be adjusted to specific customer requests.



Patterned Chrome

Chrome patterns on planar components are widely used in the optical and semiconductor industry. Materion Balzers Optics puts strong emphasis on high resolution, low defect patterns. These can also come in combination with low defect functional coatings. In most applications the Chrome transmittance and reflectance will be low, with the edge performance of the Chrome pattern playing an important role.



Gelot™ Solderable Coatings

Gelot™ is a solderable gold-based multilayer coating that can be applied to glass, fused silica, sapphire and crystals, as well as to ceramics and similar materials. Gelot™ is used in various bonding and sealing applications with optical glass components such as micro-lenses, or to provide electrical contact on conductive coatings such as Indium Tin Oxide (ITO).



Alflex™ Protected Aluminium Mirrors

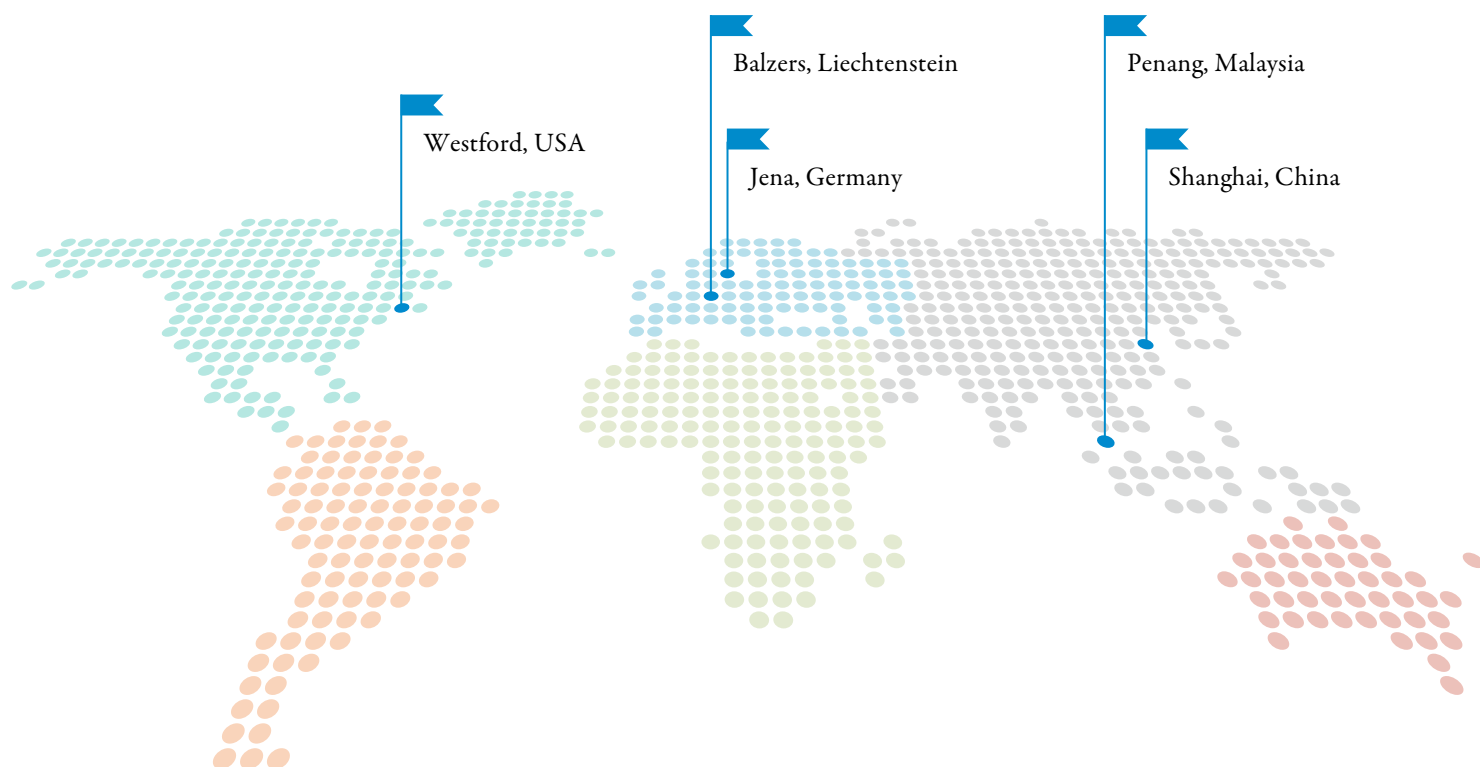
These versatile aluminum mirrors show excellent stable performance across a wide range of applications. The Alflex™ standard mirror coating has proven itself many times over due to its hardness and durability. The Alflex™ product line incorporates a broadband and a color-optimized narrowband mirror. Depending on the application it is generally insensitive to polarization and angle of incidence over a wide range. All types of Alflex™ are equipped with a protective layer against tarnish and oxidation.



Silflex™ Protected Silver Mirrors

Silflex™ MK II is a broadband, high-reflectivity mirror coating offering unprecedented performance and durability. It is virtually insensitive to polarization and angle of incidence, yet it maintains more than 98% reflectivity from the visible to the far infrared range.





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