MIDOPT®

PRODUCT GUIDE

OPTICAL FILTERS & IMAGING SOLUTIONS

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MIDOPT FILTERS: A NECESSITY, NOT AN ACCESSORY.

MidOpt has more than 30 years of experience in industrial optics and is a worldwide leader in manufacturing filters specially designed for machine vision. MidOpt is represented in over 30 countries, offers more than 3,000 cutting-edge products and serves the following industries:

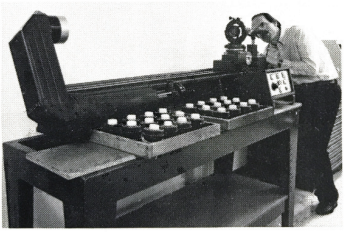
- Factory Automation
- Security and Surveillance
- License Plate Recognition
- Intelligent Transportation Systems
- Aerial Imaging
- Motion Analysis
- Medical/Life Science
- Scientific Research
- Photography/Cinematography
- 3D Metrology

HISTORY OF INNOVATION

MIDWEST
OPTICAL SYSTEMS, INC.

Since the 1980s, MidOpt has designed and manufactured high-quality optical filters for industrial imaging. From our humble beginnings with a single, red machine vision filter in our Singapore office, we quickly expanded to North America and have grown to offer one of the most complete lines of machine vision filters in the world.

In the late 70s, MidOpt Founder Barry Warzak studied under his father Frank, an optical engineer, lens designer and the owner of FJW Optical. With Barry's training and insight into customer needs, he helped launch the machine vision filter market in Singapore. Because of the country's long-standing emphasis on developing high-value manufacturing, many Singaporean companies adopted machine vision technology early on.



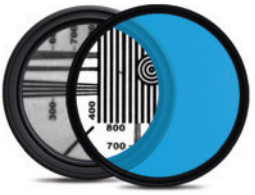
As more companies across the United States, Europe and Asia began introducing machine vision for inspecting semiconductors, electronics and other applications, they were seeking instruction and guidance. The knowledge Barry gained in Singapore was transferred to the MidOpt headquarters in the United States.

Although many companies today market optical filters for industrial imaging, a MidOpt machine vision filter is not just a machine vision filter. In the coming pages, we'll share the key features of a quality machine vision filter and the MidOpt difference when it comes to performance, design and repeatability.

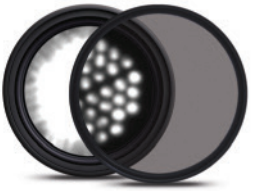
FILTER PERFORMANCE

MidOpt filters are the premier solution for industrial imaging to ensure flawless control, dependable results, unmatched repeatability and exceptional image quality for monochrome and color vision systems.

CONTRAST



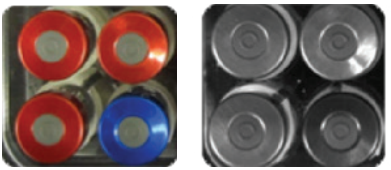
RESOLUTION



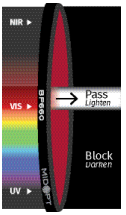
REPEATABILITY

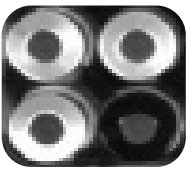
CONTRAST

Filters allow us to selectively pass or block desired wavelengths, which can highlight or darken areas of an image. The ultimate goal is to accentuate the feature we are trying to focus on. Contrast is determined by its dynamic range, recognized as the difference between the lowest and highest intensity level.

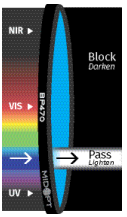


MidOpt BP635 Red Bandpass Filter



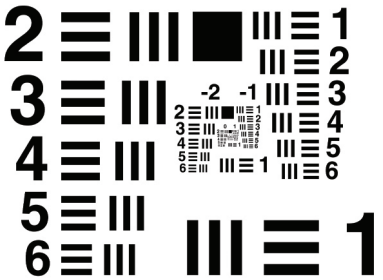


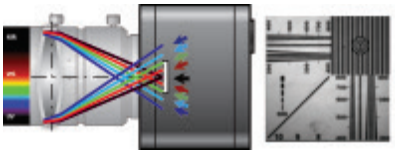
MidOpt BP470 Blue Bandpass Filter



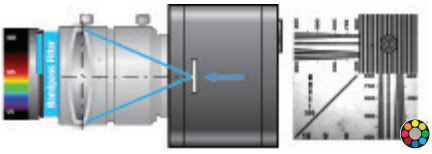
RESOLUTION

Chromatic aberration is a common problem in lenses. It occurs when colors are incorrectly refracted (bent) by the lens, resulting in a mismatch at the focal point – where the colors do not combine as they should. Bandpass Filters improve resolution by reducing the wavelength range of light allowed to pass through the camera, eliminating chromatic aberration. This is even more apparent in broad spectrum imaging where ultraviolet (UV) and infrared (IR) wavelengths are present.





No Filter

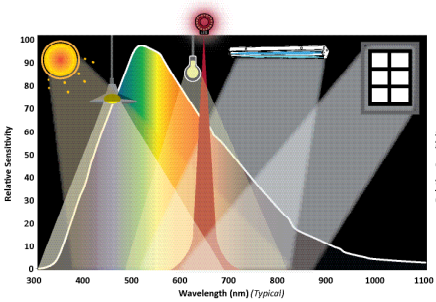


MidOpt Filter

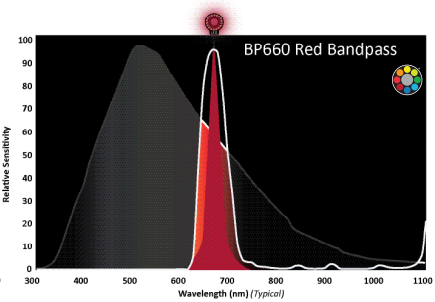
REPEATABILITY

MidOpt filters have the unique ability to control the quality and quantity of light, block all unwanted ambient light, pass only the output of light necessary for inspection and significantly increase contrast and resolution. This results in improved system accuracy, long-term repeatability and unmatched stability.

By including a filter during the vision system design stages, the results achieved in the controlled area of the lab are guaranteed once moved to the variable lighting of the factory floor.



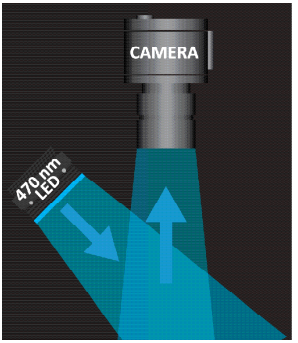
No Filter

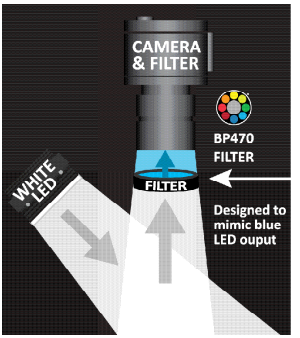


MidOpt Filter

OPTIMAL WAVELENGTH

Test the effects of monochromatic wavelengths by using optical filters together with white light. We can determine the specific wavelength that maximizes contrast and improves the resolution of the feature we want to isolate. Once we obtain that information, we can invest in the proper lighting hardware.





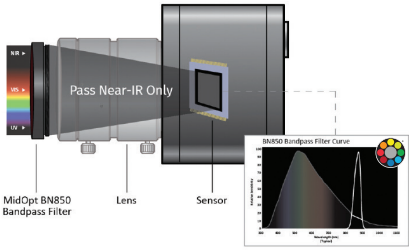
Different filter wavelengths can achieve different results.

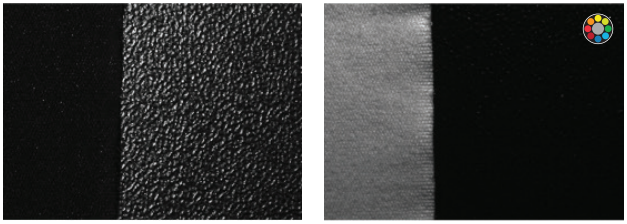
Here's a real-life application with MidOpt filters in action:

Original Color Image | Monochrome Image (No Filter) | Blue Bandpass Filter | Red Bandpass Filter | Near-IR Bandpass Filter

NEAR-IR IMAGING

If the desired image results aren't achieved when testing in the visible spectrum, we recommend testing in the near-infrared (IR). It's impossible to determine the results of near-IR imaging with the human eye alone because we're unable to see in the infrared spectrum; however, the digital sensor is.

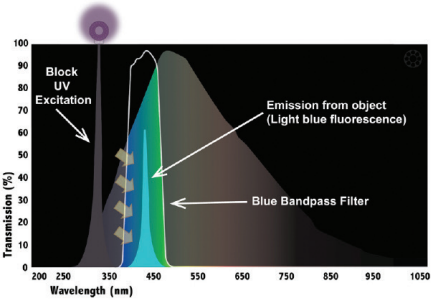




Detecting the separation between two black materials. The fabric on the left reflects infrared light, while the fabric on the right absorbs infrared light, creating contrast.

FLUORESCENCE IMAGING

For a system to be successful in an ultraviolet (UV) fluorescence application, filters must be used to reliably detect the visible emission and block the UV light source. If the fluorescence emission wavelength is unknown, the best way to determine the ideal filter is by testing.



A BP470 Blue Bandpass Filter darkens the background by blocking reflected UV light used to excite the blue fluorescence, creating sufficient contrast.

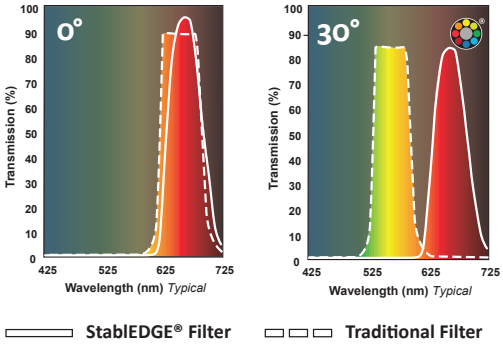
THE MIDOPT DIFFERENCE

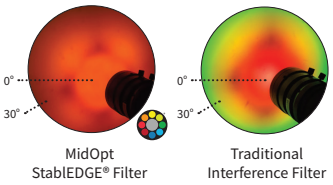
KEY FEATURES
OF A QUALITY MACHINE VISION FILTER

A MidOpt machine vision filter is not just a machine vision filter. Here's what to look for when choosing a filter for your machine vision system:

WAVELENGTH CONTROL

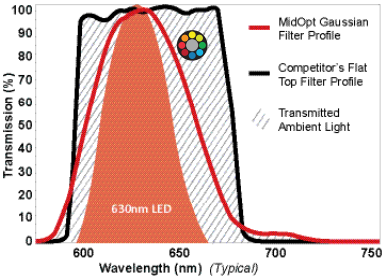
Short-shifting occurs when the angle of light passing through a traditional filter increases. This is most commonly seen when the filter is placed in front of a lens with a focal length of 12mm or less (lenses with greater than 50° (±25°) angular fields of view). This accounts for almost 60% of all lenses used today—a number that continues to grow as the demand for space forces inspection footprints to shrink.





PASSBAND PERFORMANCE

Some filters on the market have a high, flat transmission profile. With this design, an overwhelming amount of ambient light is able to pass through at the weaker tail ends of the LED spectral output curve. To ensure maximum performance, the position, height and width of the passband should emulate the bell-shaped spectral output curve (Gaussian curve) of the LED illumination being used.



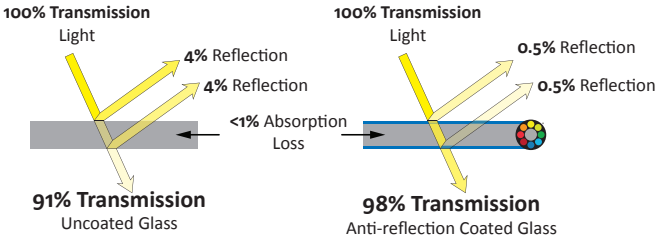
Color Image with Ambient Light

Traditional Red Flat Top Filter

MidOpt Red Gaussian Filter

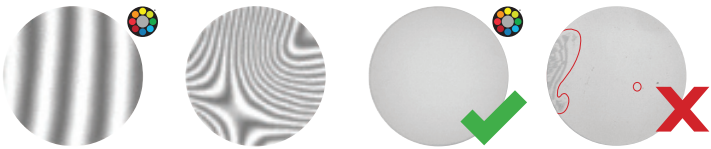
HIGH-TRANSMISSION ANTI-REFLECTION COATING

When a ray of light passes through a glass surface, a portion of the light is reflected, resulting in a 4% transmission loss per surface. MidOpt uses anti-reflection coating on all filter designs, reducing surface reflection to less than 1%. This improves the efficiency of the vision system by increasing transmission, enhancing contrast and eliminating ghost images.



OPTIMAL PERFORMANCE & REPEATABILITY

MidOpt sets the quality standard for machine vision filters. Every filter is examined to ensure near-flawless surface quality and is 100% inspected by state-of-the-art spectrophotometer technology to ensure optimal performance and repeatability. We are also one of the only manufacturers to use controlled torque when securing filters into their mounts, eliminating distortion and guaranteeing optical flatness.



MidOpt Filter
PV: 0.068 wave

Competitor Filter
PV: 5.131 wave

Good Filter

Reject Filter

MOUNTING SOLUTIONS

MidOpt offers same-day shipping and stocks over 20,000 mounted filters, ranging in size from M13.25 to M105. A variety of other mounting solutions are also available, including options for applications without filter threads, custom mounting solutions and the MidOpt exclusive 25.4® C-Mount filter. ***See page 33 for a full list of mounting solutions***

For more information, visit **midopt.com/key-features**

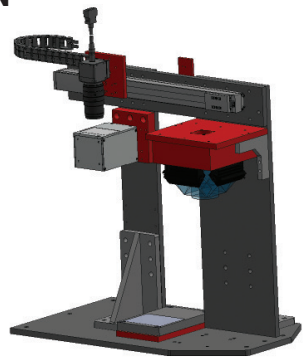
FOR MACHINE VISION
BY MACHINE VISION

ROBOTIC ASSEMBLY & INSPECTION SYSTEM

MidOpt unveils an industry first, with the introduction of cutting-edge robotic assembly and inspection technology. Quality and repeatability are ensured by limiting the possibility of human error during the manufacturing and inspection processes.

CONSISTENT QUALITY INSPECTION

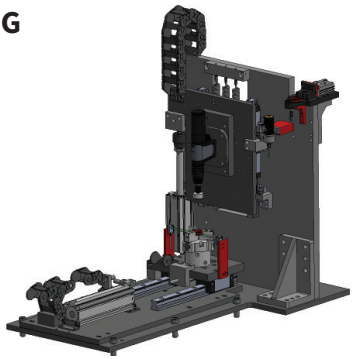
The new MidOpt Robotic Assembly and Inspection Station provides consistency and uniformity when inspecting scratches, digs and other cosmetic defects. A greater variety of inspection lighting, increased magnification and additional inspection steps are all utilized, while the variability of individual perception is removed from the inspection equation. This results in pristine optical surfaces and improved image quality. Safeguard your industrial imaging applications with superior optical filtering provided by MidOpt designs and automated assembly and inspection.

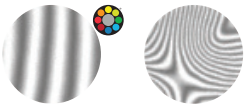


Good Filter | Reject Filter

TORQUE CONTROLLED MOUNTING

When assembling optically flat, precision polished filters into threaded filter mounts, interferometric measurements reveal drastic deformations caused by even the slightest amount of stress introduced during assembly. The resulting optical distortion can significantly impact image quality, as seen in the interferometric examples below. The new MidOpt Robotic Assembly Station allows each filter to be gently yet securely held in the filter mount by the retaining ring. After ideal torque is applied, controlled amounts of thread-locking compound are dispensed to prevent the retaining ring from loosening.





MidOpt Filter
PV: 0.068 wave

Competitor Filter
PV: 5.131 wave

For more information, visit **midopt.com/robot**

BANDPASS FILTERS

StablEDGE® FILTER DESIGN

BANDPASS FILTERS

All MidOpt Bandpass filters are double-sided polished for exceptional parallelism and optical flatness. BP and BN series filters are designed with StablEDGE® technology, which offers superior out-of-band blocking, reduces angular dependency and minimizes the effects of short-shifting.

BP SERIES Broad Bandwidth

- 60+nm FWHM*; Peak Transmission ≥90%
- StablEDGE design with a broad, Gaussian passband to mimic and accommodate the entire output of the most common LED lighting wavelengths

BN SERIES Narrow Bandwidth

- 45-55nm FWHM*; Peak transmission ≥85%
- StablEDGE design for use with laser diodes and LEDs in applications with overwhelming ambient light

APPLICATIONS: BP and BN Series Filters are used in a variety of industries, including machine vision, factory automation, security and surveillance, license plate recognition, medical and life sciences, agricultural inspection, aerial imaging, motion analysis, photography and cinematography. Test the effects of monochromatic illumination with a BandPass Filter Kit. ***See page 34***

Bi SERIES Narrow Interference Bandwidth

- 20-35nm FWHM*; Peak transmission ≥85%
- StablEDGE design for use with laser diodes
- Ideal wavelength separation when multiple light sources of similar wavelengths are present
- Reflective, mirror-like surface that helps minimize adverse thermal effects

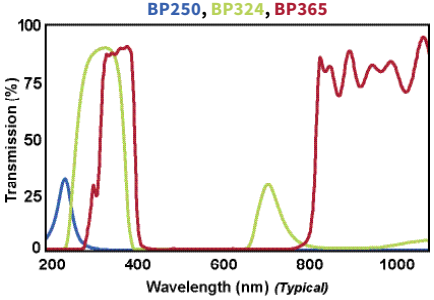
APPLICATIONS: Bi Series are popular for life science and laser analysis applications where only discrete wavelengths need to be passed to maximize system performance.

**Applies in most cases*

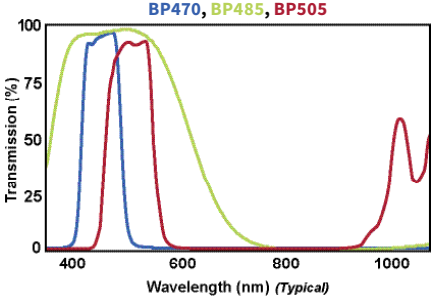
For more information, visit **midopt.com/bandpass**

BP SERIES: BROAD BANDWIDTH

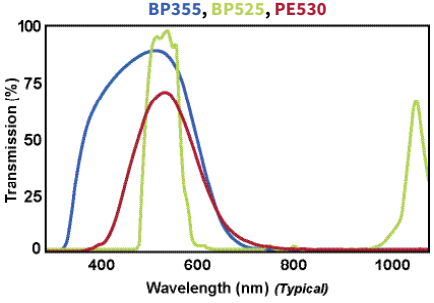
BP250, BP324, BP365



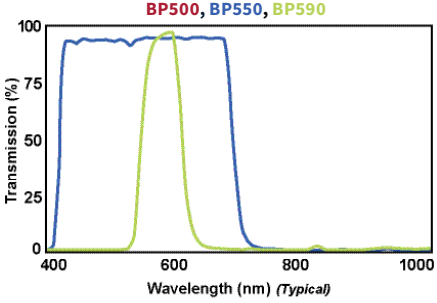
BP470, BP485, BP505



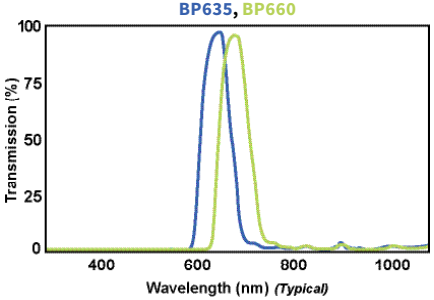
BP355, BP525, PE530



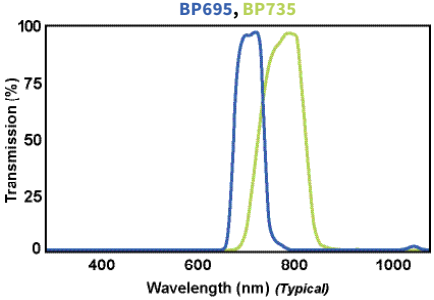
BP500, BP550, BP590



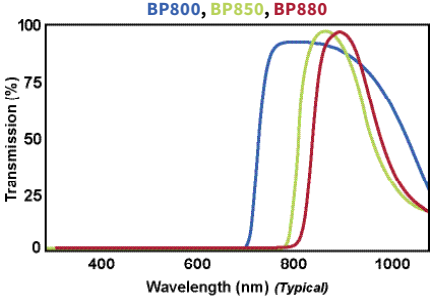
BP635, BP660



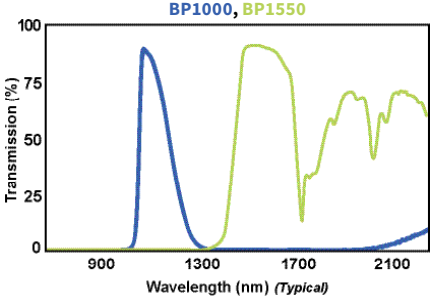
BP695, BP735



BP800, BP850, BP880

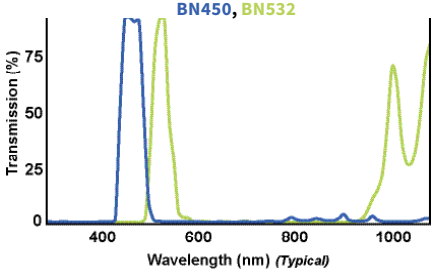


BP1000, BP1550

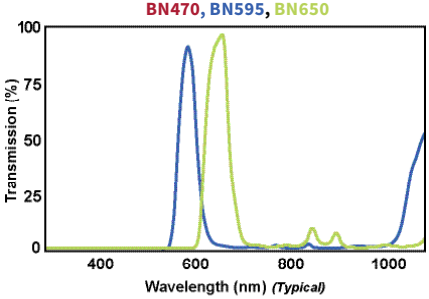


BN SERIES: NARROW BANDWIDTH

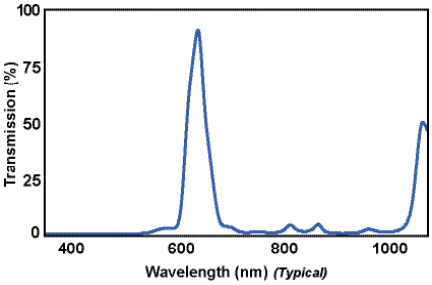
BN450, BN532



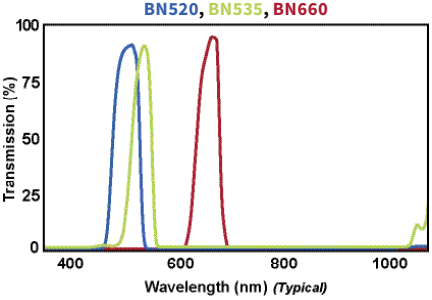
BN470, BN595, BN650



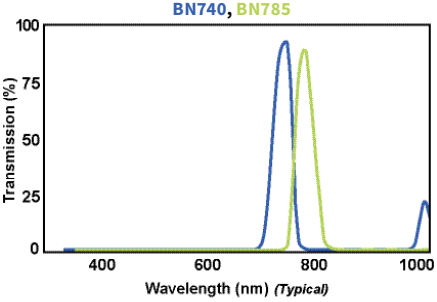
BN630



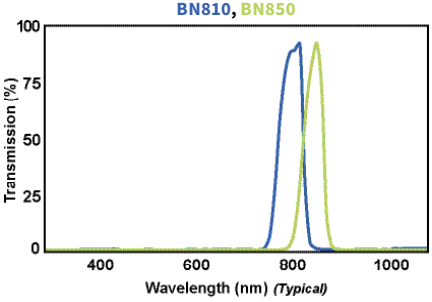
BN520, BN535, BN660



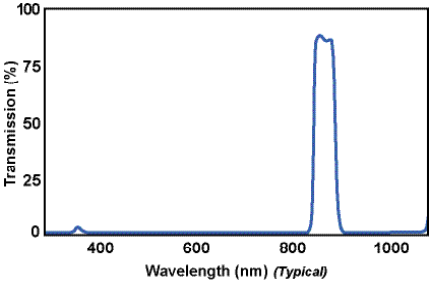
BN740, BN785



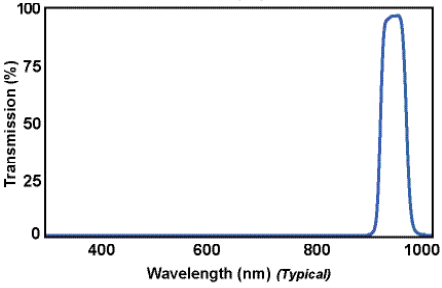
BN810, BN850



BN880

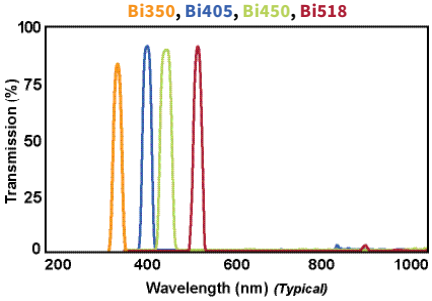


BN940

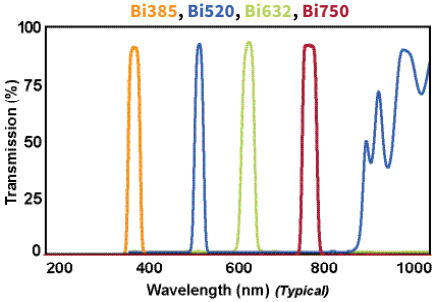


Bi SERIES: NARROW INTERFERENCE

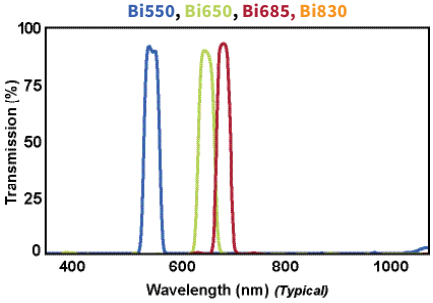
Bi350, Bi405, Bi450, Bi518



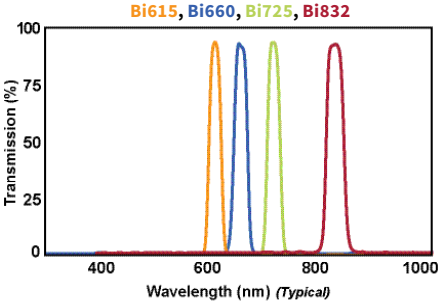
Bi385, Bi520, Bi632, Bi750



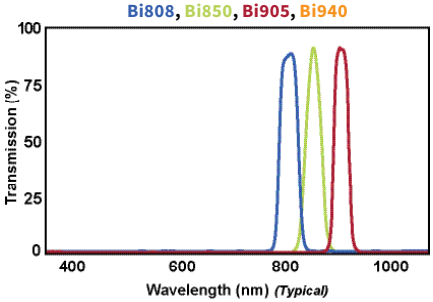
Bi550, Bi650, Bi685, Bi830



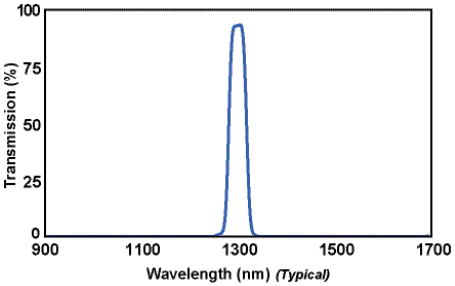
Bi615, Bi660, Bi725, Bi832



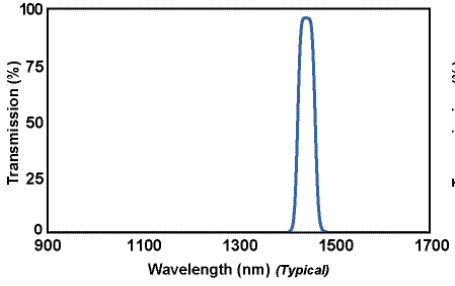
Bi808, Bi850, Bi905, Bi940



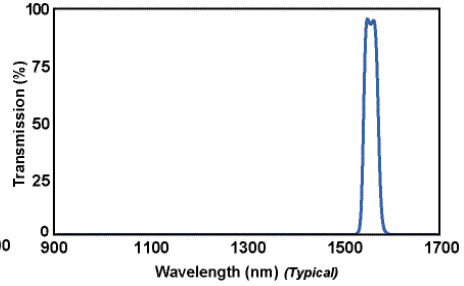
Bi1300



Bi1450



Bi1550



MULTI-BANDPASS FILTERS

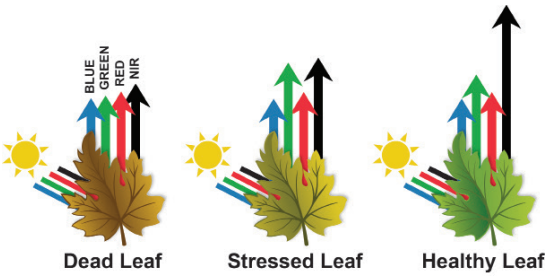
DUAL BANDPASS / TRIPLE BANDPASS

Commonly used for Normalized Difference Vegetation Index (NDVI) imaging and Enhanced Normalized Difference Vegetation Index (ENDVI) imaging.

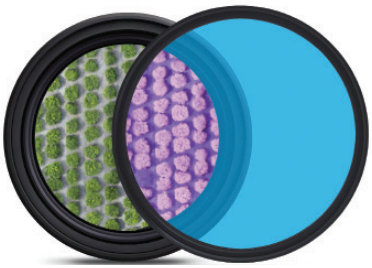
- Eliminate the need for dual or tri sensor imaging
- Anti-reflection coated for maximum transmission
- Hard-coated, single-substrate fabrication
- Pass red or blue visible light, while simultaneously passing green and NIR light
- Ideal when working with indices such as CV, NG, and ENDVI used to monitor crop health
- Recommended for installation behind the camera lens, requiring exceptional Surface quality; 10/5 scratch/dig

APPLICATIONS: Multi-Bandpass Filters have become popular in NDVI aerial drone inspection, allowing for single sensor imaging and reduced operational payload. NDVI calculation, traditionally achieved through satellite imagery, can now be obtained by utilizing Multi-Bandpass Filters and personal aerial imaging devices.

CONCEPT: Plants reflect different wavelengths of light to varying degrees based on their health. A healthy leaf absorbs blue and red light for photosynthesis, while it reflects some green light and strongly reflects near-infrared (NIR) light. Stressed vegetation reflects greater amounts of red, blue and green light while reflecting for NIR light.



MOUNT & SIZE OPTIONS: Multi-Bandpass Filters are offered in various standard threaded mounts custom mounts, sizes cut to fit the front or back of any lens, or the front of the camera sensor. Standard material thicknesses include 0.5mm, 1.1mm and 2.0mm.

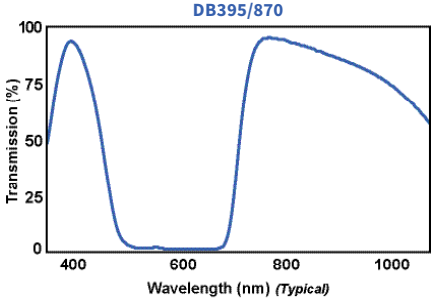


For more information, visit **midopt.com/multi-bandpass**

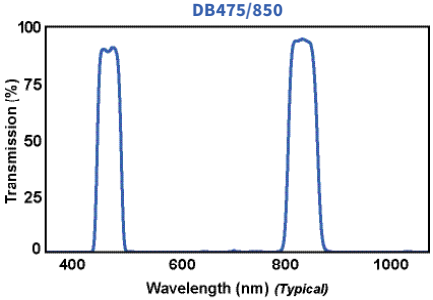
FILTERS & TRANSMISSION CURVES

DUAL BANDPASS FILTERS

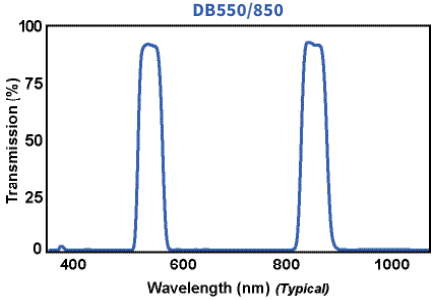
DB395/870



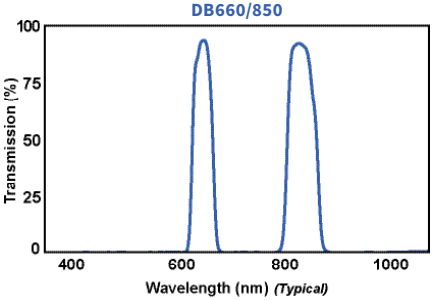
DB475/850



DB550/850

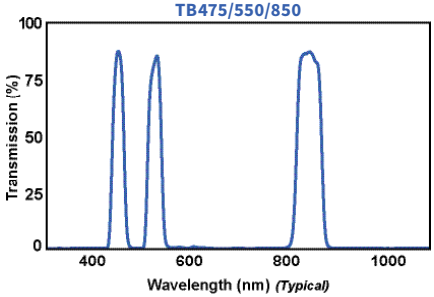


DB660/850

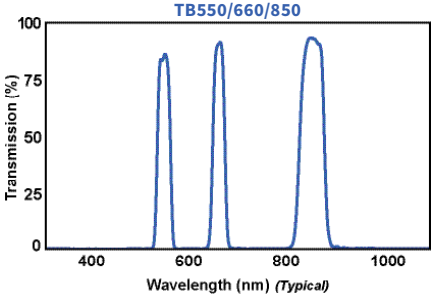


TRIPLE BANDPASS FILTERS

TB475/550/850



TB550/660/850



DUAL BANDPASS FILTERS

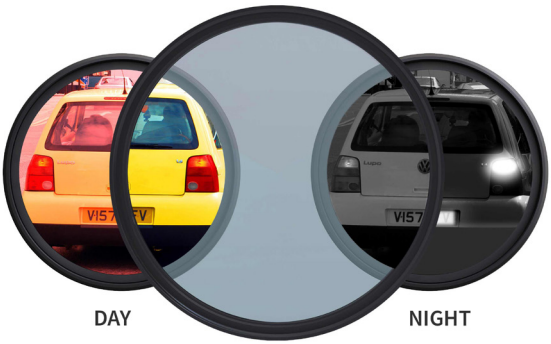
FOR DAY AND NIGHT

Dual Bandpass Filters are single filters that work twice as hard. They're ideal for applications using a color camera that require accurate color imaging during the day and infrared imaging at night.

- Pass visible light and a specific portion of the VIS and NIR spectrums
- Ideal for color camera applications that utilize daytime sunlight and NIR illumination at night
- Eliminate the need for dual sensor imaging
- Achieve accurate color rendition by blocking interfering (NIR) wavelengths
- Anti-reflection coated for maximum transmission
- Hard-coated, single-substrate fabrication
- Exceptional surface quality; 40/20 scratch/dig

APPLICATIONS: Most commonly used for security and surveillance and Intelligent Transportation Systems (ITS). One Dual Bandpass Filter can completely eliminate the need for a costly switching mechanism or expensive two-camera system.

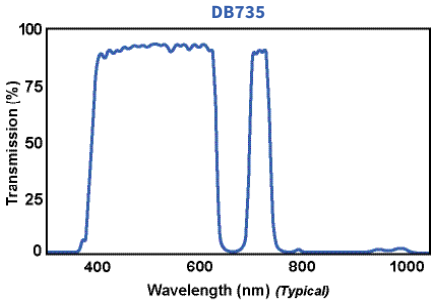
MOUNT & SIZE OPTIONS: Dual Bandpass Filters are in stock, ready to ship, and are available in Threaded Mounts, sizes M13.25 to M82; 25.4® C-Mounts; Slip Mounts; or Unmounted. Dual Bandpass Filters can be optically cemented behind an M12 lens if preferred. Custom shapes and sizes are also available.

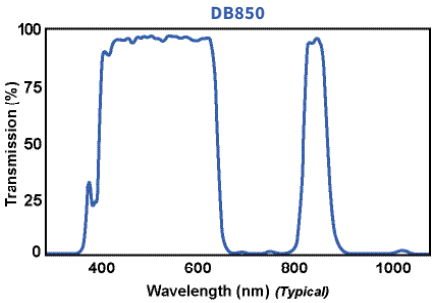


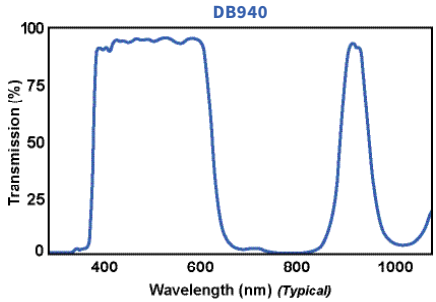
For more information, visit **midopt.com/multi-bandpass**

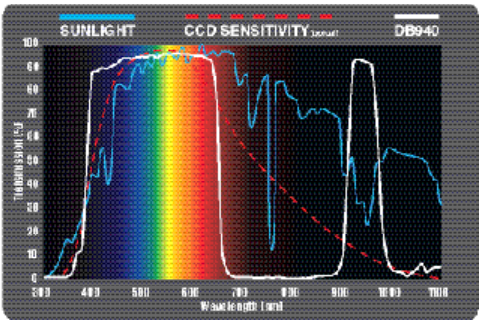
FILTERS & TRANSMISSION CURVES

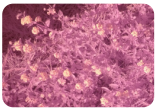
DUAL BANDPASS FILTERS











No IR Blocking Filter

DB850 Dual Bandpass Filter

DB940 Dual Bandpass Filter

Sunlight contains an almost overwhelming amount of infrared light; however, output in the region around 940nm is not as significant. Using a DB940 Filter takes advantage of this feature, resulting in greatly improved color rendition compared to Visible/850nm Dual Band Filters.

LONGPASS FILTERS

StablEDGE® FILTER DESIGN

Often referred to as “sharp-cut” filters, Longpass Filters are specially designed to pass a broad spectrum of longer wavelength light while blocking shorter wavelengths.

- Economical solution for isolating specific spectral regions
- Peak transmission ≥90%
- StablEDGE® design reduces angular dependence and minimizes short-shifting effects
- Anti-reflection coated for maximum transmission in VIS — SWIR spectrums
- Can be used with Shortpass Filters for a custom, fine-tuned Bandpass Filter
- Double-side polished glass for exceptional parallelism and optical flatness
- Exceptional surface quality; 40/20 scratch/dig
- Available in wavelength ranges from 350-12 microns

APPLICATIONS: Longpass Filters are often used in fluorescence applications to block an excitation light source or to pass multiple emission wavelengths, improving signal to noise ratio in light-controlled environments. Longpass Filters are also commonly used in photography and astronomy.

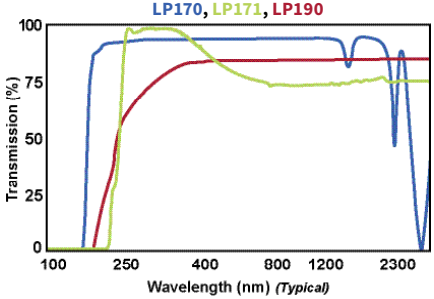
MOUNT & SIZE OPTIONS: Longpass Filters are in stock, ready to ship, and are available in Threaded Mounts, sizes M13.25 to M105; 25.4® C-Mounts; Slip Mounts; or Unmounted. Custom shapes and sizes are also available.

For more information, visit **midopt.com/longpass**

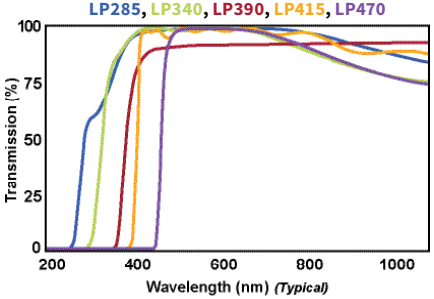
FILTERS & TRANSMISSION CURVES

LONGPASS FILTERS

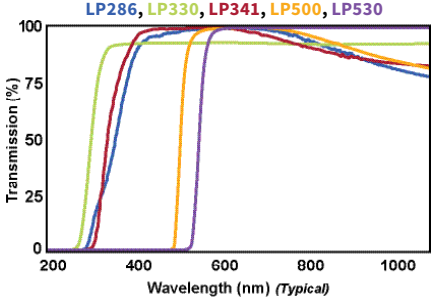
LP170, LP171, LP190



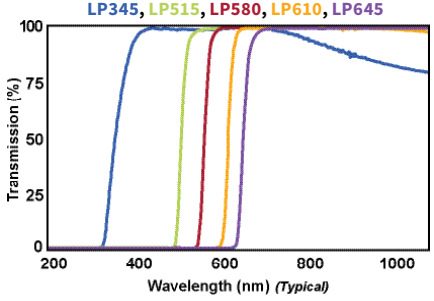
LP285, LP340, LP390, LP415, LP470



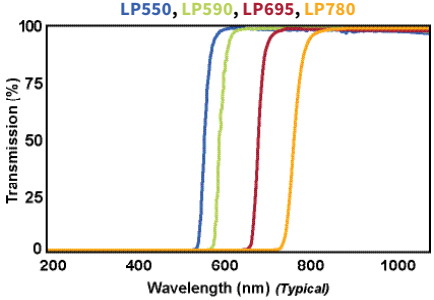
LP286, LP330, LP341, LP500, LP530



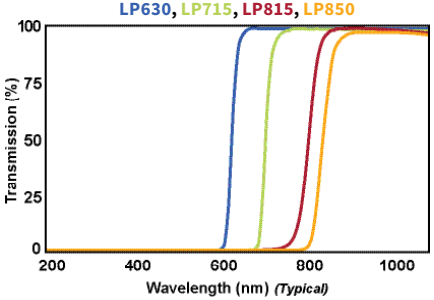
LP345, LP515, LP580, LP610, LP645



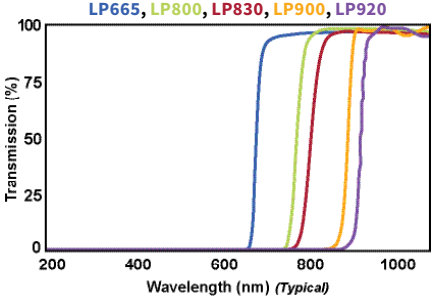
LP550, LP590, LP695, LP780



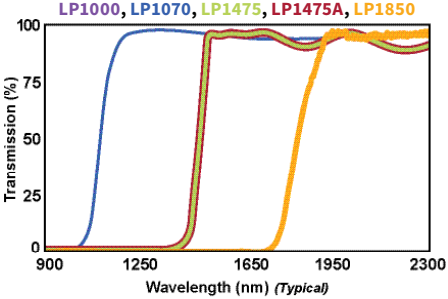
LP630, LP715, LP815, LP850



LP665, LP800, LP830, LP900, LP920



LP1000, LP1070, LP1475, LP1475A, LP1850



SHORTPASS / NIR-CUT FILTERS

Often thought of as “IR-cut” Filters, Shortpass Filters are specifically designed to pass a broad spectrum of shorter wavelength light, while blocking longer VIS and NIR wavelengths.

- Peak transmission ≥90%
- Anti-reflection coated for maximum transmission
- Can be used with Longpass Filters for a custom, fine-tuned Bandpass Filter
- Exceptional surface quality; 10/5 scratch/dig* for over the sensor
- Precision polished glass substrate
- Available in wavelength ranges from 340-785 nm

**Applies in most cases*

SP SERIES - VIS PASS

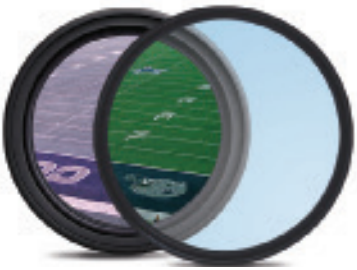
- Separate color in monochrome or color applications
- Improve contrast and resolution

SP SERIES - NEAR-IR BLOCK

- Commonly placed over the camera's image sensor to block near-IR light and achieve natural color rendition
- Used as a hot mirror to reduce unwanted heat build-up caused by infrared radiation

APPLICATIONS: Shortpass Filters are commonly used in color imaging to achieve natural color rendering. They can also be used to protect the sensor from NIR laser damage or to reduce IR radiation or “camera bloom” created during hot metal or glass extrusion processes.

MOUNT & SIZE OPTIONS: Shortpass Filters are in stock, ready to ship, and are available in Threaded Mounts, sizes M13.25 to M105; 25.4® C-Mounts; Slip Mounts; or Unmounted. Shortpass Filters can be optically cemented behind an M12 lens if preferred. Custom shapes and sizes are also available.

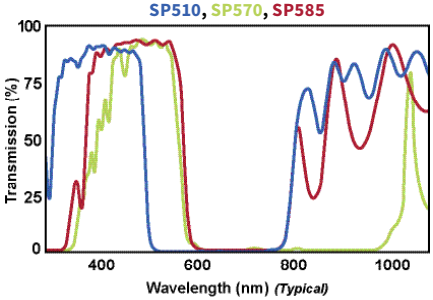


For more information, visit **midopt.com/shortpass**

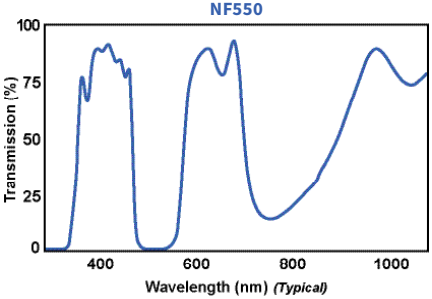
FILTERS & TRANSMISSION CURVES

SP SERIES: VIS PASS

SP510, SP570, SP585

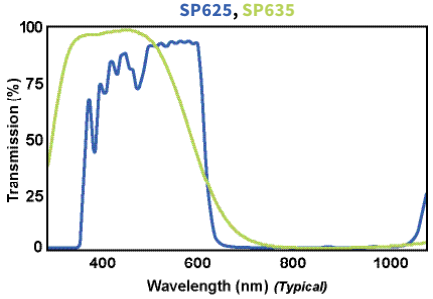


NF550

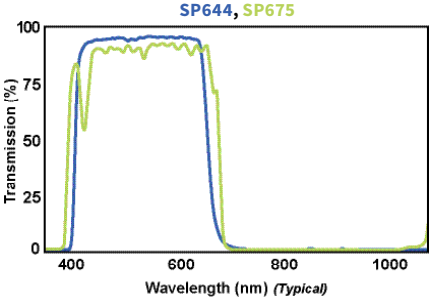


SP SERIES: VIS PASS / NIR BLOCK

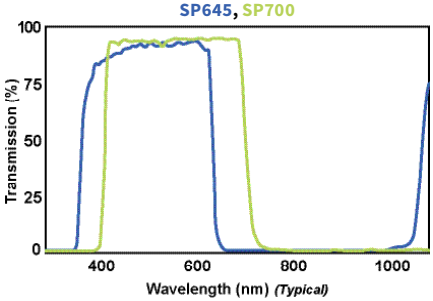
SP625, SP635



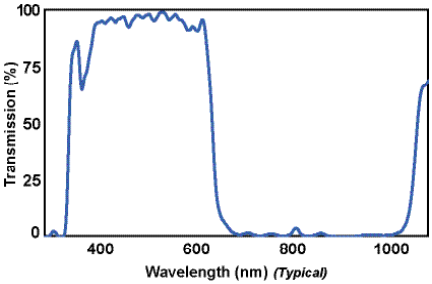
SP644, SP675



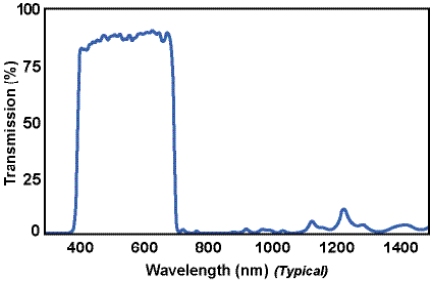
SP645, SP700



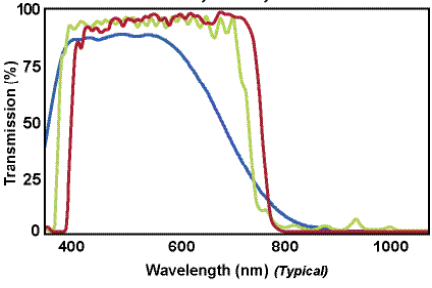
SP650



SP701



SP705, SP730, SP785



POLARIZERS

Polarizing Filters reduce reflection, enhance contrast and detect imperfections in transparent materials. Polarizing Filters for the camera lens should be used in combination with Polarizing Film for the light source to maximize glare reduction and achieve the best results.

POLARIZING FILTERS

MidOpt rotating Linear Polarizers thread onto the lens. Rotating the mount and visually observing the results makes it easy to determine the position at which glare reduction is maximized. All mounted MidOpt polarizers come with a locking thumbscrew to ensure that jarring or accidental movement during cleaning does not result in a change to the filter's position.

- Contrast ratios of up to 10,000:1
- Linear, circular and wire grid polarizers are available for VIS — SWIR spectrums
- Rotating mount with locking thumb screw to fine tune glare reduction
- Available with anti-reflection and oleophobic coatings
- Exceptional surface quality; 40/20 scratch/dig*

**Applies in most cases*

POLARIZING FILM

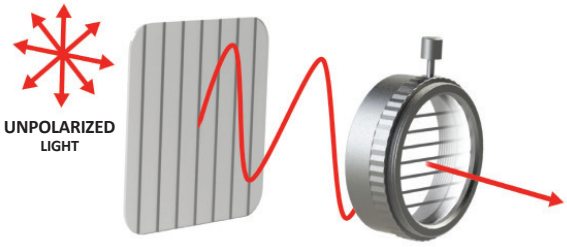
To maximize extinction, Linear Polarizers should be placed over the system's light source(s) to decrease glare and to help block incident light.

- Achieves optimal glare reduction when placed over light source
- Contrast ratios of up to 10,000:1
- Offered in high-temperature-resistant laminate and glass
- Linear polarizers are available for VIS and near-IR requirements
- Left and right circular polarizers are available for VIS spectrum applications
- PSA007, HTA008 and PSA1000 material comes standard with self-adhesive backing

APPLICATIONS: Polarizers are commonly used to reduce glare from objects with smooth surfaces or surfaces covered with grease, oil or liquid, and to detect stress and imperfections in transparent material.

For more information, visit **midopt.com/polarizing**

MOUNT & SIZE OPTIONS: Polarizing Filters and Films are in stock, ready to ship, and are available in Threaded Mounts, sizes M22.5 to M105; Slip Mounts; or Unmounted. Polarizing Film is available in multiple thicknesses and can be custom laser cut to fit any light source with a maximum usable width of 16.5" and length up to 300'.



LINEAR POLARIZING FILM
(FOR LIGHT SOURCE)

LINEAR POLARIZING FILTER
(FOR LENS) Rotate perpendicular to the axis of polarization of the Linear Polarizing Film for maximum glare reduction.

POLARIZING FILTERS

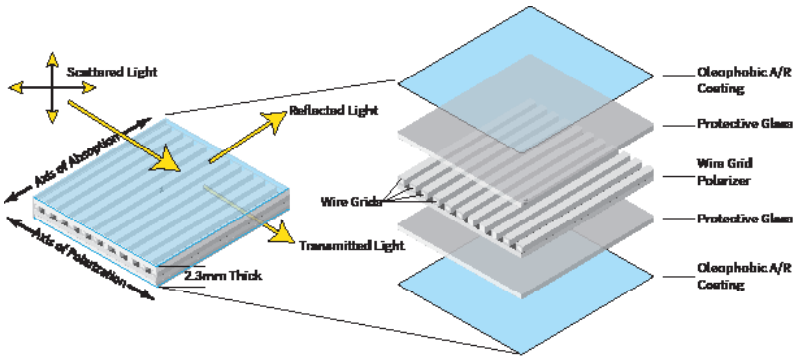
PART #	USEFUL RANGE (nm)	CONTRAST RATIO
PR032	400-700	Up to 3000:1
PR120	400-700	Up to 10,000:1
PC052	400-700	Up to 700:1
PR1000	400-2000	Up to 8000:1

See page 39 for more details

POLARIZING FILMS

PART #	USEFUL RANGE (nm)	CONTRAST RATIO
PS007	400-700	Up to 3000:1
PSA007	400-700	Up to 3000:1
PS010	400-700	Up to 3000:1
PS030	400-700	Up to 7000:1
HT025	400-700	Up to 5000:1
HT008	400-700	Up to 10,000:1
HTA008	400-700	Up to 10,000:1
PG120	400-700	Up to 10,000:1
PS1000	400-2000	Up to 8000:1
PSA1000	400-2000	Up to 8000:1
PG1000	400-2000	Up to 8000:1

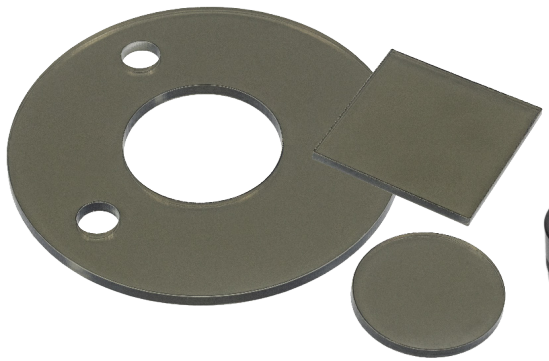
Pi1000 DETAILED DESIGN



ACRYLIC POLARIZERS

MidOpt introduces the first acrylic Polarizer, an innovative design that's thicker and more rugged than the current polarizer film on the market, and more affordable than glass polarizers. It offers superior glare reduction and because of the acrylic base, it also serves as a protective window and can be enhanced with a variety of coatings, including oleophobic, anti-reflection, and hard coat. The MidOpt Acrylic Polarizer can be placed over the light source, lens, or camera; is available in linear and wire-grid styles; and can be custom sized in thicknesses from 1-3mm.

Part #	Description	Thickness	Useful Range	Contrast Ratio	Cell Cast Acrylic	Extruded Acrylic	Hard Coating	Single Side BBAR-VIS Coating	Single Side BBAR-VIS/NIR Coating	Oleophobic Coating	Available Rotating Mount
PA371	Ultra-High Contrast Oleophobic Coated Acrylic Liner Polarizer	1.2mm	400-700nm	10,000:1		√	√	√		√	√
PA385	Ultra-High Contrast Cell Cast Acrylic Linear Polarizer	1.7mm, 2.2mm	400-700nm	10,000:1	√		√				√
PA401	Ultra-High Contrast Oleophobic Coated Acrylic Linear Polarizer	3.2mm	400-700nm	10,000:1		√	√	√		√	√
PA1000	VIS/NIR Wire Grid Oleophobic Coated Acrylic Linear Polarizer Window	1.2mm	400-2000nm	8,000:1		√	√		√	√	√



DIFFUSERS

Diffusers can be thought of as protective windows, most often for lighting applications, that also diffuse and scatter light coming from a point source such as a LED, lamp filament or laser diode.

MidOpt Acrylic Diffusers are lightweight while providing excellent durability.

	PART #	THICKNESS	COLOR TEMPERATURE	TOTAL LIGHT TRANSMISSION	TOTAL DIFFUSE TRANSMISSION	PARALLEL LIGHT TRANSMISSION	HAZE
◯	**DF035**	.8mm	6750K	35%	33%	2%	96%
◯	**DF045**	2mm	6750K	45%	43%	2%	96%
◯	**DF050**	1.5mm	6750K	50%	48%	2%	96%
◯	**DF055**	1mm	6750K	55%	53%	2%	96%
◯	**DF065**	1mm	6750K	65%	62%	3%	96%
◯	**DF070**	1mm	6750K	70%	67%	3%	96%
◯	**DF075**	1mm	6750K	75%	72%	3%	96%
◯	**DF080**	1mm	6750K	80%	77%	3%	96%
◯	**DF085**	1mm	6750K	85%	81%	4%	96%
◯	**DF090**	1mm	6750K	90%	87%	4%	96%
◯	**DF093**	1mm	6750K	93%	90%	4%	96%

**** Additional thinckesses can be custom made. Please contact us for more information.***

PROPERTIES

Property	Method	Unit	Value
Reflective Index	ASTM D–542	–	1.49
Heat Distortion Temperature	ASTM D–648	°C	110
Maximum Recommended Continuous Temperature	–	°C	80
Coefficient of Thermal Expansion	ASTM D–696	cm/cm/°C	7 x 10-5
Pencil Hardness	–	–	2H
Heat Resistance	80°C x 100hr	–	No change
Cold Resistance	–40°C x 100hr	–	No change
Humidity Resistance	60°C x 90% x 100hr	–	No change
Thermal Cycle	–40°C <–>80°C (10 cycles)	–	No change

NEUTRAL DENSITY FILTERS

Neutral Density Filters are designed to reduce light intensity neutrally over a specific wavelength range without affecting image color or contrast. They serve as "sunglasses" for your system and can be used with monochrome or color cameras.

- Available in a variety of optical densities
- Reduce light intensity while maintaining a wide aperture and shallow depth of field
- Minimize pixel saturation
- Can be stacked with other Neutral Density Filters to achieve custom optical densities
- Exceptional surface quality; 40/20 scratch/dig

ND SERIES

VISIBLE (VIS) SPECTRUM

- Absorptive filter effective from 425-675nm
- Available in optical densities ranging from 0.10-6.0

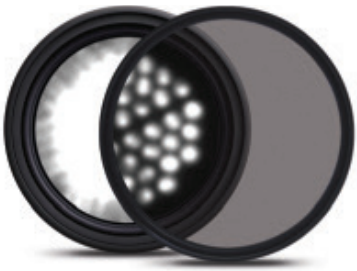
Ni SERIES

BROAD SPECTRUM; VIS/SWIR

- Low reflectivity filter effective from 400-2000nm
- Available in optical densities ranging from 0.3-2.0
- Coated on low-expansion, heat-resistant Borofloat® glass

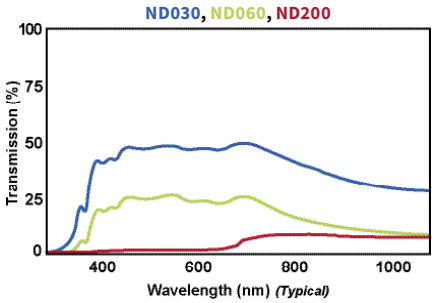
APPLICATIONS: Applications include imaging in intense lighting situations (i.e. molten metal and welding), outdoor aerial imaging and photography. Neutral Density Filters help reduce shutter speed to create blur, preventing a “jello” effect in aerial imaging.

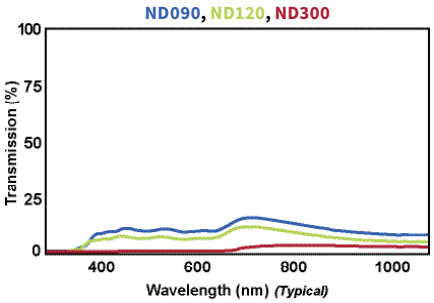
MOUNT & SIZE OPTIONS: Neutral Density Filters are in stock, ready to ship, and are available in Threaded Mounts, sizes M13.25 to M105; 25.4® C-Mounts; Slip Mounts; or Unmounted. Custom shapes and sizes are also available.

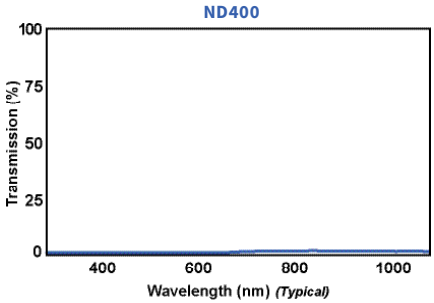


For more information, visit **midopt.com/neutral-density**

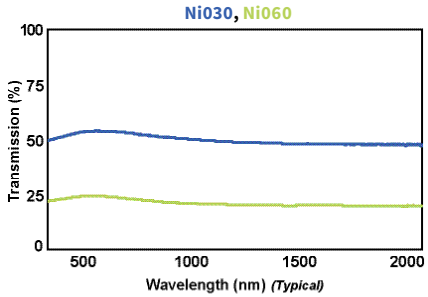
ND SERIES: VIS

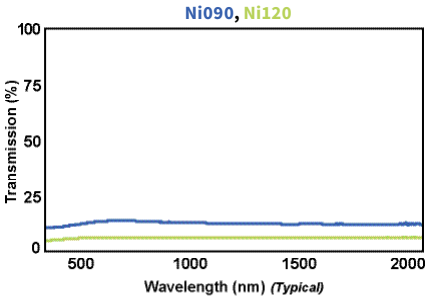


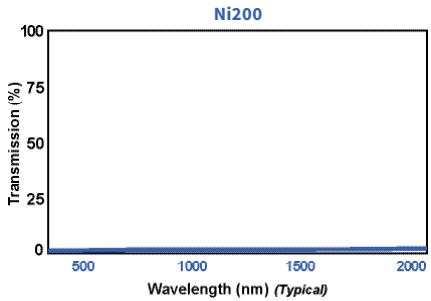




Ni SERIES: VIS-NIR







LIGHT BALANCING FILTERS

Light Balancing Filters correct artificial lighting so colors appear more natural. These filters balance color, preventing the need for additional software processing. This allows for greater image stability and control.

- Achieve accurate color images when using an artificial light source
- Increase contrast by correcting the emission spectrum of various lighting sources
- Exceptional surface quality; 40/20 scratch/dig

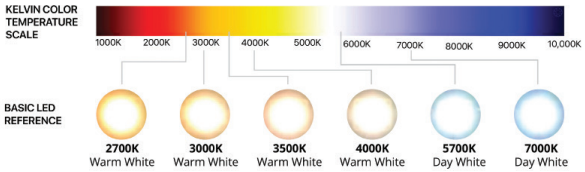
LA SERIES: Reduce blue shading ("warm" the scene). Commonly used with white LED and xenon strobe lighting.

LB SERIES: Subdue the reddish hue sometimes found with tungsten, halogen, sodium and other light sources.

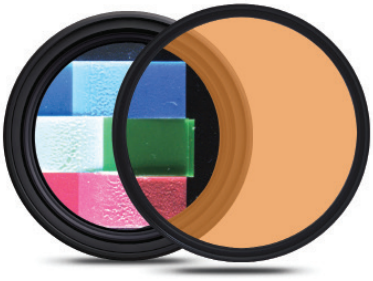
FL SERIES: Used to reduce the greenish cast created by fluorescent lighting.

APPLICATIONS: Light Balancing Filters are commonly used in color applications to create natural light (i.e. machine vision/factory automation, photography, progressive photonics and fluorescence imaging) where accurate color inspection is needed.

MOUNT & SIZE OPTIONS: Light Balancing Filters are in stock, ready to ship, and are available in Threaded Mounts, sizes M13.25 to M105; Slip Mounts; or Unmounted. Custom shapes and sizes are also available.



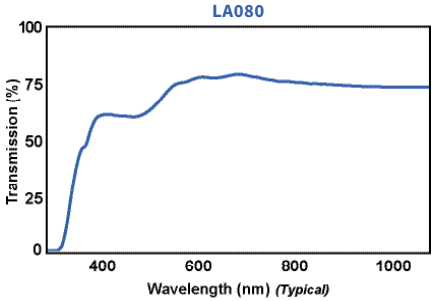
The tint of white depends on the color temperature of the light. When color temperature is high, more blue light exists.

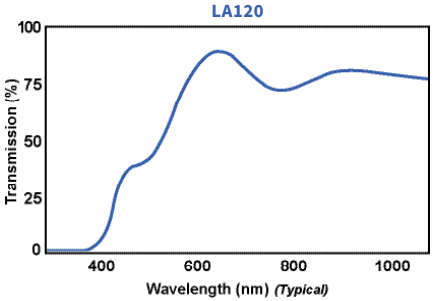


For more information, visit **midopt.com/light-balancing**

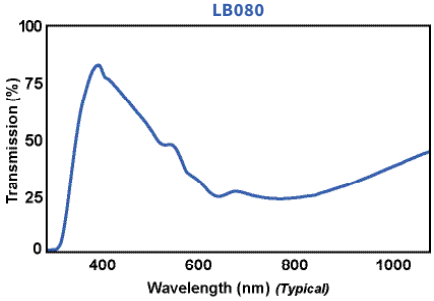
FILTERS & TRANSMISSION CURVES

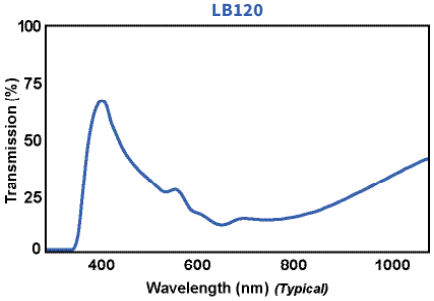
LA SERIES



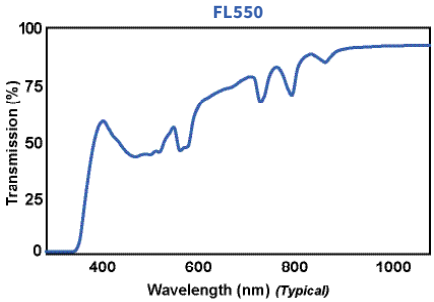


LB SERIES





FL SERIES



ACRYLIC FILTERS

StablEDGE® FILTER DESIGN

Acrylic Filters are durable, lightweight, and are an economical solution for inspection windows. They can protect lenses in environments where broken glass might pose a problem.

- High transmission ranging from 90-98%
- Offered in anti-reflection, oleophobic and hard coatings for transmission and durability
- Optical-grade acrylic
- Impact-resistant
- Half the weight of glass

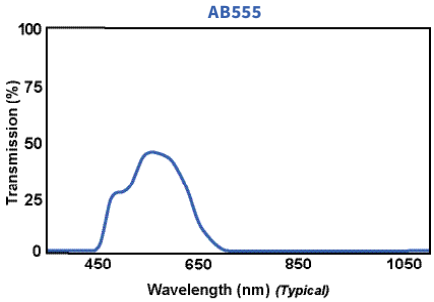
APPLICATIONS: Acrylic Filters are frequently used for lens protection and economical enclosure windows, as well as over lighting to control the wavelength emission of broad spectrum light sources. They are common in Food & Drug Administration (FDA) and European Food Safety Authority (EFSA) inspection applications where glass over the inspection area is not permitted.

MOUNT & SIZE OPTIONS: Acrylic Filters are in stock, ready to ship, and are available in Threaded Mounts, sizes M13.25 to M105 and in Slip Mounts. Acrylic Filters can be precision laser-cut to a desired size or configuration and are available for next day delivery.

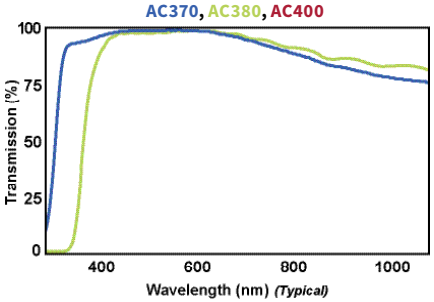
For more information, visit **midopt.com/acrylic**

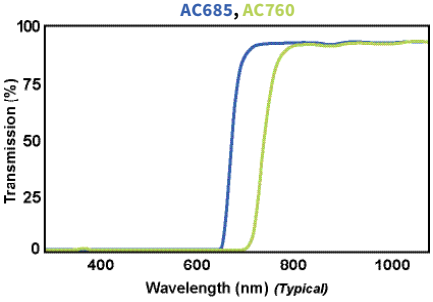
FILTERS & TRANSMISSION CURVES

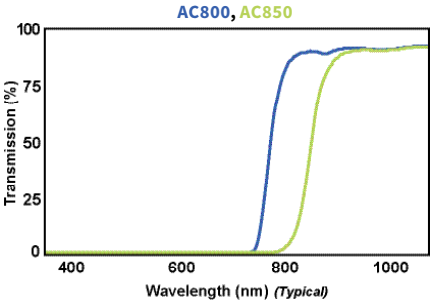
AB SERIES: ACRYLIC BANDPASS

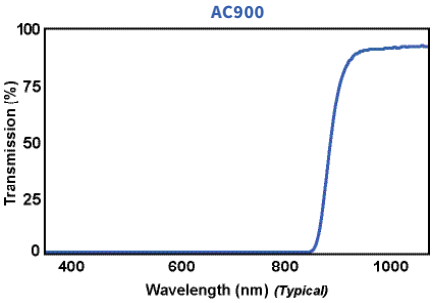


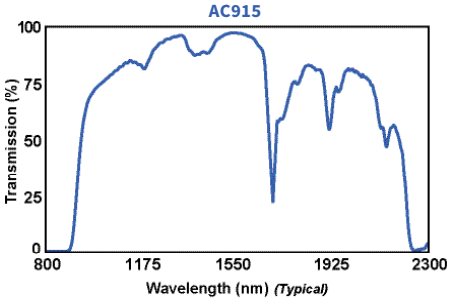
AC SERIES: ACRYLIC LONGPASS











PROTECTIVE FILTERS

Protective Windows are designed to shield lenses and enclosures from dirt, dust, liquids, impact and harsh environments without sacrificing image quality and are useful for imaging in the ultraviolet (UV), visible (VIS), near-infrared (NIR) and long-wave infrared (LWIR) spectrums. MidOpt offers a variety of glass and acrylic Protective Windows depending on the application and environment. Glass Protective Windows offer superior durability, can withstand high operating temperatures and are a great solution for applications requiring exceptional surface quality. Acrylic Protective Windows are a cost-effective, lightweight solution for protecting the lens. MidOpt Protective Windows are offered with anti-reflection (AR) and oleophobic (anti-smudge) coating options.

Left: No Coating | Right: Anti-Reflection Coating

Left: No Coating | Right: Oleophobic Coating

WINDOW TYPES

Acrylic

- Resistant to abrasions, breakage and solvents
- Half the weight of glass Protective windows
- Durable, economical, and precision laser cut to achieve any size and shape
- Optical-grade and anti-reflection coated
- Available with an oleophobic (anti-smudge) coating

Borofloat®

- Resistant to high impact, chemicals and alkalis
- Withstands temperatures of up to 450° C
- Transmits wavelengths ranging from UV, VIS and NIR
- Coated with a durable multi-layer anti-reflection coating
- Available with an oleophobic (anti-smudge) coating

Industrial-Grade Glass

- Economical glass Protective window for industrial applications
- Coated with a durable multi-layer anti-reflection coating
- Available uncoated or with an oleophobic (anti-smudge) coating

Precision Windows

- Made with precision polished N-BK7
- Low image distortion and stain-resistant
- Free of bubbles and inclusions
- Excellent transmission in the VIS and NIR
- Durable multi-layer anti-reflection coating

Fused Silica

- Ultra-low thermal expansion / shock resistant
- Withstands temperatures of up to 1100° C
- Superior transmission in the UV
- Available with a multi-layer anti-reflection coating

Sapphire

- Stronger than standard glass windows
- Durable surface to withstand harsh environments
- Resistant to high impact, chemicals and alkalis
- Transmits wavelengths ranging from UV, VIS and short-wave infrared (SWIR)

Germanium

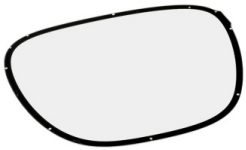
- Transmits wavelengths in the long-wave infrared (LWIR) used in thermal imaging applications
- Protects against abrasive airborne particles, salt water, and most acids
- Coated with a durable multi-layer anti-reflection coating
- Available with a DLC (diamond-like carbon) coating

	PART#	DESCRIPTION	USEFUL RANGE (nm)	CUT-ON WL 50% T	PEAK TRANSMISSION	SE
AC & LP SERIES – PROTECTIVE FILTERS						
○	**AC370**	Acrylic Oleophobic A/R Protective Window	380-850nm	370nm	≥98%	•
○	**AC380**	Acrylic A/R Protective Window	450-850nm	380nm	≥95%	•
○	**AC400**	Acrylic Oleophobic A/R Protective Window	415-1100nm	400nm	≥95%	•
○	**LP170**	Fused Silica Protective Window	200-2300nm	170nm	≥94%	•
○	**LP171**	Fused Silica Multi-Layer A/R Coated Protective Window	200-2300nm	170nm	≥94%	•
○	**LP190**	Sapphire Protective Window	250-2300nm	190nm	≥88%	•
○	**LP285**	Borofloat® Multi-Layer A/R Coated Protective Window	350-1100nm	285nm	≥98%	•
○	**LP286**	Borofloat® Oleophobic A/R Coated Protective Window	350-1100nm	285nm	≥98%	•
○	**LP330**	Industrial-Grade Glass Protective Window	350-1100nm	330nm	≥90%	•
○	**LP340**	Industrial-Grade Multi-Layer A/R Coated Glass Protective Window	350-800nm	340nm	≥98%	•
○	**LP341**	Industrial-Grade Oleophobic A/R Coated Glass Protective Window	350-800nm	340nm	≥98%	•
○	**LP345**	Precision Multi-Layer A/R Coated Glass Protective Window	350-800nm	340nm	≥98%	•
○	**LP390**	UV-Absorbing Protective Window	410-1100nm	390nm	≥90%	•
○	**LP415**	UV Dichroic Block Protective Window	415-1100nm	415nm	≥95%	
●	**LP8000**	Germanium DLC Coated LWIR Protective Window	7.5-12.5µ	5250nm	≥90%	•

For more information, visit **midopt.com/protective**

CUSTOM WINDOWS

MidOpt specializes in manufacturing custom Protective Windows, which can be designed for any type or size application at any wavelength range. MidOpt custom windows can be manufactured from different substrates and include various coatings depending on the application requirements.



SUBSTRATES

Borofloat® and Optical Glass

Useful Range: 350-2600nm

- Resistant to high impact, chemicals and alkalis
- Withstands temperatures of up to 450° C
- Tranparent in the near-UV, VIS and SWIR

Acrylic

Useful Range: 380-850nm

- Hard coated materials resistant to abrasion, breakage and solvents
- Half the weight of glass
- Durable, economical, and precision-laser-cut to

Fused Silica

Useful Range: 200-2300nm

- Ultra-pure material with low thermal expansion
- Scratch- thermal shock- and chemical-resistant
- Withstands temperatures up to 1100° C
- Superior transmission in the UV

Sapphire

Useful Range: 250-2300nm

- Hardest, most durable Protective Window available
- Withstands harsh environments
- Can be used in the UV, VIS, SWIR and MWIR

Germanium

Useful Range: 7500-12500nm

- DLC (Diamond Like Carbon) coating
- Withstands harsh environments
- Resistant to corrosion, chemicals, alkalis and most acids
- Transmits LWIR wavelengths

Industrial-Grade Glass

Useful Range: 350-1100nm

- Economical glass protection for industrial applications
- Eliminates glare and improves contrast and brightness when combined with A/R coatings

Also available in chemically-strengthened glass options, such as Gorilla Glass®

COATINGS

Oleophobic

Repels dirt, oil and finger print smudging

Anti-reflection

99% transmissivity, <1% reflection loss

Anti-fog

Prevents fogging and condensation build-up

Hydrophobic

Repels water and other liquids

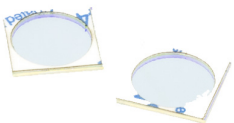
SILK SCREENING OPTIONS

- Borders
- Masking
- Fiducial Marks
- Logos and Patterns

Block or transmit specific wavelength ranges

ADHESIVE BACKING OPTIONS

A wide variety of high strength, double-sided, precision die-cut tapes that provide easy, resilient and long-lived bonding solutions for assembling glass to metal or plastic components without the need for traditional fasteners.



FILTER KITS

FK200 MACHINE VISION FILTER KIT

FK220 BN SERIES FILTER TEST KIT

FS100 MACHINE VISION FILTER SWATCH KIT

NS100 NEUTRAL DENSITY FILTER SWATCH KIT

SK100 SUPER FILTER TEST KIT

INCLUDES 70 FILTERS FOR UV, VISIBLE AND NEAR-IR IMAGING

FK100 MACHINE VISION FILTER BINDER KIT

FOR SIZES M22.5 TO M105

IK100 NEAR-INFRARED FILTER BINDER KIT

FOR SIZES M22.5 TO M105

NK100 NEUTRAL DENSITY FILTER BINDER KIT

FOR SIZES M22.5 TO M105

For more information, visit **midopt.com/filter-kits**

ACCESSORIES & OPTICS

EXTENSION RINGS

ROTATING RIGHT ANGLE ATTACHMENTS

STEP ADAPTER RINGS

CLOSE-UP LENS SET

LENS ENCLOSURES

CLEANING KITS

CUSTOM LENSES

WINDOWS

MIRRORS

PRISMS

WEDGES

LIGHT PIPES

DIFFUSERS

BEAMSPLITTERS

T/R	Thickness
50:50	0.5-3.0 mm
70:30	1.0-2.0 mm
30:70	1.0-2.0 mm
80:20	1.0-2.0 mm
20:80	1.0-2.0 mm

TEST GLASS RENTAL

MidOpt has more than 3,000 test glass radii in house, contact us for more information.

For more information, visit **midopt.com/accessories** | **midopt.com/custom-optics**

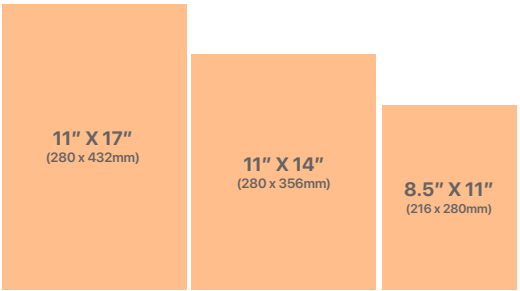
Backlight
fluore**SHEET**™

Backlights provide sharp contrast to outline a shape, edges or an opening. But applications with space constraints may dictate backlight utilization. MidOpt introduces the Backlight fluoreSHEET™ (BF590). When the fluoreSHEET™ is illuminated from the front with a blue LED light, it emits an orange fluorescence. A backlight effect can be created by using a MidOpt Orange Bandpass Filter (BP590) to capture the orange emission and block the blue LED excitation, giving the appearance of a bright white diffuse background in a monochrome image.

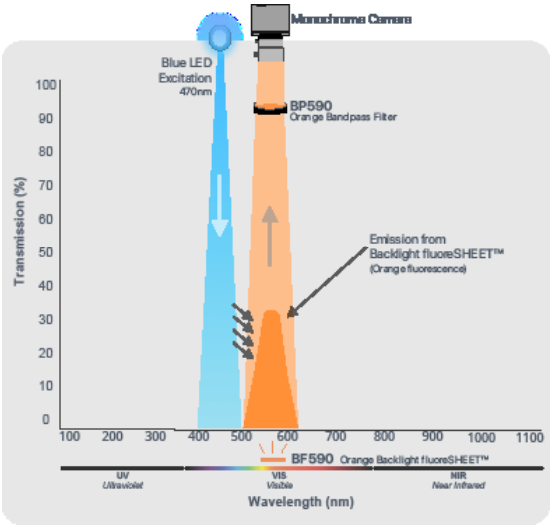
ATTRIBUTES

- Adhesive backing
- Repels water
- Tear-resitant
- Flexible

SIZES

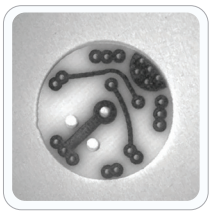


P/N: BF590-R432x280 P/N: BF590-R356x280 P/N: BF590-R280x216



The BP590 Orange Bandpass Filter is necessary to capture the orange wavelength that is being emitted from the fluoreSHEET™, while blocking the blue excitation from the LED light source. The result is a bright white diffuse background similar to the effect of backlight illumination.

White Background
Blue LED
No Filter



White Background
Blue LED
Orange Bandpass Filter (BP590)

Backlight fluoreSHEET™ (BF590)
Blue LED
Orange Bandpass Filter (BP590)

For more information, visit **midopt.com/accessories/backlight-fluoresheet**

MOUNTING SOLUTIONS

THREADED MOUNT

Designed for lenses with filter threads.

CREATE PART #: Select a filter, and add a mount size (e.g. M27)

Example: BP470-27

SLIP MOUNT

Designed for wide-angle lenses without filter threads.

CREATE PART #: Select a filter, use "S" for slip and add the outside diameter of the lens in millimeters. (e.g. S43mm)

Example: BP470-S43

25.4® C-MOUNT

Threads directly into any C-mount camera between the lens and sensor.

CREATE PART #: Select a filter, and add "-25.4"

Example: BP470-25.4

SOLUTIONS FOR M12 LENSES

Offered in aluminum slip mount over the lens.

CREATE PART #: Select a filter, use "S" for slip and add the outside diameter of the lens in millimeters followed by the letter "A". (e.g. S14mmA)

Example: BP470-S14A

UNMOUNTED

Designed for wide-angle lenses without filter threads.

CREATE PART #:

CIRCLE:
Use "D" and add diameter in mm (e.g. 19mm)
Example: BP470-D19

SQUARE:
Use "R" and add side measurement in mm (e.g. 15mm)
Example: BP470-R15

RECTANGLE:
Use "R" and add length in mm (e.g. 30mm) **x** width in mm (e.g. 15mm)
Example: BP470-R30x15

For more information, visit **midopt.com/mounts**

Mount Sizes

+ THREADED

Mount Size	Pitch
M13.25	0.5
M22.5	0.5
M25.5	0.5
M27	0.5
M30.5	0.5
M34	0.5
M35.5	0.5
M37	0.75
M37.5	0.5
M39	0.5
M40.5	0.5
M43	0.75
M46	0.75
M48	0.75
M49	0.75
M52	0.75
M55	0.75
M58	0.75
M62	0.75
M67	0.75
M72	0.75
M77	0.75
M82	0.75
M86	1.0
M95	1.0
M105	1.0

+ C-MOUNT

M25.4™

+ SLIP MOUNT

Outside Dia. Range	Threaded Mount
15.1-19.0	M22.5
19.1-26.5	M30.5
26.6-31.9	M40.5
32.0-40.9	M46
41.0-50.9	M55
51.0-57.9	M62
58.0-68.0	M72
68.1-79.0	M82
79.1-101.0	M105

+ M12 MOUNT

Outside Dia. Range	Part #
13.2-14.2	S14A
14.3-15.0	S15A

+ UNMOUNTED

Custom Shapes & Sizes Available

FILTER LINE-UP

KEY FEATURES

- StablEDGE® Technology
- Gaussian Design
- Anti-Reflection Coated
- 40/20 Scratch/Dig

PART #	DESCRIPTION	USEFUL RANGE (nm)	StablEDGE®	Gaussian	Anti-Reflection Coated	40/20 Scratch/Dig
BANDPASS | BP Series: Broad Bandwidth						
BP250	Deep-to-Near UV Bandpass	230-275		•		*
BP324	Near-UV Bandpass	290-365	•	•	•	•
BP340	Near-UV Bandpass	315-365	•	•	•	•
BP365	Near-UV Bandpass	335-400		•	•	•
BP450	Indigo Bandpass	425-470	•	•	•	•
BP470	Blue Bandpass	425-495	•	•	•	•
BP485	Absorptive VIS Bandpass/NIR Block	380-585	•	•	•	•
BP500	Green-Blue Bandpass	440-555	•	•	•	•
BP505	Cyan Bandpass	485-550	•	•	•	•
BP525	Light Green Bandpass	500-555	•	•	•	•
PE530	Photopic Response Filter	495-565	•	•	•	•
BP550	NIR/UV Block-Visible Bandpass	405-690			•	•
BP590	Orange Bandpass	560-600	•	•	•	•
BP635	Light Red Bandpass	615-645	•	•	•	•
BP660	Dark Red Bandpass	640-680	•	•	•	•
BP695	Near-IR Bandpass	680-720	•	•	•	•
BP735	Near-IR Bandpass	715-780	•	•	•	•
BP800	Near-IR Bandpass	745-950	•	•	•	•
BP850	Near-IR Bandpass	820-910	•	•	•	•
BP880	Near-IR Bandpass	845-930	•	•	•	•
BP1000	SWIR Bandpass	930-1030	•	•	•	•
BP1550	SWIR Bandpass	1485-1645	•	•	•	•
BANDPASS | BN Series: Narrow Bandwidth						
BN450	Narrow Indigo Bandpass	435-465	•	•	•	•
BN470	Narrow Blue Bandpass	460-490	•	•	•	•
BN520	Narrow Green Bandpass	510-545	•	•	•	•
BN532	Narrow Green Bandpass	525-550	•	•	•	•
BN535	Narrow Green Bandpass	520-545	•	•	•	•
BN595	Narrow Orange Bandpass	580-610	•	•	•	•
BN630	Narrow Light Red Bandpass	625-645	•	•	•	•
BN650	Narrow Dark Red Bandpass	638-672	•	•	•	•
BN660	Narrow Dark Red Bandpass	645-675	•	•	•	•
BN740	Narrow Near-IR Bandpass	730-755	•	•	•	•
BN785	Narrow Near-IR Bandpass	770-790	•	•	•	•
BN810	Narrow Near-IR Bandpass	798-820	•	•	•	•
BN850	Narrow Near-IR Bandpass	840-865	•	•	•	•
BN880	Narrow Near-IR Bandpass	855-890		•	•	•
BN940	SWIR Bandpass	928-955		•	•	•
BANDPASS | Bi Series: Narrow Interference						
Bi350	Near UV Interference Bandpass	344-358		•		•
Bi385	Near UV Interference Bandpass	370-392		•		•
Bi405	Violet Interference Bandpass	400-415		•		•
Bi450	Blue Interference Bandpass	445-465		•		•
Bi518	(Limited) Light Green Interference Bandpass	510-525		•		•
Bi520	Light Green Interference Bandpass	515-525		•		•
Bi550	Green Interference Bandpass	535-558		•		•
Bi615	Amber Interference Bandpass	605-620		•		•
Bi632	Light Red Interference Bandpass	625-640		•		•
Bi650	Red Interference Bandpass	643-665		•		•
Bi660	Dark Red Interference Bandpass	650-665		•		•
Bi685	Dark Red Interference Bandpass	675-692		•		•

* *80/50 Scratch/dig surface quality*

FILTER LINE-UP

PART #	DESCRIPTION	USEFUL RANGE (nm)	SE		A/R	40/20
BANDPASS | Bi Series: Narrow Interference *(continued)*						
Bi725	Red Edge Interference Bandpass	717-732		•		•
Bi750	Near-IR Interference Bandpass	740-765		•		•
Bi780	(Limited) Near-IR Interference Bandpass	765-795		•		•
Bi808	Near-IR Interference Bandpass	798-820		•		•
Bi830	Near-IR Interference Bandpass	810-850		•		•
Bi832	Near-IR Interference Bandpass	822-846		•		•
Bi850	Near-IR Interference Bandpass	845-860		•		•
Bi880	(Limited) Near-IR Interference Bandpass	870-890		•		•
Bi905	Near-IR Interference Bandpass	895-915		•		•
Bi940	Near-IR Interference Bandpass	930-952		•		•
Bi1300	SWIR Interference Bandpass	1290-1310		•	•	•
Bi1450	SWIR Interference Bandpass	1440-1460		•	•	•
Bi1550	SWIR Interference Bandpass	1540-1560		•	•	•
DUAL BANDPASS | DB Series: Dual Bandwidth						
DB395/870	Absorptive VIS + NIR	375-425, 745-970	•		•	•
DB475/850	Blue + 850nm NIR	460-490, 830-870		•		•
DB550/850	Green + 850nm NIR	535-565, 830-870		•		•
DB660/850	Red + 850nm NIR	645-675, 830-870		•		•
DB735	Visible + 735nm NIR	405-645, 725-755				•
DB850	Visible + 850nm NIR	405-645, 835-875				•
DB940	Visible + 940nm NIR	405-650, 925-965				•
TRIPLE BANDPASS | TB Series: Triple Bandwidth						
TB475/550/850	Blue + Green + 850 NIR	468-483, 543-558, 835-865		•	•	•
TB550/660/850	Green + Red + 850 NIR	543-558, 653-668, 835-865		•	•	•
LONGPASS | LP Series: Longpass						
LP170	Fused Silica Protective Window	200-2300	•			•
LP171	Fused Silica Multi-Layer A/R Coated Protective Window	200-2300	•			•
LP190	Sapphire Protective Window	250-2300	•			★
LP285	Borofloat® Multi-Layer A/R Coated Protective Window	350-1100	•		•	•
LP286	Borofloat® Oleophobic A/R Coated Protective Window	350-1100	•		•	•
LP330	Industrial-Grade Glass Protective Window	350-1100	•			•
LP340	Industrial-Grade Multi-Layer A/R Coated Glass Protective Window	350-800	•		•	•
LP341	Industrial-Grade Oleophobic A/R Coated Glass Protective Window	365-1100	•		†	•
LP345	Precision Multi-Layer A/R Coated Glass Protective Window	365-1100	•		†	•
LP347	Near-IR Protective Window	690-1090	•		†	•
LP390	UV-Absorbing Protective Window	410-1100	•			•
LP415	UV Dichroic Block	415-1100			•	•
LP470	Light Yellow Longpass	480-1100	•		•	•
LP500	Yellow Longpass	510-1100	•		•	•
LP515	Yellow-Orange Longpass	520-1100	•		•	•
LP530	Orange Longpass	545-1100	•		•	•
LP550	Orange Longpass	560-1100	•		•	•
LP580	Red-Orange Longpass	585-1100	•		•	•
LP590	Red Longpass	605-1100	•		•	•
LP610	Red Longpass	620-1100	•		•	•
LP630	Red Longpass	645-1100	•		•	•
LP645	Dark Red Longpass	650-1100	•		•	•
LP665	Dark Red Longpass	680-1100	•		•	•

★ *80/50 Scratch/dig surface quality* † *Oleophobic AR Coating*

FILTER LINE-UP

LONGPASS | LP Series: Longpass *(continued)*

PART #	DESCRIPTION	USEFUL RANGE (nm)	SE		A/R	40/20
LP695	Near-IR Longpass	715-1100	•		•	•
LP715	Near-IR Longpass	730-1100	•		•	•
LP780	Near-IR Longpass	800-1100	•		•	•
LP800	Near-IR Longpass	820-1100	•		•	•
LP815	Near-IR Longpass	825-1100	•		•	•
LP830	Near-IR Longpass	845-1100	•		•	•
LP850	Near-IR Longpass	870-1100	•		•	•
LP900	Near-IR Longpass	910-1100			•	•
LP920	Near-IR Longpass	930-2300			•	•
LP1000	SWIR Longpass	1010-2300	•		•	•
LP1070	SWIR Longpass	1100-2300	•		•	•
LP1475	SWIR Longpass	1490-2300			•	•
LP1475A	SWIR Longpass / Extended VIS Block	1490-2300			•	•
LP1850	SWIR Longpass	1900-12,000	•		•	•
LP8000	Germanium DLC Coated LWIR Protective Window	7.5-12.5µ	•		•	•

SHORTPASS | SP Series: VIS Pass

SP510	Blue Shortpass	340-500			•	•
SP570	Blue-Green Shortpass	410-560			•	•
SP585	Cyan Shortpass	395-575			•	•
NF550	Magenta Dichroic (Green Block)	395-475, 605-700			•	•

SHORTPASS | SP Series: VIS Pass / NIR Block

SP625	Blue-Orange Shortpass	425-620			•	•
SP635	Absorptive VIS Shortpass/NIR Block	380-585	•		•	•
SP644	Near-IR/MId-Red Dichroic Block	395-638			•	•
SP645	Near-IR/Mid-Red Dichroic Block	400-640			•	•
SP650	Near-IR/Mid-Red Dichroic Block	400-640			•	•
SP675	Near-IR/Deep Red Dichroic Block	420-660			•	•
SP700	Near-IR/UV Block-Visible Shortpass	405-690			•	•
SP701	Extended Hot Mirror	410-690			•	★
SP705	Near-IR/Deep Red Absorp. Block	370-630	•		•	•
SP730	Near-IR/Colorless Dichroic Block	400-710			•	•
SP785	Modified Near-IR Dichroic Block	425-770			•	•

NEUTRAL DENSITY | ND Series: VIS

ND030	Absorptive 50% Avg. Transmission	425-675	•			•
ND060	Absorptive 25% Avg. Transmission	425-675	•			•
ND090	Absorptive 12.5% Avg. Transmission	425-675	•			•
ND120	Absorptive 6.25% Avg. Transmission	425-675	•			•
ND200	Absorptive 1.0% Avg. Transmission	425-675	•			•
ND300	Absorptive 0.1% Avg. Transmission	425-675	•			•
ND400	Absorptive 0.01% Avg. Transmission	425-675	•			•

NEUTRAL DENSITY | Ni Series: VIS-NIR

Ni030	Low Reflectivity 50% Avg. Transmission	400-2000			•	•
Ni060	Low Reflectivity 25% Avg. Transmission	400-2000			•	•
Ni090	Low Reflectivity 12.5% Avg. Transmission	400-2000			•	•
Ni120	Low Reflectivity 6.25% Avg. Transmission	400-2000			•	•
Ni200	Reflective 1% Avg. Transmission	400-2000				•

PART #	DESCRIPTION	USEFUL RANGE (nm)	CONTRAST RATIO	A/R	40/20
POLARIZING FILTERS					
PR032	Linear Polarizer	400-700	Up to 3000:1		•
PR120	Ultra High Contrast Linear Polarizer	400-700	Up to 10,000:1	†	★
PC052	Circular Polarizer	400-700	Up to 700:1		•
PR1000	VIS-NIR Wire Grid Linear Polarizer	400-2000	Up to 8000:1	†	★

★ *60/40 Scratch/dig surface quality* † *Oleophobic AR Coating*

FILTER LINE-UP

POLARIZING FILM

PART #	DESCRIPTION	USEFUL RANGE (nm)	CONTRAST RATIO	A/R	80/50
PS007	High Contrast Linear Polarizer Film .007" thk	400-700	Up to 3000:1		●
PSA007	High Contrast Linear Polarizer Film .007" thk *(self adhesive)*	400-700	Up to 3000:1		●
PS010	High Contrast Linear Polarizer Film .010" thk	400-700	Up to 3000:1		●
PS030	Ultra High Contrast Linear Polarizer Film .030" thk	400-700	Up to 7000:1		●
HT025	High Temp. Linear Polarizer Film .025" thk	400-700	Up to 5000:1		
HT008	High Temp. Linear Polarizer Film .008" thk	400-700	Up to 10,000:1		●
HTA008	High Temp. Linear Polarizer Film .008" thk (*self adhesive*)	400-700	Up to 10,000:1		●
PG120	Ultra High Contrast Glass Linear Polarizer	400-700	Up to 10,000:1	†	●
PS1000	VIS-NIR Wire Grid Linear Polarizer Film Polarizer	400-2000	Up to 8000:1		●
PSA1000	VIS-NIR Wire Grid Linear Polarizer Film Polarizer *(self adhesive)*	400-2000	Up to 8000:1		●
PG1000	VIS-NIR Wire Grid Glass Linear Polarizer	400-2000	Up to 8000:1	†	●

† *Oleophobic AR Coating*

ACRYLIC POLARIZERS

PART #	DESCRIPTION	USEFUL RANGE (nm)	CONTRAST RATIO	A/R	80/50
PA371	Ultra-High Contrast Oleophobic Coated Acrylic Liner Polarizer	400-700	10,000:1	†	●
PA385	Ultra-High Contrast Cell Cast Acrylic Linear Polarizer	400-700	10,000:1	●	●
PA401	Ultra-High Contrast Oleophobic Coated Acrylic Linear Polarizer	400-700	10,000:1	†	●
PA1000	VIS/NIR Wire Grid Oleophobic Coated Acrylic Linear Polarizer Window	400-2000	8,000:1	†	●

† *Oleophobic AR Coating*

PROTECTIVE | AC & LP Series: Protective Filters

PART #	DESCRIPTION	USEFUL RANGE (nm)	SE		A/R	40/20
AC370	Acrylic Oleophobic A/R Protective Window	380-850	●		†	★
AC380	Acrylic A/R Protective Window	450-850	●		●	★
AC400	Acrylic Oleophobic A/R Protective Window	415-1100	●		†	●
LP170	Fused Silica Protective Window	200-2300	●			●
LP171	Fused Silica Multi-Layer A/R Coated Protective Window	200-2300	●			●
LP190	Sapphire Protective Window	250-2300	●			★
LP285	Borofloat® Multi-Layer A/R Coated Protective Window	350-1100	●		●	●
LP286	Borofloat® Oleophobic A/R Coated Protective Window	350-1100	●		●	●
LP330	Industrial-Grade Glass Protective Window	350-1100	●			●
LP340	Industrial-Grade Multi-Layer A/R Coated Glass Protective Window	350-800	●		●	●
LP341	Industrial-Grade Oleophobic A/R Coated Glass Protective Window	365-1100	●		†	●
LP345	Precision Multi-Layer A/R Coated Glass Protective Window	365-1100	●		†	●
LP390	UV-Absorbing Protective Window	410-1100	●			●
LP415	UV Block	415-1100			●	●
LP8000	Germanium DLC Coated LWIR Protective Window	7.5-12.5µ	●		●	●

★ *80/50 Scratch/dig surface quality* † *Oleophobic AR Coating*

FILTER LINE-UP

LIGHT BALANCING

PART #	DESCRIPTION	USEFUL RANGE (nm)	SE		A/R	80/50
LA080	Light Balancing (Minus Blue)	400-700	•			•
LA120	Light Balancing (Minus Blue)	400-700	•		•	•
LB080	Light Balancing (Minus Red)	400-700	•			•
LB120	Light Balancing (Minus Red)	400-700	•			•
FL550	Light Balancing (Minus Green)	400-700	•			•

ACRYLIC | AB Series: Acrylic Bandpass

PART #	DESCRIPTION	USEFUL RANGE (nm)	SE		A/R	80/50
AB555	Acrylic Absorptive NIR/UV-Block Visible Bandpass	470-645	•	•		•

ACRYLIC | AC Series: Acrylic Longpass

PART #	DESCRIPTION	USEFUL RANGE (nm)	SE		A/R	80/50
AC370	Oleophobic A/R Acrylic Protective Window	380-850	•		†	•
AC380	A/R Acrylic Protective Window	450-850	•		•	•
AC400	Acrylic Oleophobic A/R Protective Window	415-1100	•		†	•
AC685	Acrylic Near-IR Longpass	710-1100	•			•
AC760	Acrylic Near-IR Longpass	780-1100	•			•
AC800	Acrylic Near-IR Longpass	815-1100	•			•
AC850	Acrylic Near-IR Longpass	880-1100	•			•
AC900	Acrylic SWIR Longpass	930-1650	•			•
AC915	A/R Acrylic SWIR Longpass	960-1650 1750-1890 1925-2090	•		•	•

† *Oleophobic AR Coating*

DIFFUSERS | DF Series

PART #	DESCRIPTION	THICKNESS	TOTAL LIGHT TRANSMISSION	TOTAL DIFFUSE TRANSMISSION
DF035	Acrylic Diffuser	.8mm	35%	33%
DF045	Acrylic Diffuser	2mm	45%	43%
DF050	Acrylic Diffuser	1.5mm	50%	48%
DF055	Acrylic Diffuser	1mm	55%	53%
DF065	Acrylic Diffuser	1mm	65%	62%
DF070	Acrylic Diffuser	1mm	70%	67%
DF075	Acrylic Diffuser	1mm	75%	72%
DF080	Acrylic Diffuser	1mm	80%	77%
DF085	Acrylic Diffuser	1mm	85%	81%
DF090	Acrylic Diffuser	1mm	90%	87%
DF093	Acrylic Diffuser	1mm	93%	90%

Filter Performance

The performance of a filter is based on what happens to light passing through the filter. The apparent color of light reflected off the surface is not a reliable way to judge the filter's capabilities. Batch-to-batch difference in the apparent color of the coatings or filter substrates can often be easily seen when looking at two examples of the same filter type. The color of the coating does not indicate a disparity in performance. Standard surface quality for most filters is 40/20 scratch/dig. Filters 62mm and greater have a surface quality tolerance of 60/40 scratch/dig.

Due to continuous product improvement, specifications are subject to change without notice. For the most up-to-date information, **visit midopt.com**

FILTERS: A NECESSITY,
NOT AN ACCESSORY.

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