

ANDOVER CORPORATION
Quality Optical Filters and Coatings



2012 - 2013

Andover Corporation

Why Choose Us...

As a recognized leader in the manufacture of high-quality optical filters and coatings, Andover Corporation has built an international reputation by consistently raising the bar—both for our products and for our people. We take it as a personal challenge to innovate along with our customers, designing and delivering precision solutions for use in air, water, and gas analyzers, chemical analysis, machine vision, medical diagnostics, and astronomy. Whether you need just one custom filter or thousands of off-the-shelf products, you have our guarantee of excellent craftsmanship, exceptional performance, and unsurpassed service with every order.

Large or small, domestic or foreign, the companies that purchase our products consistently tell us that they value the following key Andover advantages:

Andover Corporation
4 Commercial Drive
Salem, New Hampshire 03079-2800

Tel: 603.893.6888
Fax: 603.893.6508
US toll-free: 888.893.9992
International: +00.1.603.893.6888

Email: techstaff@andovercorp.com
www.andovercorp.com



Custom Design Expertise

Our talented and highly skilled engineers can meet your most demanding requirements for custom filters and coatings. With more than 30 years in business, we've designed products for advanced applications such as medical instrumentation, machine vision, fluorescence studies, astronomical observation, telecommunications, and space-borne and defense systems.

Exceptional Reliability

Andover's filters and coatings far exceed the industry standards for quality and performance. This precision reflects the fact that Andover Corporation is one of the few optical filter manufacturers in the world to design our own state-of-the-art equipment that allows us to control the entire production process.

Extensive Standard Offering

Andover maintains an inventory of over a thousand different optical filters. Bandpass, Dichroic, Edge, Heat control, and Calibration filters are just a few of the product categories that are in stock and ready for immediate shipping.

Thank you!

Thank you for your interest in our latest catalog of products and services. We value your patronage and take great pride in responding quickly to any questions you may have; especially if you require a customized solution. So, if there is a type of filter you need but don't see available, please let us know.

We also welcome any comments you might have about how we may serve you better.

-The Andover Corporation Team

Attention to Service

Flexibility is the hallmark of our company. Our highly experienced technical sales staff will help you get the right products you need, at the right time and the right price. And, when you call Andover, you can be confident that a knowledgeable staff member will always be available to answer your questions.

Extras Making the Difference

Unlike most optical filter manufacturers, we supply exact spectral curve data with all orders at no additional charge, saving you the cost of incoming quality control. We'll even help you reduce inventory by shipping your order only when you require it.

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A ndover Corporation

Andover Corporation was established in 1976 with the purpose of designing and manufacturing high-quality optical filters and coatings. As the company has grown, the focus has remained on quality. Our current facility spans 44,000 square feet on 17 acres of land in Salem, NH.

Our facility is custom-designed and state-of-the-art, and includes automated coating, glass polishing, and fabrication equipment. Our testing capabilities are extensive, including both automated spectrophotometers for broadband spectral measurements, and ultra-high-resolution spectrophotometers for narrowband measurements. Our optical metrology lab features a custom-designed, computer-controlled tunable interferometer to measure transmitted wavefronts beyond the capabilities of a traditional laser interferometer.

We manufacture filters and coatings for a wide variety of applications; including medical instrumentation, fluorescence studies, machine vision, astronomical observation, telecommunications, space-borne systems and defense systems.

Frequently Asked Questions

- How do you distinguish between an image quality and a commercial quality filter?

Image quality filters are ideal for applications that require high resolution, such as astronomical observations. To make these products, we fabricate high-quality optical glass to ensure the substrate is extremely flat and parallel, and then apply anti-reflective coatings on the external surfaces to reduce ghost images and maximize energy throughput. Commercial quality filters can have the same spectral characteristics as image quality filters, but they are designed for use in instruments rather than imaging applications. (See page 26 for details.)

- What do I need to do to maintain my filters in good condition?

We recommend cleaning your filters about every three months. If the environment is particularly dusty or you often shift the filters between applications, more regular cleaning may be warranted. We suggest that you apply acetone, methanol, or alcohol to a soft tissue and then rub the filter using a circular motion.

- Are there any particular environmental conditions to consider when using a filter?

It's important to avoid prolonged exposure to high humidity and large temperature variations. To reduce the risk of damage due to thermal shock, we recommend a maximum operating temperature of 70°C and a maximum temperature change of 5°C per minute.

- Does it matter which way I mount a filter?

As a rule, the highly reflective (shinier) side of the filter should face the source of radiation. This minimizes the thermal load on the absorbing glass blocking components and epoxies, extending the life of the filter.

- When placing an order, why do I need to include the operating temperature?

The center wavelength of an interference filter shifts linearly with changes in ambient temperature. Our filter designs take this into consideration to ensure proper performance at your specific operating temperature.

- When can I expect to receive my order?

Standard products ship within two to three days of receipt of order.

- How quickly can I get a quote?

We respond within 24 hours and deliver a written estimate within two to three days.

- Do you offer discounts on surplus stock?

Andover offers generous price terms on our surplus inventory. Just visit our website at www.andovercorp.com/search/ and plug in the desired wavelength to see what's available.

- Do you charge a premium for small quantities?

No, there is no extra charge -- even when you order a single item.

- How do I send custom specifications for quoting?

You can do this one of two ways:

1. Email your request to sales@andovercorp.com
2. Fax your specifications to 603.893.6508
Attn: Technical Sales Dept.

- Do you provide a small quantity for prototyping?

Yes, once you approve the pricing for your order, we will be happy to provide a few prototype pieces.

Custom Capabilities



Our Custom Advantage

While stocking over 1,000 standard filters, Andover Corporation has built a worldwide reputation for developing custom, often state-of-the-art, filters and coatings.

With our extensive engineering experience and advanced manufacturing facility, we control the entire production process to ensure that you receive only the highest-quality products, attentive service, and timely delivery.

- Fully automated systems for excellent repeatability and rapid turnaround
- Continuously updated manufacturing processes
- Products that far exceed industry standards for quality

Optical Fabrication

Whether you need a filter that's 5mm or 300mm, Andover has fully automated CNC equipment to fabricate exactly what you want, at the quality you want, and using the optical material of your choice.



Specialized Coatings

With our computer-controlled systems, we can quickly produce a variety of high-quality coatings in sizes up to 300mm with excellent repeatability using any process from thermal evaporation to magnetron sputtering.



Machine Fabrication

Andover's 3-axis machining centers allow us to fabricate complex tooling quickly and accurately, greatly reducing the lead time for custom components.



Optical Polishing

Andover's in-house polishing facility can achieve flatness up to $\lambda/10$ wave per inch and parallelism of 10 arc seconds or better, with a surface quality of 40/20.



Andover Corporation's quality testing starts at the raw material and continues through the finished product.

Total Quality Control

To ensure total quality control, most of our equipment is either custom designed or custom constructed to our exact specifications.



We check all filter glass for striae, bubbles and inclusions using our tunable interferometer and custom-designed inclusion tester. These instruments detect minute defects, even in materials that do not transmit visible light.



State-of-the-Art Testing

Most interferometers rely on laser light to produce interference fringes. Since they do not transmit the laser wavelength, many bandpass filters cannot be measured with these instruments. To solve this problem, we have constructed a computerized, tunable white light interferometer that produces actual transmitted wavefront interferograms of filters at any wavelength in the range of 350nm–1100nm.



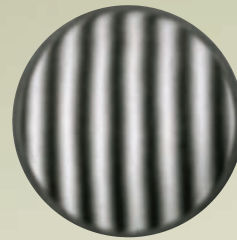
Our in-house environmental chambers allow us to perform routine and custom product testing at temperatures from -62°C to over 500°C. This along with the ability to vary humidity levels ensures compliance with your custom specification or MIL standard.



Image Quality Filters

Have demanding custom imaging requirements?

Image quality filters are ideal for applications that require high resolution, such as astronomical observations, video monitoring systems, high-resolution photography, and other imaging applications. To meet these demanding requirements, Andover Corporation has developed a line of custom Image Quality (IQ) filters using high-grade optical material that is both striation and inclusion-free. The surfaces are ground and polished to a transmitted wavefront of $\lambda/4$ per inch and parallel to 30 arc seconds or better. The internal coating positions are optimized and the exterior surfaces antireflection coated to eliminate multiple images and fringe patterns, and maximize energy throughput. For very high-resolution applications, we can also provide image quality filters with a transmitted wavefront of $\lambda/10$ and parallelism of 10 arc seconds. While commercial quality filters can have the same spectral characteristics as image quality filters, they are designed for use in instruments rather than imaging applications.

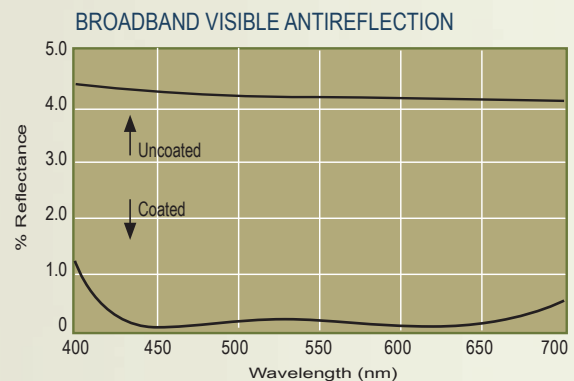


All filters come with test documentation

Contact our Technical Sales Staff to discuss your specific requirements: 1.888.893.9992 (US) or +00.1.603.893.6888 (Outside US)

ANTIREFLECTIVE COATINGS

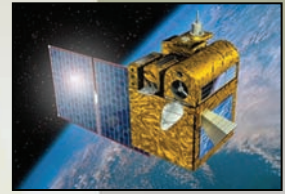
Thin-film coatings are an effective way to limit reflections while also improving optimal system performance. Andover Corporation manufactures a variety of antireflective coatings designed for high efficiency, mechanical durability, and environmental stability.



A few examples of Andover's achievements

SOLar Diameter Imager and Surface Mapper (SODISM) on the PICARD satellite

PICARD is an investigation dedicated to the simultaneous measurement of the absolute total and spectral solar irradiance, the diameter and solar shape, and to the Sun's interior probing by the helioseismology method. These measurements obtained all along the mission will allow the study of their variations as a function of the solar activity.

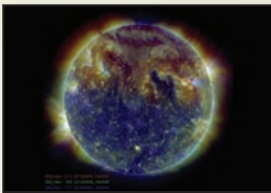
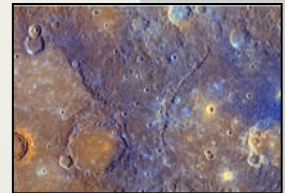


Helioseismic and Magnetic Imager (HMI)

The primary goal of the HMI investigation is to study the origin of solar variability and to characterize and understand the Sun's interior and the various components of magnetic activity. The HMI investigation is based on measurements obtained with the HMI instrument as part of the Solar Dynamics Observatory (SDO) mission.

MERCURY Surface, Space ENVIRONMENT, GEOchemistry and Ranging (MESSENGER)

MESSENGER launched on August 3, 2004. Its mission is to analyze the surface of Mercury, to better understand our own planet. It carries seven instruments, one of which is the Mercury Dual Imaging System (MDIS), a camera with wide and narrow fields-of-view, for monochrome, color and stereo imaging.

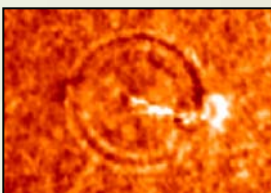


The Atmospheric Imaging Assembly (AIA) for the Solar Dynamics Observatory (SDO)

SDO is designed to provide an unprecedented view of the solar corona, taking images that span at least 1.3 solar diameters in multiple wavelengths nearly simultaneously, at a resolution of about 1 arcsec and at a cadence of 10 seconds or better. These data will significantly improve our understanding of the physics behind the activity displayed by the Sun's atmosphere, which drives space weather in the heliosphere and in planetary environments.

The Cross-track Infrared Sounder (CrIS)

CrIS is a Michelson interferometer infrared sounder that is part of the Cross-track Infrared Microwave Sounding Suite (CrIMSS). The objective of CrIMSS is to provide global three dimensional soundings of atmospheric temperature and moisture as well as provide data on other geophysical parameters.



The Michelson Doppler Imager (MDI)

MDI is part of an international collaboration to study the interior structure and dynamics of the Sun. The MDI team was responsible for the design and fabrication, and now for the operation, of the MDI instrument on board the Solar and Heliospheric Observatory (SOHO) spacecraft.

About Bandpass Filters



Bandpass Filters

The use of bandpass filters is one of the simplest and most economical ways to transmit a well-defined band of light and to reject all other unwanted radiation. Their design is essentially a thin film Fabry-Perot interferometer formed by vacuum deposition, and consists of two reflecting stacks separated by an even-order spacer layer.

Because the Fabry-Perot filter is essentially Lorentzian in shape, the cut-on and cut-off slopes are shallow and the rate of attenuation in the out-of-band blocking range is slow. To improve the slopes and increase the attenuation in the blocking band, we introduce more cavities into the construction of our standard dielectric bandpass filters.

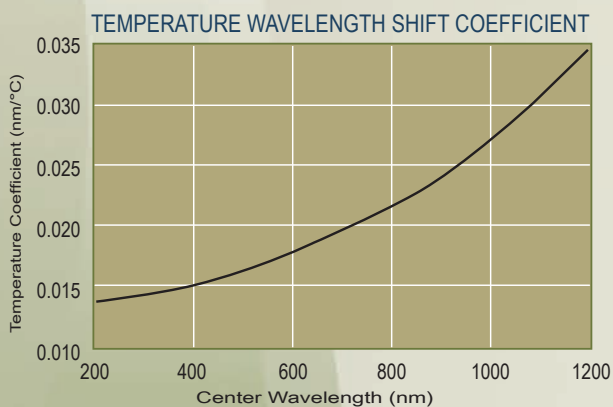
Environmental Considerations

Ambient temperature and optical path geometry are important factors to consider in selecting or specifying bandpass filters.

Ambient Temperature

The center wavelength of a bandpass filter shifts linearly with changes in ambient temperature—up with a positive change and down with a negative change. The temperature coefficient chart below gives a good approximation of the shift in wavelength for a given temperature change.

To counter these effects, Andover has developed temperature controllers that help to maintain the ambient temperature of bandpass filters. (For more information, see page 66).



Angle of Incidence

The central wavelength of the all-dielectric Fabry-Perot filter shifts lower with an increase in the incident angle. The amount of shift depends upon the incident angle and the filter's effective index (N^*). This feature can be very useful in tuning a filter to the desired central wavelength. Use the formula below to determine the wavelength shift of a filter in collimated light with incident angles up to 15° .

$$\lambda_\theta = \lambda_0 \left[1 - \left(\frac{N_e}{N^*} \right)^2 \sin^2 \theta \right]^{\frac{1}{2}}$$

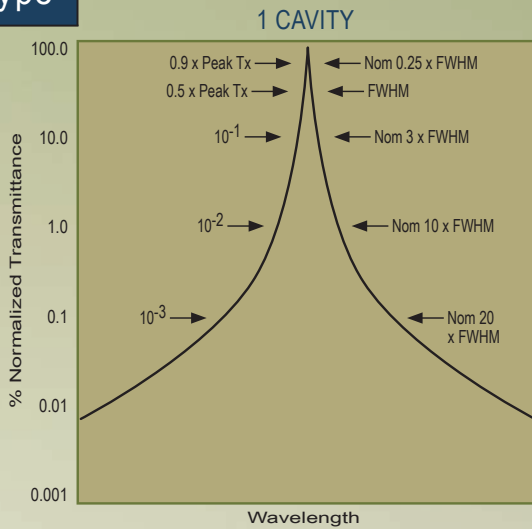
Where:

- λ_θ = Wavelength at angle of incidence
- λ_0 = Wavelength at normal incidence
- N_e = Refractive index of external medium
- N^* = Effective refractive index of the filter
- θ = Angle of incidence

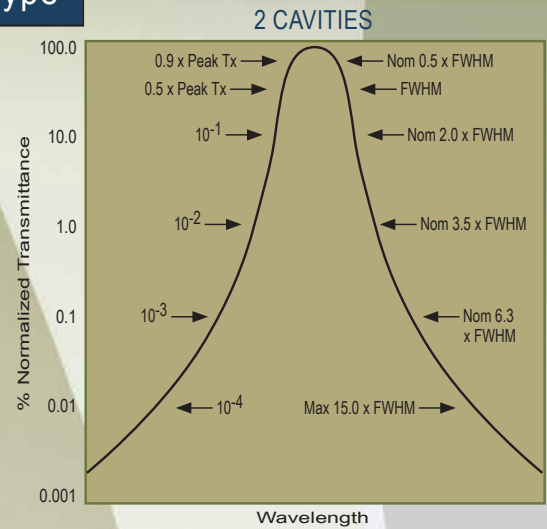
When using a filter with non-collimated light, the wavelength shift will appear somewhat less than that of collimated light at the same angle. In a cone of light, only the central ray is normal to the surface while all others are increasingly off-angle. To approximate this shift, use this same formula and divide the results by two. (This approach works in systems where the full cone angle is up to 20°).

Spectral Profiles for Andover's 10 Basic Filter Types

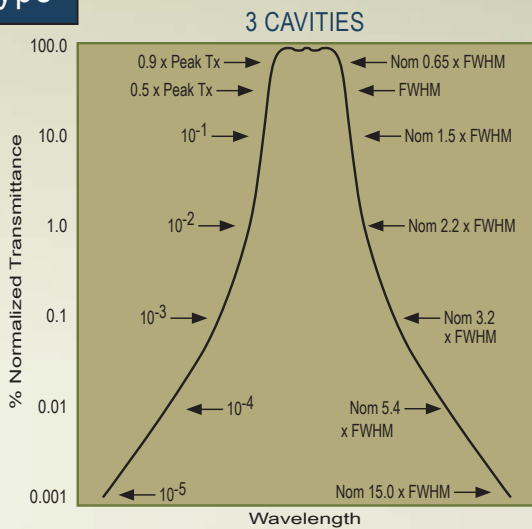
1 Type



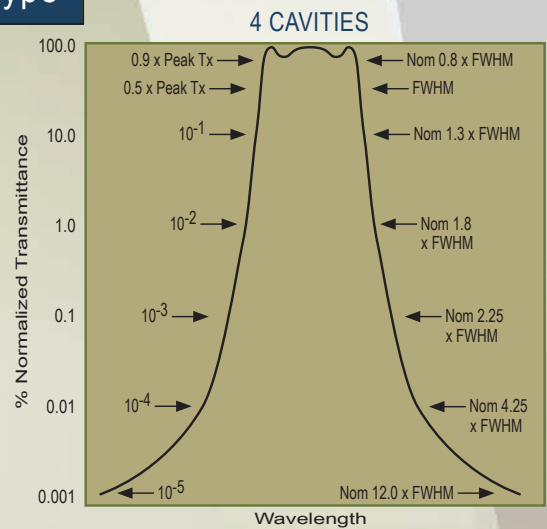
2 Type



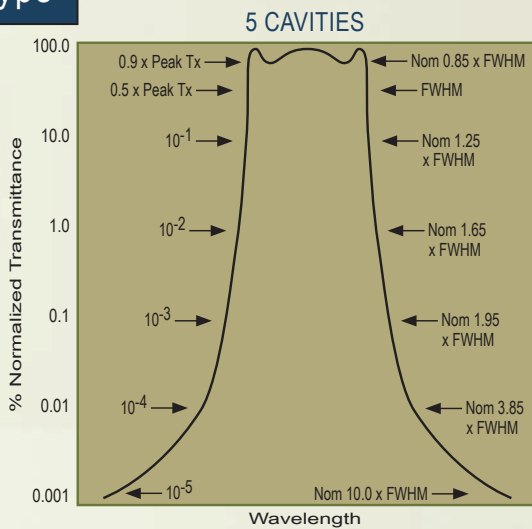
3 Type



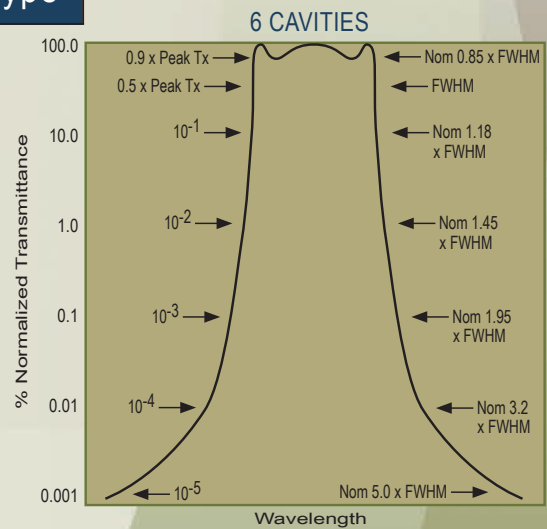
4 Type



5 Type



6 Type

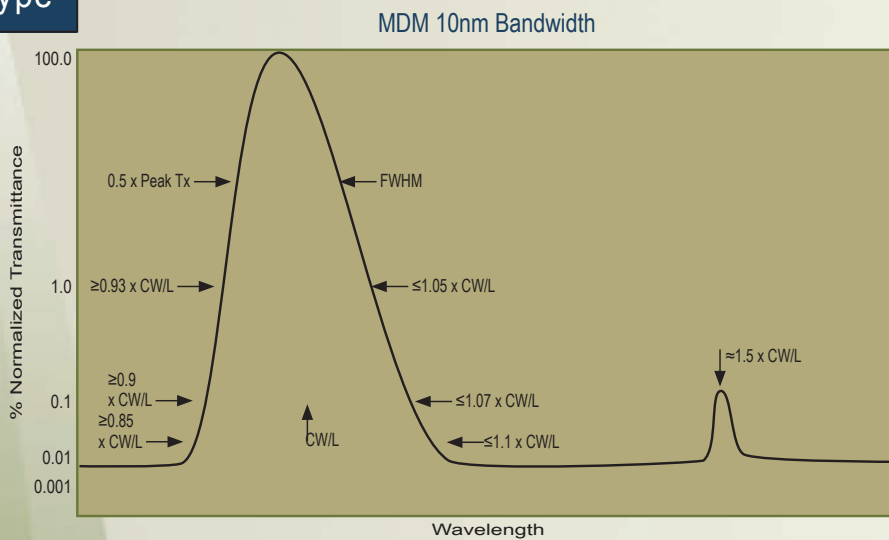


Filter types 1-6 represent unblocked filter profiles. Bandshape may vary depending upon level of additional blocking.

Normalized Transmittance of Peak (%)	Full Bandwidth Multiplier (Nominal)					
	1 Cavity	2 Cavities	3 Cavities	4 Cavities	5 Cavities	6 Cavities
90.0	0.25 nom.	0.5 nom.	0.65–0.70	0.8–0.9	0.85–0.90	0.85–0.90
10.0	2.5–3.0	1.6–2.0	1.2–1.5	1.1–1.3	1.1–1.25	1.1–1.25
1.0	8.0–10.0	2.8–3.5	1.9–2.2	1.5–1.8	1.5–1.65	1.5–1.65
0.1	15.0–20.0	5.5–6.3	2.9–3.2	2.0–2.25	2.0–2.25	2.0–2.25
0.01	undefined	10.0–15.0	4.9–5.4	3.5–4.25	3.1–3.85	2.9–3.2
0.001	undefined	undefined	10.0–15.0	9.0–12.0	8.0–10.0	4.0–5.0

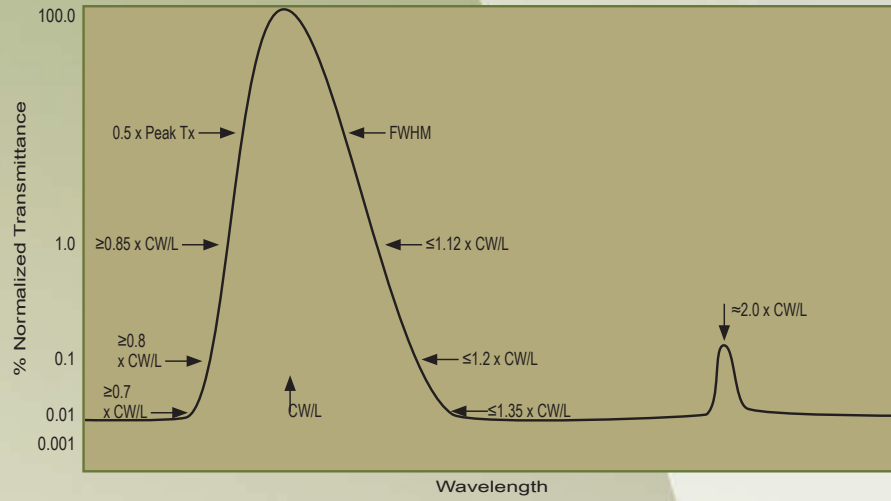
MDM filters are a special type of bandpass filter utilizing dielectric layers (D) surrounded by metallic layers (M). They provide excellent throughput over a wide spectral range while providing good out-of-band blocking.

7 Type



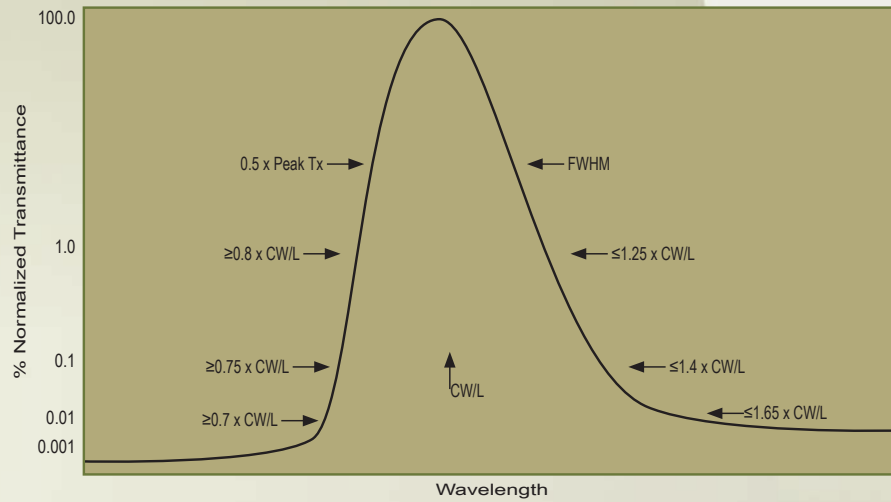
8 Type

MDM 25nm Bandwidth



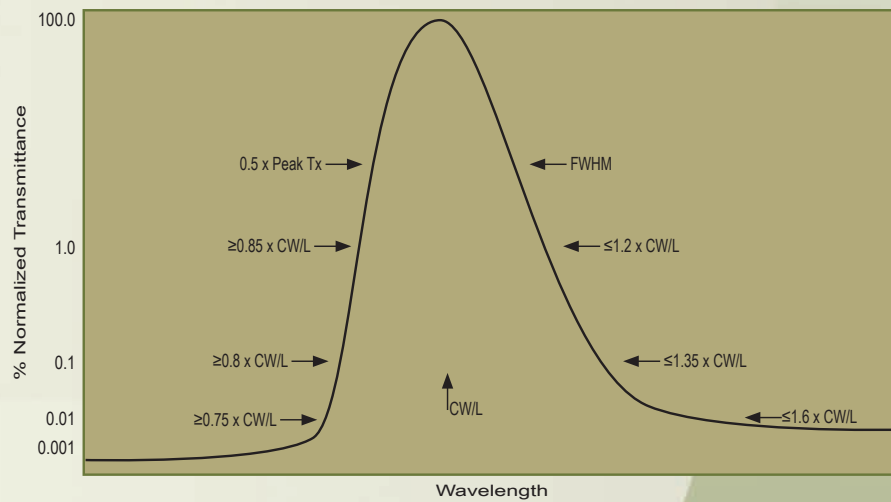
9 Type

MDM 40-70nm Bandwidth



10 Type

MDM 80-100nm Bandwidth



Standard Bandpass Filters



Standard Bandpass Filters

Andover offers one of the most extensive selections of bandpass filters in the industry, including many of the primary laser, mercury, biomedical, and analytical spectral lines.

We use a proprietary method to stabilize our products to prevent drift of peak wavelength with age and hermetically seal each filter for maximum protection against humidity. Each filter is mounted in a black anodized aluminum ring, adding further protection against chipping, scratching, and moisture penetration.

- Wavelengths from the ultra-violet through the infrared
- Stabilized to prevent drift of peak wavelength over time
- Hermetically sealed and protected by an anodized aluminum ring

GENERAL SPECIFICATIONS

Diameter Tolerance	+0/- .25mm	
Usable Aperture	<u>Filter Size</u>	<u>Usable Aperture</u>
	12.5mm Ø	9.0mm Ø
	25.0mm Ø	21.0mm Ø
	50.0mm Ø	45.0mm Ø
Surface Quality	80–50 (Per MIL-PRF-13830B)	
Optical Quality	Commercial instrumentation grade	
Out-of-Band Blocking	1 x 10 ⁻⁴ avg. from X-ray to FIR	
Specification Temperature	+23°C	
Max. Survival Temp Range	CW/L 214–380nm	-50°C to +50°C
	CW/L 380.1–2400nm	-50°C to +70°C
Humidity Resistance	Per MIL-C-48497A	
Mechanical	Mounted in an anodized aluminum ring	
Optional:	Mounted in threaded ring - see pg 55 for thread sizes	

Applications

Spectral Radiometry
 Medical Diagnostics
 Chemical Analysis
 Colorimetry



Standard Bandpass Sets



If you're looking to purchase more than just a few filters, may we suggest Building Your Own Set and SAVE! All filter sets are favorably discounted and include a complete spectral curve data sheet for each filter. They also come with a quality hardwood case for secure storage.



Sets	Size, Shape & Part Number		
	12.5mm Ø ○	25mm Ø ○	50mm Ø ○
6-Piece Set	000FS06-12.5	000FS06-25	000FS06-50
8-Piece Set	000FS08-12.5	000FS08-25	000FS08-50
12-Piece Set	000FS12-12.5	000FS12-25	000FS12-50

Choose from the following Part Numbers to build your own 6, 8 or 12 piece set. In making your selections, please keep in mind that each set you create must contain the same size filters to qualify as a set.

STANDARD BANDPASS FILTERS

Line	CWL (nm)	FWHM	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (nm)	Size, Shape & Part Number		
							12.5mm Ø ○	25mm Ø ○	50mm Ø ○
-	193.0 +3/-5	15 ±3	MDM/7	12	-	4.0	193FS15-12.5	193FS15-25	193FS15-50
-	200.0 +3/-0	10 ±2	MDM/7	12	-	4.0	200FS10-12.5	200FS10-25	200FS10-50
Zn	214.0 +3/-0	10 ±2	MDM/7	12	-	4.0	214FS10-12.5	214FS10-25	214FS10-50
Zn	214.0 ±3	22 ±4	MDM/8	20	-	4.0	214FS22-12.5	214FS22-25	214FS22-50
-	220.0 +3/-0	10 ±2	MDM/7	12	-	4.0	220FS10-12.5	220FS10-25	220FS10-50
Cd	228.0 +3/-0	10 ±2	MDM/7	15	-	4.0	228FS10-12.5	228FS10-25	228FS10-50
Cd	228.0 ±3	25 ±5	MDM/8	20	-	4.0	228FS25-12.5	228FS25-25	228FS25-50
Ni	232.0 +3/-0	10 ±2	MDM/7	15	-	4.0	232FS10-12.5	232FS10-25	232FS10-50
Co	239.0 +3/-0	10 ±2	MDM/7	15	-	4.0	239FS10-12.5	239FS10-25	239FS10-50
Co	239.0 ±3	25 ±5	MDM/8	20	-	4.0	239FS25-12.5	239FS25-25	239FS25-50
HeCd	248.0 +3	10 ±2	MDM/7	12	-	4.0	248FS10-12.5	248FS10-25	248FS10-50
Hg	253.7 +3/-0	10 ±2	MDM/7	12	-	4.0	254FS10-12.5	254FS10-25	254FS10-50
Hg	253.7 ±3	25 ±5	MDM/8	18	-	4.0	254FS25-12.5	254FS25-25	254FS25-50

MDM= Metal-Dielectric-Metal

STANDARD BANDPASS FILTERS

Line	CWL (nm)	FWHM	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (nm)	Size, Shape & Part Number		
							12.5mm Ø	25mm Ø	50mm Ø
Hg	253.7 +10-0	40 ±8	MDM/9	20	-	4.0	254FS40-12.5	254FS40-25	254FS40-50
-	260.0 +3/-0	10 ±2	MDM/7	12	-	4.0	260FS10-12.5	260FS10-25	260FS10-50
Hg	265.0 +3/-0	10 ±2	MDM/7	12	-	4.0	265FS10-12.5	265FS10-25	265FS10-50
Hg	265.0 ±3	25 ±5	MDM/8	20	-	4.0	265FS25-12.5	265FS25-25	265FS25-50
Hg	270.0 +3/-0	10 ±2	MDM/7	12	-	4.0	270FS10-12.5	270FS10-25	270FS10-50
Hg	275.0+3/-0	10 ±2	MDM/7	12	-	4.0	275FS10-12.5	275FS10-25	275FS10-50
Hg	280.0 +3/-0	10 ±2	MDM/7	12	-	4.0	280FS10-12.5	280FS10-25	280FS10-50
Hg	280.0 ±3	25 ±5	MDM/8	20	-	4.0	280FS25-12.5	280FS25-25	280FS25-50
Hg	289.0 +3/-0	10 ±2	MDM/7	15	-	4.0	289FS10-12.5	289FS10-25	289FS10-50
Hg	296.7 +3/-0	10 ±2	MDM/7	15	-	4.0	297FS10-12.5	297FS10-25	297FS10-50
-	300.0 +3/-0	10 ±2	MDM/7	15	-	4.0	300FS10-12.5	300FS10-25	300FS10-50
-	300.0 ±3	25 ±5	MDM/8	20	-	4.0	300FS25-12.5	300FS25-25	300FS25-50
-	300.0 +10/-0	40 ±8	MDM/9	20	-	4.0	300FS40-12.5	300FS40-25	300FS40-50
Zn	307.1 +3/-0	10 ±2	MDM/7	15	-	4.0	307FS10-12.5	307FS10-25	307FS10-50
Zn	307.1 ±3	25 ±5	MDM/8	20	-	4.0	307FS25-12.5	307FS25-25	307FS25-50
-	310.0 +3/-0	10 ±2	MDM/7	15	-	4.0	310FS10-12.5	310FS10-25	310FS10-50
Hg	313.0 +3/-0	10 ±2	MDM/7	15	-	4.0	313FS10-12.5	313FS10-25	313FS10-50
Hg	313.0 ±3	25 ±5	MDM/8	20	-	4.0	313FS25-12.5	313FS25-25	313FS25-50
-	320.0 +3/-0	10 ±2	3/3	25	1.45	8.0	320FS10-12.5	320FS10-25	320FS10-50
Cd	326.1 +0.5/-0	3 ±0.5	2/2	15	1.45	8.0	326FS03-12.5	326FS03-25	326FS03-50
Cd	326.1 +2/-0	10 ±2	3/3	25	1.45	8.0	326FS10-12.5	326FS10-25	326FS10-50
Cd	326.1 ±3	25 ±5	3/3	25	1.45	8.0	326FS25-12.5	326FS25-25	326FS25-50
-	330.0 +3/-0	10 ±2	3/3	25	1.45	8.0	330FS10-12.5	330FS10-25	330FS10-50
Hg	334.0 +2/-0	10 ±2	3/3	25	1.45	8.0	334FS10-12.5	334FS10-25	334FS10-50
N ₂ Laser	337.1 +0.5/-0	3 ±0.5	2/2	20	1.45	7.0	337FS03-12.5	337FS03-25	337FS03-50
N ₂ Laser	337.1 +2/-0	10 ±2	3/3	25	1.45	8.0	337FS10-12.5	337FS10-25	337FS10-50
biomed	340.0 +2/-0	8 ±2	3/3	35	1.45	8.0	340FS08-12.5	340FS08-25	340FS08-50
biomed	340.0 +3/-0	10 ±2	3/3	25	1.45	8.0	340FS10-12.5	340FS10-25	340FS10-50
biomed	340.0 ±3	25 ±5	3/3	25	1.45	7.0	340FS25-12.5	340FS25-25	340FS25-50
Nd/YAG Laser	350.0 +3/-0	10 ±2	3/3	25	1.45	8.0	350FS10-12.5	350FS10-25	350FS10-50
-	350.0 ±3	25 ±5	3/3	25	1.45	7.0	350FS25-12.5	350FS25-25	350FS25-50
-	350.0 +10/-0	40 ±8	3/3	25	1.45	7.0	350FS40-12.5	350FS40-25	350FS40-50
-	355.0 +2/-0	10 ±2	3/3	25	1.45	7.0	355FS10-12.5	355FS10-25	355FS10-50
-	360.0 +3/-0	10 ±2	3/3	25	1.45	7.0	360FS10-12.5	360FS10-25	360FS10-50
Hg	365.0 +1/-0	5 ±1	2/2	20	1.45	7.0	365FS05-12.5	365FS05-25	365FS05-50
Hg	365.0 +2/-0	10 ±2	3/3	25	1.45	7.0	365FS10-12.5	365FS10-25	365FS10-50
Hg	365.0 ±3	25 ±5	3/3	25	1.45	7.0	365FS25-12.5	365FS25-25	365FS25-50
Ni	370.0 +3/-0	10 ±2	3/3	25	1.45	7.0	370FS10-12.5	370FS10-25	370FS10-50
-	380.0 +3/-0	10 ±2	3/3	25	1.45	7.0	380FS10-12.5	380FS10-25	380FS10-50
-	390.0 +3/-0	10 ±2	3/3	35	1.45	7.0	390FS10-12.5	390FS10-25	390FS10-50
-	400.0 +3/-0	10 ±2	3/3	45	1.45	7.0	400FS10-12.5	400FS10-25	400FS10-50
-	400.0 ±2	20 ±4	3/3	45	1.45	7.0	400FS20-12.5	400FS20-25	400FS20-50
-	400.0 +10/-0	40 ±8	3/3	45	1.45	7.0	400FS40-12.5	400FS40-25	400FS40-50




MDM= Metal-Dielectric-Metal

STANDARD BANDPASS FILTERS

Line	CWL (nm)	FWHM	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (nm)	Size, Shape & Part Number		
							12.5mm Ø ○	25mm Ø ○	50mm Ø ○
-	400.0 +20/-10	70 ±16	MDM/10	60	-	7.0	400FS70-12.5	400FS70-25	400FS70-50
Hg	404.7 +1/-0	5 ±1	2/2	35	1.45	7.0	405FS05-12.5	405FS05-25	405FS05-50
Hg	404.7 +2/-0	10 ±2	3/3	45	1.45	7.0	405FS10-12.5	405FS10-25	405FS10-50
-	410.0 +3/-0	10 ±2	3/3	45	1.45	7.0	410FS10-12.5	410FS10-25	410FS10-50
-	415.0 +2/-0	10 ±2	3/3	45	1.45	7.0	415FS10-12.5	415FS10-25	415FS10-50
-	420.0 +3/-0	10 ±2	3/3	45	1.45	7.0	420FS10-12.5	420FS10-25	420FS10-50
-	430.0 +3/-0	10 ±2	3/3	45	1.45	7.0	430FS10-12.5	430FS10-25	430FS10-50
Hg	435.8 +1/-0	5 ±1	2/2	45	1.45	7.0	436FS05-12.5	436FS05-25	436FS05-50
Hg	435.8 +2/-0	10 ±2	3/3	45	1.45	7.0	436FS10-12.5	436FS10-25	436FS10-50
-	440.0 +3/-0	10 ±2	3/3	45	1.45	7.0	440FS10-12.5	440FS10-25	440FS10-50
He/Cd Laser	441.6 +0.2/-0	1 ±0.2	2/2	35	1.45	8.5	442FS02-12.5	442FS02-25	442FS02-50
He/Cd Laser	441.6 +0.5/-0	3 ±0.5	2/2	40	1.45	8.5	442FS03-12.5	442FS03-25	442FS03-50
He/Cd Laser	441.6 +2/-0	10 ±2	3/3	45	1.45	7.0	442FS10-12.5	442FS10-25	442FS10-50
-	450.0 +3/-0	10 ±2	3/3	45	1.45	7.0	450FS10-12.5	450FS10-25	450FS10-50
-	450.0 ±2	20 ±4	3/3	55	1.45	7.0	450FS20-12.5	450FS20-25	450FS20-50
-	450.0 +10/-0	40 ±8	3/3	55	1.45	7.0	450FS40-12.5	450FS40-25	450FS40-50
-	450.0 +20/-10	80 ±16	MDM/9	65	-	7.0	450FS80-12.5	450FS80-25	450FS80-50
Cs	455.5 +2/-0	10 ±2	3/3	50	1.45	7.0	456FS10-12.5	456FS10-25	456FS10-50
Ar/lon Laser	457.9 +0.2/-0	1 ±0.2	2/2	40	1.45	8.5	458FS02-12.5	458FS02-25	458FS02-50
Ar/lon Laser	457.9 +0.5/-0	3 ±0.5	2/2	45	1.45	8.5	458FS03-12.5	458FS03-25	458FS03-50
Ar/lon Laser	457.9 +2/-0	10 ±2	3/3	50	1.45	7.0	458FS10-12.5	458FS10-25	458FS10-50
-	460.0 +3/-0	10 ±2	3/3	50	1.45	7.0	460FS10-12.5	460FS10-25	460FS10-50
-	470.0 +3/-0	10 ±2	3/3	50	2.05	7.0	470FS10-12.5	470FS10-25	470FS10-50
-	480.0 +3/-0	10 ±2	3/3	50	2.05	7.0	480FS10-12.5	480FS10-25	480FS10-50
Hb	486.1 +2/-0	10 ±2	3/3	50	2.05	7.0	486FS10-12.5	486FS10-25	486FS10-50
Ar/lon Laser	488.0 +.2/-0	1 ±0.2	2/2	45	2.05	8.5	488FS02-12.5	488FS02-25	488FS02-50
Ar/lon Laser	488.0 +0.5/-0	3 ±0.5	2/2	50	2.05	8.5	488FS03-12.5	488FS03-25	488FS03-50
Ar/lon Laser	488.0 +2/-0	10 ±2	3/3	55	2.05	7.0	488FS10-12.5	488FS10-25	488FS10-50
-	490.0 +3/-0	10 ±2	3/3	55	2.05	7.0	490FS10-12.5	490FS10-25	490FS10-50
-	500.0 +3/-0	10 ±2	3/3	55	2.05	7.0	500FS10-12.5	500FS10-25	500FS10-50
-	500.0 ±2	20 ±4	3/3	55	2.05	7.0	500FS20-12.5	500FS20-25	500FS20-50
-	500.0 +10/-0	40 ±8	3/3	55	2.05	7.0	500FS40-12.5	500FS40-25	500FS40-50
-	500.0 +20/-10	80 ±16	MDM/9	70	-	7.0	500FS80-12.5	500FS80-25	500FS80-50
Cd	508.5 +2/-0	10 ±2	3/3	55	2.05	7.0	508FS10-12.5	508FS10-25	508FS10-50
-	510.0 +3/-0	10 ±2	3/3	55	2.05	7.0	510FS10-12.5	510FS10-25	510FS10-50
Ar/lon Laser	514.5 +0.2/-0	1 ±0.2	2/2	45	2.05	8.5	515FS02-12.5	515FS02-25	515FS02-50
Ar/lon Laser	514.5 +0.5/-0	3 ±0.5	2/2	50	2.05	8.5	515FS03-12.5	515FS03-25	515FS03-50
Ar/lon Laser	514.5 +2/-0	10 ±2	3/3	55	2.05	7.0	515FS10-12.5	515FS10-25	515FS10-50
-	520.0 +3/-0	10 ±2	3/3	55	2.05	7.0	520FS10-12.5	520FS10-25	520FS10-50
-	523.0 +2/-0	10 ±2	3/3	55	2.05	7.0	523FS10-12.5	523FS10-25	523FS10-50
-	530.0 +3/-0	10 ±2	3/3	55	2.05	7.0	530FS10-12.5	530FS10-25	530FS10-50
Nd/YAG Laser	532.0 +0.2/-0	1 ±0.2	2/2	45	2.05	8.5	532FS02-12.5	532FS02-25	532FS02-50
Nd/YAG Laser	532.0 +0.5/-0	3 ±0.5	2/2	50	2.05	8.5	532FS03-12.5	532FS03-25	532FS03-50

MDM= Metal-Dielectric-Metal

STANDARD BANDPASS FILTERS

Line	CWL (nm)	FWHM (nm)	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (nm)	Size, Shape & Part Number		
							12.5mm Ø 	25mm Ø 	50mm Ø 
Nd/YAG Laser	532.0 +2/-0	10 ±2	3/3	55	2.05	7.0	532FS10-12.5	532FS10-25	532FS10-50
Ti	535.0 +2/-0	10 ±2	3/3	55	2.05	7.0	535FS10-12.5	535FS10-25	535FS10-50
-	540.0 +3/-0	10 ±2	3/3	55	2.05	7.0	540FS10-12.5	540FS10-25	540FS10-50
-	543.5 +2/-0	10 ±2	3/3	55	2.05	7.0	544FS10-12.5	544FS10-25	544FS10-50
Hg	546.1 +1/-0	5 ±1	2/2	55	1.45	7.0	546FS05-12.5	546FS05-25	546FS05-50
Zn	546.1 +2/-0	10 ±2	3/3	55	2.05	7.0	546FS10-12.5	546FS10-25	546FS10-50
-	550.0 +3/-0	10 ±2	3/3	55	2.05	7.0	550FS10-12.5	550FS10-25	550FS10-50
-	550.0 ±2	20 ±4	3/3	55	1.45	7.0	550FS20-12.5	550FS20-25	550FS20-50
-	550.0 +10/-0	40 ±8	3/3	55	2.05	7.0	550FS40-12.5	550FS40-25	550FS40-50
-	550.0 +20/-10	80 ±16	MDM/9	70	-	7.0	550FS80-12.5	550FS80-25	550FS80-50
-	560.0 +3/-0	10 ±2	3/3	55	2.05	7.0	560FS10-12.5	560FS10-25	560FS10-50
-	570.0 +3/-0	10 ±2	3/3	55	2.05	7.0	570FS10-12.5	570FS10-25	570FS10-50
Hg	577.0 +1/-0	5 ±1	2/2	50	1.45	7.0	577FS05-12.5	577FS05-25	577FS05-50
Hg	577.0 +2/-0	10 ±2	3/3	55	2.05	7.0	577FS10-12.5	577FS10-25	577FS10-50
-	580.0 +3/-0	10 ±2	3/3	55	2.05	7.0	580FS10-12.5	580FS10-25	580FS10-50
Na	589.3 +2/-0	10 ±2	3/3	55	2.05	7.0	589FS10-12.5	589FS10-25	589FS10-50
-	590.0 +3/-0	10 ±2	3/3	55	2.05	7.0	590FS10-12.5	590FS10-25	590FS10-50
-	600.0 +3/-0	10 ±2	2/2	55	2.05	7.0	600FS10-12.5	600FS10-25	600FS10-50
-	600.0 ±2	20 ±4	2/2	55	1.45	7.0	600FS20-12.5	600FS20-25	600FS20-50
-	600.0 +10/-0	40 ±8	3/3	55	2.05	7.0	600FS40-12.5	600FS40-25	600FS40-50
-	600.0 +20/-10	80 ±16	MDM/9	70	-	7.0	600FS80-12.5	600FS80-25	600FS80-50
-	610.0 +3/-0	10 ±2	3/3	55	2.05	7.0	610FS10-12.5	610FS10-25	610FS10-50
-	620.0 +3/-0	10 ±2	3/3	55	2.05	7.0	620FS10-12.5	620FS10-25	620FS10-50
-	630.0 +3/-0	10 ±2	3/3	55	2.05	7.0	630FS10-12.5	630FS10-25	630FS10-50
HeNe Laser	632.8 +0.2/-0	1 ±0.2	2/2	50	2.05	8.5	633FS02-12.5	633FS02-25	633FS02-50
HeNe Laser	632.8 +0.5/-0	3 ±0.5	2/2	50	2.05	8.5	633FS03-12.5	633FS03-25	633FS03-50
HeNe Laser	632.8 +2/-0	10 ±2	3/3	55	2.05	7.0	633FS10-12.5	633FS10-25	633FS10-50
Zn	636.2 +2/-0	10 ±2	3/3	60	2.05	7.0	636FS10-12.5	636FS10-25	636FS10-50
-	640.0 +3/-0	10 ±2	3/3	60	2.05	7.0	640FS10-12.5	640FS10-25	640FS10-50
Kr Laser	647.1 +0.2/-0	1 ±0.2	2/2	50	2.05	8.5	647FS02-12.5	647FS02-25	647FS02-50
Kr Laser	647.1 +0.5/-0	3 ±0.5	2/2	50	2.05	8.5	647FS03-12.5	647FS03-25	647FS03-50
Kr Laser	647.1 +2/-0	10 ±2	3/3	60	2.05	7.0	647FS10-12.5	647FS10-25	647FS10-50
-	650.0 +3/-0	10 ±2	3/3	55	2.05	7.0	650FS10-12.5	650FS10-25	650FS10-50
-	650.0 ±2	20 ±4	3/3	55	2.05	7.0	650FS20-12.5	650FS20-25	650FS20-50
-	650.0 +10/-0	40 ±8	3/3	50	2.05	7.0	650FS40-12.5	650FS40-25	650FS40-50
-	650.0 +20/-10	80 ±16	MDM/9	70	-	7.0	650FS80-12.5	650FS80-25	650FS80-50
Ha	656.3 +0.2/-0	1 ±0.2	2/2	45	2.05	8.5	656FS02-12.5	656FS02-25	656FS02-50
Ha	656.3 +0.5/-0	3 ±0.5	2/2	50	2.05	8.5	656FS03-12.5	656FS03-25	656FS03-50
Ha	656.3 +2/-0	10 ±2	3/3	55	2.05	7.0	656FS10-12.5	656FS10-25	656FS10-50
-	660.0 +3/-0	10 ±2	3/3	55	2.05	7.0	660FS10-12.5	660FS10-25	660FS10-50
Li	670.0 +3/-0	10 ±2	3/3	55	2.05	7.0	670FS10-12.5	670FS10-25	670FS10-50
Laser Diode	670.8 +2/-0	10 ±2	3/3	55	2.05	7.0	671FS10-12.5	671FS10-25	671FS10-50
	675.8 +2/-0	10 ±2	3/3	55	2.05	7.0	675FS10-12.5	675FS10-25	675FS10-50

MDM= Metal-Dielectric-Metal

STANDARD BANDPASS FILTERS

Line	CWL (nm)	FWHM (nm)	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (nm)	Size, Shape & Part Number		
							12.5mm Ø ○	25mm Ø ○	50mm Ø ○
-	675.0 ±2	20 ±4	3/3	55	2.05	7.0	675FS20-12.5	675FS20-25	675FS20-50
-	680.0 +3/-0	10 ±2	3/3	55	2.05	7.0	680FS10-12.5	680FS10-25	680FS10-50
-	690.0 +3/-0	10 ±2	3/3	55	2.05	7.0	690FS10-12.5	690FS10-25	690FS10-50
Ruby Laser	694.3 +0.2/-0	1 ±0.2	2/2	45	2.05	8.5	694FS02-12.5	694FS02-25	694FS02-50
Ruby Laser	694.3 +0.5/-0	3 ±0.5	2/2	50	2.05	8.5	694FS03-12.5	694FS03-25	694FS03-50
Ruby Laser	694.3 +2/-0	10 ±2	3/3	55	2.05	7.0	694FS10-12.5	694FS10-25	694FS10-50
-	700.0 +3/-0	10 ±2	3/3	55	2.05	7.0	700FS10-12.5	700FS10-25	700FS10-50
-	700.0 ±2	20 ±4	3/3	55	2.05	7.0	700FS20-12.5	700FS20-25	700FS20-50
-	700.0 +10/-0	40 ±8	3/3	50	2.05	7.0	700FS40-12.5	700FS40-25	700FS40-50
-	700.0 +20/-10	80 ±16	MDM/9	65	-	7.0	700FS80-12.5	700FS80-25	700FS80-50
-	710.0 +3/-0	10 ±2	3/3	55	2.05	7.0	710FS10-12.5	710FS10-25	710FS10-50
-	720.0 +3/-0	10 ±2	3/3	55	2.05	7.0	720FS10-12.5	720FS10-25	720FS10-50
-	730.0 +3/-0	10 ±2	3/3	50	2.05	7.0	730FS10-12.5	730FS10-25	730FS10-50
-	740.0 +3/-0	10 ±2	3/3	50	2.05	7.0	740FS10-12.5	740FS10-25	740FS10-50
-	750.0 +3/-0	10 ±2	3/3	50	2.05	7.0	750FS10-12.5	750FS10-25	750FS10-50
-	750.0 ±2	20 ±4	3/3	50	2.05	7.0	750FS20-12.5	750FS20-25	750FS20-50
-	750.0 +10/-0	40 ±8	3/3	40	2.05	7.0	750FS40-12.5	750FS40-25	750FS40-50
-	750.0 +20/-10	100 ±20	MDM/9	65	-	7.0	750FS00-12.5	750FS00-25	750FS00-50
-	760.0 +3/-0	10 ±2	3/3	50	2.05	7.0	760FS10-12.5	760FS10-25	760FS10-50
K	766.5 +2/-0	10 ±2	3/3	50	2.05	7.0	766FS10-12.5	766FS10-25	766FS10-50
-	770.0 +3/-0	10 ±2	3/3	50	2.05	7.0	770FS10-12.5	770FS10-25	770FS10-50
Rb	780.0 +3/-0	10 ±2	3/3	50	2.05	7.0	780FS10-12.5	780FS10-25	780FS10-50
Laser Diode	780.0 ±2	20 ±4	3/3	50	2.05	7.0	780FS20-12.5	780FS20-25	780FS20-50
-	790.0 +3/-0	10 ±2	3/3	50	2.05	7.0	790FS10-12.5	790FS10-25	790FS10-50
Rb	794.7 +2/-0	10 ±2	3/3	50	2.05	7.0	795FS10-12.5	795FS10-25	795FS10-50
-	800.0 +3/-0	10 ±2	3/3	50	2.05	7.0	800FS10-12.5	800FS10-25	800FS10-50
-	800.0 ±2	20 ±4	3/3	50	2.05	7.0	800FS20-12.5	800FS20-25	800FS20-50
-	800.0 +10/-0	40 ±8	3/3	50	2.05	7.0	800FS40-12.5	800FS40-25	800FS40-50
-	800.0 +20/-10	100 ±20	MDM/9	65	-	7.0	800FS00-12.5	800FS00-25	800FS00-50
Laser Diode	810.0 +3/-0	10 ±2	3/3	50	2.05	7.0	810FS10-12.5	810FS10-25	810FS10-50
Laser Diode	810.0 ±2	20 ±4	3/3	50	2.05	7.0	810FS20-12.5	810FS20-25	810FS20-50
-	820.0 +3/-0	10 ±2	3/3	50	2.05	7.0	820FS10-12.5	820FS10-25	820FS10-50
GaAlAs Laser	830.0 +3/-0	10 ±2	3/3	50	2.05	7.0	830FS10-12.5	830FS10-25	830FS10-50
Laser Diode	830.0 ±2	20 ±4	3/3	50	2.05	7.0	830FS20-12.5	830FS20-25	830FS20-50
-	840.0 +3/-0	10 ±2	3/3	50	2.05	7.0	840FS10-12.5	840FS10-25	840FS10-50
-	850.0 +3/-0	10 ±2	3/3	50	2.05	7.0	850FS10-12.5	850FS10-25	850FS10-50
-	850.0 ±2	20 ±4	3/3	50	2.05	7.0	850FS20-12.5	850FS20-25	850FS20-50
-	850.0 +10/-0	40 ±8	3/3	50	2.05	7.0	850FS40-12.5	850FS40-25	850FS40-50
-	850.0 +20/-10	100 ±20	MDM/9	65	-	7.0	850FS00-12.5	850FS00-25	850FS00-50
-	860.0 +3/-0	10 ±2	3/3	50	2.05	7.0	860FS10-12.5	860FS10-25	860FS10-50
-	870.0 +3/-0	10 ±2	3/3	50	2.05	7.0	870FS10-12.5	870FS10-25	870FS10-50
-	880.0 +3/-0	10 ±2	3/3	50	2.05	7.0	880FS10-12.5	880FS10-25	880FS10-50
-	890.0 +3/-0	10 ±2	3/3	50	2.05	7.0	890FS10-12.5	890FS10-25	890FS10-50

MDM= Metal-Dielectric-Metal

STANDARD BANDPASS FILTERS

Line	CWL (nm)	FWHM (nm)	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (nm)	Size, Shape & Part Number		
							12.5mm Ø ○	25mm Ø ●	50mm Ø ●
-	900.0 +3/-0	10 ±2	3/3	50	2.05	7.0	900FS10-12.5	900FS10-25	900FS10-50
-	900.0 ±2	20 ±4	3/3	50	2.05	7.0	900FS20-12.5	900FS20-25	900FS20-50
-	900.0 +10/-0	40 ±8	3/3	50	2.05	7.0	900FS40-12.5	900FS40-25	900FS40-50
-	900.0 +20/-10	100 ±20	MDM/9	60	-	7.0	900FS00-12.5	900FS00-25	900FS00-50
GaAs	905.0 +0.2/-0	1 ±0.2	2/2	45	2.05	8.5	905FS02-12.5	905FS02-25	905FS02-50
GaAs	905.0 +0.5/-0	3 ±0.5	2/2	45	2.05	8.5	905FS03-12.5	905FS03-25	905FS03-50
GaAs	905.0 +2/-0	10 ±0.2	3/3	50	2.05	7.0	905FS10-12.5	905FS10-25	905FS10-50
-	910.0 +3/-0	10 ±2	3/3	50	2.05	7.0	910FS10-12.5	910FS10-25	910FS10-50
-	920.0 +3/-0	10 ±2	3/3	50	2.05	7.0	920FS10-12.5	920FS10-25	920FS10-50
-	930.0 +3/-0	10 ±2	3/3	50	2.05	7.0	930FS10-12.5	930FS10-25	930FS10-50
-	940.0 +3/-0	10 ±2	3/3	50	2.05	7.0	940FS10-12.5	940FS10-25	940FS10-50
-	950.0 +3/-0	10 ±2	3/3	50	2.05	7.0	950FS10-12.5	950FS10-25	950FS10-50
-	950.0 ±2	20 ±4	3/3	50	2.05	7.0	950FS20-12.5	950FS20-25	950FS20-50
-	950.0 +10/-0	40 ±8	3/3	50	1.45	7.0	950FS40-12.5	950FS40-25	950FS40-50
-	950.0 +20/-10	100 ±20	MDM/9	60	-	7.0	950FS00-12.5	950FS00-25	950FS00-50
-	960.0 +3/-0	10 ±2	3/3	50	2.05	7.0	960FS10-12.5	960FS10-25	960FS10-50
-	970.0 +3/-0	10 ±2	3/3	50	2.05	7.0	970FS10-12.5	970FS10-25	970FS10-50
-	980.0 +3/-0	10 ±2	3/3	50	2.05	7.0	980FS10-12.5	980FS10-25	980FS10-50
-	990.0 +3/-0	10 ±2	3/3	50	2.05	7.0	990FS10-12.5	990FS10-25	990FS10-50
-	1000.0 +3/-0	10 ±2	3/3	45	2.05	8.5	100FS10-12.5	100FS10-25	100FS10-50
-	1000.0 ±2	20 ±4	3/3	45	2.05	8.5	100FS20-12.5	100FS20-25	100FS20-50
-	1000.0 +10/-0	40 ±8	3/3	45	1.45	8.5	100FS40-12.5	100FS40-25	100FS40-50
-	1000.0 +20/-10	100 ±20	MDM/9	60	-	8.5	100FS00-12.5	100FS00-25	100FS00-50
Hg	1014.0 +2/-0	10 ±2	3/3	45	2.05	8.5	014FS10-12.5	014FS10-25	014FS10-50
-	1046.0 +2/-0	10 ±2	3/3	45	2.05	8.5	046FS10-12.5	046FS10-25	046FS10-50
-	1050.0 +3/-0	10 ±2	3/3	45	2.05	8.5	050FS10-12.5	050FS10-25	050FS10-50
Nd Laser	1064.0 +0.2/-0	1 ±0.2	2/2	40	2.05	8.5	064FS02-12.5	064FS02-25	064FS02-50
Nd/YAG	1064.0 +0.5/-0	3 ±0.5	2/2	45	2.05	8.5	064FS03-12.5	064FS03-25	064FS03-50
Nd/YAG	1064.0 +2/-0	10 ±2	3/3	40	2.05	8.5	064FS10-12.5	064FS10-25	064FS10-50
-	1100.0 +3/-0	10 ±2	3/3	40	2.05	8.5	110FS10-12.5	110FS10-25	110FS10-50
-	1150.0 +3/-0	10 ±2	3/3	40	2.05	8.5	115FS10-12.5	115FS10-25	115FS10-50
-	1200.0 +3/-0	10 ±2	2/2	35	2.05	8.5	120FS10-12.5	120FS10-25	120FS10-50
-	1250.0 +3/-0	10 ±2	2/2	35	2.05	8.5	125FS10-12.5	125FS10-25	125FS10-50
-	1300.0 +3/-0	10 ±2	2/2	35	2.05	8.5	130FS10-12.5	130FS10-25	130FS10-50
-	1300.0 ±3	20 ±5	3/3	35	2.05	8.5	130FS20-12.5	130FS20-25	130FS20-50
-	1350.0 +3/-0	10 ±2	2/2	35	2.05	8.5	135FS10-12.5	135FS10-25	135FS10-50
-	1400.0 +3/-0	10 ±2	2/2	30	2.05	8.5	140FS10-12.5	140FS10-25	140FS10-50
-	1500.0 +3/-0	10 ±2	2/2	30	2.05	8.5	150FS10-12.5	150FS10-25	150FS10-50
-	1500.0 ±3	20 ±5	3/3	30	2.05	8.5	150FS20-12.5	150FS20-25	150FS20-50
-	1550.0 +3/-0	10 ±2	2/2	30	2.05	8.5	155FS10-12.5	155FS10-25	155FS10-50
-	1550.0 ±3	20 ±5	3/3	30	2.05	8.5	155FS20-12.5	155FS20-25	155FS20-50
Methane	1665.0 +3/-0	10 ±2	2/2	30	2.05	8.5	167FS10-12.5	167FS10-25	167FS10-50
-	1665.0 ±3	20 ±5	3/3	30	2.05	8.5	167FS20-12.5	167FS20-25	167FS20-50

MDM= Metal-Dielectric-Metal

Semi-Custom Bandpass



Semi-Custom

Thanks to a large inventory of components, Andover Corporation can fabricate and deliver higher-performance commercial quality bandpass filters to your specifications as soon as 5-10 days from receipt of order. To specify your semi-custom filter, all you have to do is follow three quick steps:

1. Select the desired bandwidth, filter type, and center wavelength from the range listed.
2. Select the blocking range.
3. Select the size and corresponding part number.

All other features are predetermined by these three choices. The out-of-band blocking of these filters is 1×10^{-4} within the defined spectral range. Optional threaded rings are available, and image quality versions are also available. Please call for pricing and delivery.

- Wavelengths from the ultraviolet through infrared
- Bandwidths from 0.15nm to 80nm
- Short lead time
- See page 12 for general specifications

1

SELECT

2

SELECT

3

SELECT

Bandwidth (FWHM) (nm)	Cavities/ Filter Type	CW/L Range (nm)	CW/L Tolerance (nm)	Min. T (%) When Blocked To		N*	Size, Shape & Part Number		
							1μ	FIR	12.5mm Ø ○
0.15 ± 0.05	1/1	450.0–550.0	+0.1/-0	40	30	1.45	001FC10-12.5	001FC10-25	001FC10-50
	1/1	550.1–750.0	+0.1/-0	45	40	1.45	001FC12-12.5	001FC12-25	001FC12-50
0.20 ± 0.05	1/1	450.0–550.0	+0.1/-0	45	35	1.45/2.05	002FC10-12.5	002FC10-25	002FC10-50
	1/1	550.1–750.0	+0.1/-0	45	35	2.05	002FC12-12.5	002FC12-25	002FC12-50
0.30 ± 0.10	2/2	450.0–550.0	+0.1/-0	35	25	1.45	003FC10-12.5	003FC10-25	003FC10-50
	2/2	550.1–750.0	+0.1/-0	40	35	2.05	003FC12-12.5	003FC12-25	003FC12-50
0.30 ± 0.40	3/3	550.0–750.0	+0.1/-0	35	30	2.05	004FC12-12.5	004FC12-25	004FC12-50
0.50 ± 0.10	2/2	450.0–550.0	+0.1/-0	40	30	1.45/2.05	005FC10-12.5	005FC10-25	005FC10-50
	2/2	550.1–750.0	+0.1/-0	45	35	2.05	005FC12-12.5	005FC12-25	005FC12-50
0.60 ± 0.10	2/2	430.0–480.0	±0.1	40	35	1.45	006FC08-12.5	006FC08-25	006FC08-50
	2/2	480.1–550.0	±0.1	45	35	2.05	006FC10-12.5	006FC10-25	006FC10-50
	2/2	550.1–750.0	±0.1	45	25	2.05	006FC12-12.5	006FC12-25	006FC10-50
0.50 to 0.80	3/3	480.0–550.0	±0.1	40	30	2.05	007FC10-12.5	007FC10-25	007FC10-50
	3/3	550.1–750.0	±0.1	45	35	2.05	007FC12-12.5	007FC12-25	007FC12-50
	3/3	750.1–950.0	±0.1	45	35	2.05	007FC14-12.5	007FC14-25	007FC14-50
0.80 ± 0.20	2/2	430.0–480.0	+0.2/-0	45	40	1.45	008FC08-12.5	008FC08-25	008FC08-50
	2/2	480.1–550.0	+0.2/-0	45	40	2.05	008FC10-12.5	008FC10-25	008FC10-50
	2/2	550.1–750.0	+0.2/-0	50	45	2.05	008FC12-12.5	008FC12-25	008FC12-50
	2/2	750.1–950.0	+0.2/-0	50	45	2.05	008FC14-12.5	008FC14-25	008FC14-50
	2/2	950.1–1100.0	+0.2/-0	50	40	2.05	008FC16-12.5	008FC16-25	008FC16-50

SEMI-CUSTOM BANDPASS FILTERS

1
SELECT

2
SELECT

3
SELECT

Bandwidth (FWHM) (nm)	Cavities/ Filter Type	CW/L Range (nm)	CW/L Tolerance (nm)	Min. T (%) When Blocked To 1μ FIR		N*	Size, Shape & Part Number		
							12.5mm Ø ○	25mm Ø ○	50mm Ø ○
1.0 ± 0.2	2/2	340.0–385.0	+0.2/-0	-	8	1.45	010FC04-12.5	010FC04-25	010FC04-50
	2/2	385.1–395.0	+0.2/-0	15	10	1.45	010FC05-12.5	010FC05-25	010FC05-50
	2/2	395.1–430.0	+0.2/-0	20	15	1.45	010FC06-12.5	010FC06-25	010FC06-50
	2/2	430.1–480.0	+0.2/-0	40	35	1.45/2.05	010FC08-12.5	010FC08-25	010FC08-50
	2/2	480.1–550.0	+0.2/-0	50	40	2.05	010FC10-12.5	010FC10-25	010FC10-50
	2/2	550.1–750.0	+0.2/-0	55	45	2.05	010FC12-12.5	010FC12-25	010FC12-50
	2/2	750.1–950.0	+0.2/-0	55	45	2.05	010FC14-12.5	010FC14-25	010FC14-50
	2/2	950.1–1100.0	+0.2/-0	55	40	2.05	010FC16-12.5	010FC16-25	010FC16-50
1.0 ± 0.2	3/3	480.0–550.0	+0.2/-0	50	35	1.45/2.05	010FC35-12.5	010FC35-25	010FC35-50
	3/3	550.1–750.0	+0.2/-0	55	40	2.05	010FC36-12.5	010FC36-25	010FC36-50
	3/3	750.1–950.0	+0.2/-0	55	40	2.05	010FC37-12.5	010FC37-25	010FC37-50
	3/3	950.1–1100.0	+0.2/-0	50	35	2.05	010FC38-12.5	010FC38-25	010FC38-50
1.5 ± 0.3	2/2	250.0–320.0	+0.3/-0	-	6	1.45	015FC02-12.5	015FC02-25	015FC02-50
	2/2	320.1–387.0	+0.3/-0	-	10	1.45	015FC04-12.5	015FC04-25	015FC04-50
	2/2	387.1–430.0	+0.3/-0	20	10	1.45	015FC06-12.5	015FC06-25	015FC06-50
	2/2	430.1–480.0	+0.3/-0	40	30	1.45/2.05	015FC08-12.5	015FC08-25	015FC08-50
	2/2	480.1–550.0	+0.3/-0	55	50	2.05	015FC10-12.5	015FC10-25	015FC10-50
	2/2	550.1–750.0	+0.3/-0	55	50	2.05	015FC12-12.5	015FC12-25	015FC12-50
	2/2	750.1–950.0	+0.3/-0	55	50	2.05	015FC14-12.5	015FC14-25	015FC14-50
	2/2	950.1–1100.0	+0.3/-0	65	50	2.05	015FC16-12.5	015FC16-25	015FC16-50
2.0 ± 0.5	2/2	240.0–320.0	+0.5/-0	-	6	1.45	020FC02-12.5	020FC02-25	020FC02-50
	2/2	320.1–387.0	+0.5/-0	-	10	1.45	020FC04-12.5	020FC04-25	020FC04-50
	2/2	387.1–430.0	+0.4/-0	30	25	1.45	020FC06-12.5	020FC06-25	020FC06-50
	2/2	430.1–480.0	+0.4/-0	50	45	1.45/2.05	020FC08-12.5	020FC08-25	020FC08-50
	2/2	480.1–550.0	+0.4/-0	55	50	2.05	020FC10-12.5	020FC10-25	020FC10-50
	2/2	550.1–750.0	+0.4/-0	55	50	2.05	020FC12-12.5	020FC12-25	020FC12-50
	2/2	750.1–950.0	+0.4/-0	65	50	2.05	020FC14-12.5	020FC14-25	020FC14-50
	2/2	950.1–1100.0	+0.4/-0	55	45	2.05	020FC16-12.5	020FC16-25	020FC16-50
2.0 ± 0.5	3/3	430.0–480.0	+0.4/-0	50	40	1.45/2.05	020FC34-12.5	020FC34-25	020FC34-50
	3/3	480.1–550.0	+0.4/-0	55	45	2.05	020FC35-12.5	020FC35-25	020FC35-50
	3/3	550.1–750.0	+0.4/-0	55	45	2.05	020FC36-12.5	020FC36-25	020FC36-50
	3/3	750.1–950.0	+0.4/-0	60	50	2.05	020FC37-12.5	020FC37-25	020FC37-50
	3/3	950.1–1100.0	+0.4/-0	65	45	2.05	020FC38-12.5	020FC38-25	020FC38-50
3.0 ± 0.5	2/2	240.0–320.0	+0.5/-0	-	8	1.45	030FC02-12.5	030FC02-25	030FC02-50
	2/2	320.1–387.0	+0.5/-0	-	10	1.45	030FC04-12.5	030FC04-25	030FC04-50
	2/2	387.1–430.0	+0.5/-0	40	25	1.45	030FC06-12.5	030FC06-25	030FC06-50
	2/2	430.1–480.0	+0.5/-0	45	35	1.45/2.05	030FC08-12.5	030FC08-25	030FC08-50
	2/2	480.1–550.0	+0.5/-0	55	50	2.05	030FC10-12.5	030FC10-25	030FC10-50
	2/2	550.1–750.0	+0.5/-0	55	50	2.05	030FC12-12.5	030FC12-25	030FC12-50
	2/2	750.1–950.0	+0.5/-0	55	50	2.05	030FC14-12.5	030FC14-25	030FC14-50
	2/2	950.1–1100.0	+0.5/-0	65	50	2.05	030FC16-12.5	030FC16-25	030FC16-50

SEMI-CUSTOM BANDPASS FILTERS

1
SELECT

2
SELECT

3
SELECT

Bandwidth (FWHM) (nm)	Cavities/ Filter Type	CW/L Range (nm)	CW/L Tolerance (nm)	Min. T (%) When Blocked To 1μ FIR		N*	Size, Shape & Part Number		
							12.5mm Ø ○	25mm Ø ○	50mm Ø ○
3.0 ± 0.5	3/3	430.0–480.0	+0.5/-0	50	40	1.45/2.05	030FC34-12.5	030FC34-25	030FC34-50
	3/3	480.1–550.0	+0.5/-0	55	45	2.05	030FC35-12.5	030FC35-25	030FC35-50
	3/3	550.1–750.0	+0.5/-0	55	45	2.05	030FC36-12.5	030FC36-25	030FC36-50
	3/3	750.1–950.0	+0.5/-0	60	50	2.05	030FC37-12.5	030FC37-25	030FC37-50
	3/3	950.1–1100.0	+0.5/-0	55	45	2.05	030FC38-12.5	030FC38-25	030FC38-50
5.0 ± 1.0	2/2	240.0–320.0	+1/-0	-	8	1.45	050FC02-12.5	050FC02-25	050FC02-50
	2/2	320.1–385.0	+1/-0	-	25	1.45	050FC04-12.5	050FC04-25	050FC04-50
	2/2	385.1–480.0	+1/-0	45	35	1.45/2.05	050FC06-12.5	050FC06-25	050FC06-50
	2/2	480.1–550.0	+1/-0	55	50	2.05	050FC10-12.5	050FC10-25	050FC10-50
	2/2	550.1–750.0	+1/-0	55	50	2.05	050FC12-12.5	050FC12-25	050FC12-50
	2/2	750.1–950.0	+1/-0	60 ^a	45	2.05	050FC14-12.5	050FC14-25	050FC14-50
	2/2	950.1–1100.0	+1/-0	65 ^b	45	2.05	050FC16-12.5	050FC16-25	050FC16-50
	2/2	1100.1–1300.0	+1/-0	55 ^c	40	2.05	050FC18-12.5	050FC18-25	050FC18-50
	2/2	1300.1–1550.0	+1/-0	50 ^d	35	2.05	050FC19-12.5	050FC19-25	050FC19-50
5.0 ± 1.0	3/3	400.0–430.0	+1/-0	45	40	1.45	050FC33-12.5	050FC33-25	050FC33-50
	3/3	430.1–460.0	+1/-0	55	40	1.45	050FC34-12.5	050FC34-25	050FC34-50
	3/3	460.1–550.0	+1/-0	55	45	1.45/2.05	050FC35-12.5	050FC35-25	050FC35-50
	3/3	550.1–750.0	+1/-0	55	45	2.05	050FC36-12.5	050FC36-25	050FC36-50
	3/3	750.1–950.0	+1/-0	60 ^a	45	2.05	050FC37-12.5	050FC37-25	050FC37-50
	3/3	950.1–1100.0	+1/-0	55 ^b	40	2.05	050FC38-12.5	050FC38-25	050FC38-50
	3/3	1100.1–1300.0	+1/-0	50 ^c	35	2.05	050FC39-12.5	050FC39-25	050FC39-50
5.0 ± 1.0	4/4	460.0–550.0	+1/-0	60	50	1.45/2.05	050FC45-12.5	050FC45-25	050FC45-50
	4/4	550.1–750.0	+1/-0	60	50	2.05	050FC46-12.5	050FC46-25	050FC46-50
	4/4	750.1–950.0	+1/-0	55 ^a	45	2.05	050FC47-12.5	050FC47-25	050FC47-50
	4/4	950.1–1100.0	+1/-0	55 ^b	40	2.05	050FC48-12.5	050FC48-25	050FC48-50
10.0 ± 2.0	MDM/7	214.0–250.0	+2/-0	-	12	--	100FC00-12.5	100FC00-25	100FC00-50
	MDM/7	250.1–320.0	+2/-0	-	15	--	100FC02-12.5	100FC02-25	100FC02-50
	3/3	320.1–385.0	+2/-0	-	25	--	100FC32-12.5	100FC32-25	100FC32-50
	3/3	385.1–430.0	+2/-0	50	40	1.45	100FC33-12.5	100FC33-25	100FC33-50
	3/3	430.1–480.0	+2/-0	60	50	1.45/2.05	100FC34-12.5	100FC34-25	100FC34-50
	3/3	480.1–550.0	+2/-0	70	55	2.05	100FC35-12.5	100FC35-25	100FC35-50
	3/3	550.1–750.0	+2/-0	70	55	2.05	100FC36-12.5	100FC36-25	100FC36-50
	3/3	750.1–950.0	+2/-0	70 ^a	45	2.05	100FC37-12.5	100FC37-25	100FC37-50
	3/3	950.1–1100.0	+2/-0	70 ^b	45	2.05	100FC38-12.5	100FC38-25	100FC38-50
	3/3	1100.1–1300.0	+2/-0	70 ^c	35	2.05	100FC39-12.5	100FC39-25	100FC39-50
	2/2	1300.1–1550.0	+2/-0	70 ^d	35	2.05	100FC40-12.5	100FC40-25	100FC40-50
	2/2	1550.1–2400.0	+2/-0	60 ^e	-	2.05	100FC41-12.5	100FC41-25	100FC41-50

a= Blocking to 1200nm b= Blocking to 1300nm c= Blocking to 1550nm d= Blocking to 2400nm e= Blocking to 3200nm

SEMI-CUSTOM BANDPASS FILTERS

1
SELECT

2
SELECT

3
SELECT

Bandwidth (FWHM) (nm)	Cavities/ Filter Type	CW/L Range (nm)	CW/L Tolerance (nm)	Min. T (%) When Blocked To 1μ FIR		N*	Size, Shape & Part Number		
							12.5mm Ø ○	25mm Ø ○	50mm Ø ○
10.0 ± 2.0	4/4	460.0–550.0	+2/-0	60	45	1.45/2.05	100FC45-12.5	100FC45-25	100FC45-50
	4/4	550.1–750.0	+2/-0	60	45	2.05	100FC46-12.5	100FC46-25	100FC46-50
	4/4	750.1–950.0	+2/-0	70 ^a	50	2.05	100FC47-12.5	100FC47-25	100FC47-50
	4/4	950.1–1100.0	+2/-0	70 ^b	45	2.05	100FC48-12.5	100FC48-25	100FC48-50
	4/4	1100.1–1300.0	+2/-0	70 ^c	30	2.05	100FC49-12.5	100FC49-25	100FC49-50
20.0 ± 4.0	MDM/8	214.0–250.0	±2.5	–	12	–	200FC00-12.5	200FC00-25	200FC00-50
	MDM/8	250.1–320.0	±2.5	–	15	–	200FC02-12.5	200FC02-25	200FC02-50
	5/5	320.1–400.0	±2.5	–	30	1.45	200FC32-12.5	200FC32-25	200FC32-50
20.0 ± 4.0	3/3	400.1–480.0	±2.0	50	45	1.45	200FC33-12.5	200FC33-25	200FC33-50
	3/3	480.1–550.0	±2.0	65	50	1.45	200FC35-12.5	200FC35-25	200FC35-50
	3/3	550.1–750.0	±2.0	70	50	1.45/2.05	200FC36-12.5	200FC36-25	200FC36-50
	3/3	750.1–950.0	±2.0	70 ^a	50	2.05	200FC37-12.5	200FC37-25	200FC37-50
	3/3	950.1–1100.0	±2.0	70 ^b	50	2.05	200FC38-12.5	200FC38-25	200FC38-50
	3/3	1100.1–1300.0	±2.0	70 ^c	30	2.05	200FC39-12.5	200FC39-25	200FC39-50
	3/3	1300.1–1550.0	±2.0	70 ^d	30	2.05	200FC40-12.5	200FC40-25	200FC40-50
	3/3	1550.1–2400.0	±2.0	60 ^e	30	2.05	200FC41-12.5	200FC41-25	200FC41-50
20.0 ± 4.0	4/4	480.0–550.0	±2.0	65	45	1.45	200FC45-12.5	200FC45-25	200FC45-50
	4/4	550.1–750.0	±2.0	70	50	1.45/2.05	200FC46-12.5	200FC46-25	200FC46-50
	4/4	750.1–950.0	±2.0	70 ^a	50	2.05	200FC47-12.5	200FC47-25	200FC47-50
	4/4	950.1–1100.0	±2.0	70 ^b	40	2.05	200FC48-12.5	200FC48-25	200FC48-50
40.0 ± 10.0	MDM/8	230.0–250.0	±5.0	–	15	–	400FC00-12.5	400FC00-25	400FC00-50
	MDM/8	250.1–320.0	±5.0	–	20	–	400FC02-12.5	400FC02-25	400FC02-50
	5/5	320.1–399.9	±5.0	–	30	1.45	400FC52-12.5	400FC52-25	400FC52-50
50.0 ± 10.0	5/5	400.0–460.0	±5.0	60	45	1.45	500FC53-12.5	500FC53-25	500FC53-50
	5/5	460.1–520.1	±5.0	70	50	1.45	500FC54-12.5	500FC54-25	500FC54-50
	4/4	520.1–750.1	±5.0	70	50	2.05	500FC46-12.5	500FC46-25	500FC46-50
	4/4	750.1–900.0	±5.0	75 ^a	50	2.05	500FC47-12.5	500FC47-25	500FC47-50
	3/3	900.1–1100.0	±5.0	75 ^b	45	2.05	500FC38-12.5	500FC38-25	500FC38-50
	3/3	1100.1–1300.0	±5.0	70 ^c	35	2.05	500FC39-12.5	500FC39-25	500FC39-50
	3/3	1300.1–1550.0	±5.0	70 ^d	30	2.05	500FC40-12.5	500FC40-25	500FC40-50
	3/3	1550.1–2400.0	±5.0	70 ^e	–	2.05	500FC41-12.5	500FC41-25	500FC41-50
60.0 ± 10.0	5/5	340.0–399.0	±6.0	–	30	1.45	600FC52-12.5	600FC52-25	600FC52-50
80.0 ± 20.0	5/5	460.0–750.0	±10.0	75	–	1.45	800FC55-12.5	800FC55-25	800FC55-50
	4/4	750.1–900.0	±10.0	75 ^a	–	1.45	800FC47-12.5	800FC47-25	800FC47-50
	4/4	900.1–1100.0	±10.0	70 ^b	–	2.05	800FC48-12.5	800FC48-25	800FC48-50
	4/4	1100.1–1300.0	±10.0	70 ^c	–	2.05	800FC49-12.5	800FC49-25	800FC49-50
	4/4	1300.1–1550.0	±10.0	70 ^d	–	2.05	800FC50-12.5	800FC50-25	800FC50-50
	4/4	1550.1–2400.0	±10.0	70 ^e	–	2.05	800FC51-12.5	800FC51-25	800FC51-50

a= Blocking to 1200nm b= Blocking to 1300nm c= Blocking to 1550nm d= Blocking to 2400nm e= Blocking to 3200nm

Calibration Filter Sets

Calibration

Andover offers two filter sets for verifying the transmittance and absorbance scales of visible absorption spectrophotometers with maximum bandwidths of 2.2nm and 6.5nm. Made of uncoated Schott NG-4 and NG-5 glass, the filters are polished over the central 5mm x 20mm area to a transmitted wavefront of 1/4 wave or better at 633nm and parallelism of 30 arc seconds or better. The transmission value of each filter is measured on a spectrophotometer calibrated with standards directly traceable to the National Institute of Standards and Technology (NIST).

- Spectrophotometric glass filters for verifying transmittance and absorbance scales
- Calibration standards traceable to NIST
- Shipped in a durable aluminum storage case

GENERAL SPECIFICATIONS

Each filter is mounted in a black anodized aluminum holder compatible with the 1cm cuvette holder supplied with most spectrophotometers. Individual filters have removable shutters to protect the glass from damage. Every filter set is shipped with a Certificate of Calibration stating the transmission value of each filter at wavelengths of 440nm, 465nm, 546.1nm, 590nm and 635nm.

AC-930 Filter Set

The AC-930 calibration filter set consists of three absorption glass filters and one blank holder to be used as a balancing filter. The nominal transmittance values of these filters are 10%, 20%, and 30%.

AC-1930 Filter Set

The AC-1930 filter set consists of three absorption glass filters and one blank holder to be used as a balancing filter. The nominal transmittance values of these filters are 1%, 3%, and 50%.



Description	Transmittance Values	Part Number
AC-930 Filter Set	10%, 20%, 30%	AC-930
AC-1930 Filter Set	1%, 3%, 50%	AC-1930

Recertification Service

Each calibration filter set is certified for two years. At the end of that period, sets should be returned to Andover Corporation in their original shipping box for cleaning and recertification. Please contact the Sales Department at (888) 893-9992 before returning your filter set.

Astronomy Filters



- Options for professionals and amateurs alike
- Ideal for photometric calibration

UBVRI Filters

Andover Corporation now offers two sets of UBVRI filters—the Johnson/Bessel and the Kron/Cousins types—as standard items. These wideband filters isolate and measure large specific bands of light emitted by astronomical objects. Both types have the same ultraviolet, blue and visible filters but different red and infrared filters. The Johnson/Bessel type is better suited for use with a photomultiplier tube, while the Kron/Cousins type is better suited for use with a Silicon CCD.

GENERAL SPECIFICATIONS

Size Tolerance	+0/-0.25mm
Glass Thickness	5.0mm +/-0.1mm
Bevels	Break all sharp edges
Coating Durability	Per MIL-C-48497A moderate abrasion
Construction	Schott glass substrates (ground and polished) laminated with index-matching epoxy

Please note: Custom UBVRI filters are available in your choice of size and spectral characteristics. Please contact our technical sales department for a quotation.

OPTICAL SPECIFICATIONS

Transmitted Wavefront	1/4 wave or better per 25mm
Parallelism	30 arc seconds or better
Surface Quality	60/40 or better per MIL-C-675
Optical Quality	Image Quality
AR Coatings	Exterior surfaces (appropriate to the filter passband)

JOHNSON/BESSEL FILTER SPECIFICATIONS

	U	B	V	R	I
Nominal CW/L	365nm	440nm	550nm	630nm	900nm
Nominal FWHM	60nm	100nm	90nm	120nm	300nm
Nominal Transmission	> 50%	> 55%	> 70%	> 70%	> 70%

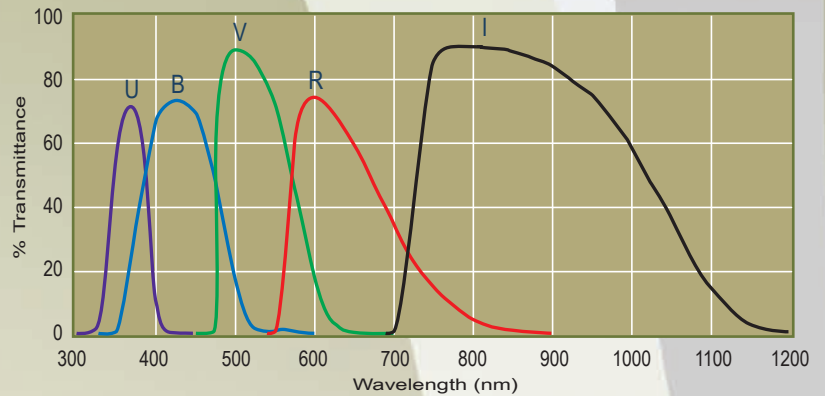
KRON/COUSINS FILTER SPECIFICATIONS

	U	B	V	R	I
Nominal CW/L	365nm	440nm	550nm	760nm	800nm
Nominal FWHM	60nm	100nm	90nm	250nm	150nm
Nominal Transmission	> 50%	> 55%	> 70%	> 70%	> 70%

JOHNSON/BESSEL UBVR I FILTERS

Size, Shape & Part Number & Type					
Type	25mm Ø ○	50mm Ø ○	50mm SQ □	(Mounted) 31mm Ø ○	(Mounted) 50mm Ø ○
Ultraviolet	JOHN-U-25	JOHN-U-50	JOHN-U-50S	JOHN-U-31M	JOHN-U-50M
Blue	JOHN-B-25	JOHN-B-50	JOHN-B-50S	JOHN-B-31M	JOHN-B-50M
Visible	JOHN-V-25	JOHN-V-50	JOHN-V-50S	JOHN-V-31M	JOHN-V-50M
Red	JOHN-R-25	JOHN-R-50	JOHN-R-50S	JOHN-R-31M	JOHN-R-50M
Infrared	JOHN-I-25	JOHN-I-50	JOHN-I-50S	JOHN-I-31M	JOHN-I-50M
5 Piece Sets	JOHN-FA-25	JOHN-FA-50	JOHN-FA-50S	JOHN-FA-31M	JOHN-FA-50M

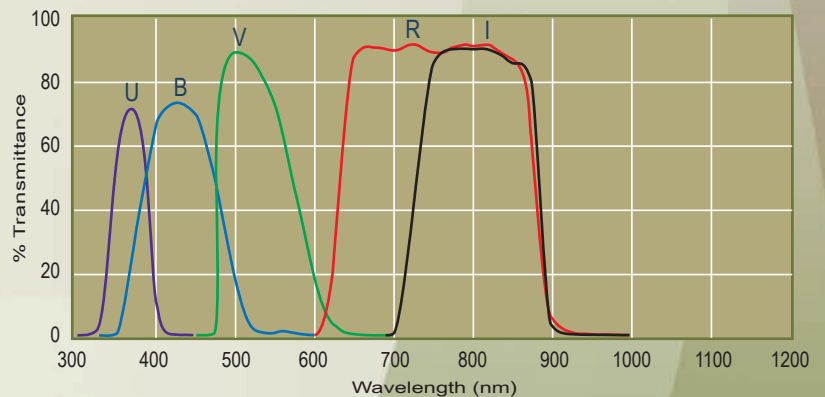
- Ultraviolet
- Blue
- Visible
- Red
- Infrared



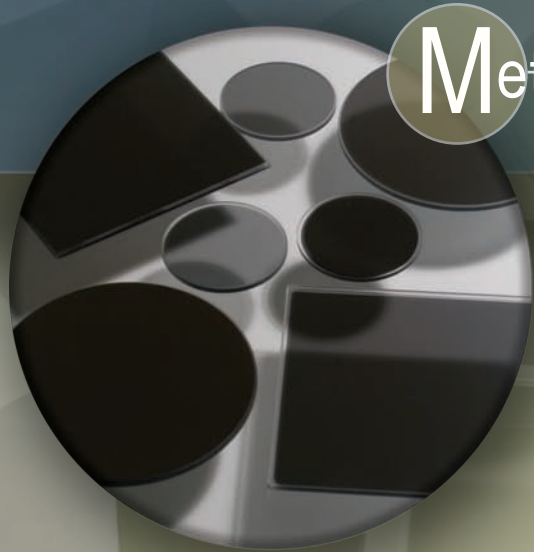
KRON/COUSINS UBVR I FILTERS

Size, Shape & Part Number & Type					
Type	25mm Ø ○	50mm Ø ○	50mm SQ □	(Mounted) 31mm Ø ○	(Mounted) 50mm Ø ○
Ultraviolet	KRON-U-25	KRON-U-50	KRON-U-50S	KRON-U-31M	KRON-U-50M
Blue	KRON-B-25	KRON-B-50	KRON-B-50S	KRON-B-31M	KRON-B-50M
Visible	KRON-V-25	KRON-V-50	KRON-V-50S	KRON-V-31M	KRON-V-50M
Red	KRON-R-25	KRON-R-50	KRON-R-50S	KRON-R-31M	KRON-R-50M
Infrared	KRON-I-25	KRON-I-50	KRON-I-50S	KRON-I-31M	KRON-I-50M
5 Piece Sets	KRONFA-25	KRON-FA-50	KRON-FA-50S	KRON-FA-31M	KRON-FA-50M

- Ultraviolet
- Blue
- Visible
- Red
- Infrared



Metallic Neutral Density Filters



- Provides attenuation with greater linearity over a wide spectral range
- Reduces thermal effects in low-power laser applications
- Delivers superior durability
- Soda lime glass, fused silica and custom substrates available

GENERAL SPECIFICATIONS

Thickness	1.5 ±0.5mm
Dimensional Tolerances	+0/-0.2mm
Clear Aperture	90% of outside dimension
Surface Quality	60/40 per MIL-0-13830B
Coating Adherence	Per MIL-M-13508C
Humidity	Per MIL-STD-810F
Max. Operating Temperature	+100°C
Substrate Materials	Glass (350–2000nm region) or fused silica (250–2000nm region)
Optical Quality	Glass: Flatness of 3–5 waves per inch and parallelism of 3 arc minutes or better. Fused Silica: Flatness of λ/4 per inch and parallelism of 30 arc seconds or better
Mechanical	Unmounted
Optional:	Mounted in threaded ring - see pg 55 for thread sizes

Metallic Coated

Metallic-coated neutral density (ND) filters obtain their optical density from a metal alloy coating on a substrate determined by the wavelength region of interest. Unlike the all-dielectric or absorption type, the metallic type ND filter employs a combination of absorption and reflection to reduce the intensity of light. While able to withstand more incident energy than the absorptive type, metallic ND filters are suitable only for low-power applications. (Note: If used in series, these filters should be tilted to avoid multiple reflections and any reduction of density).

Applications

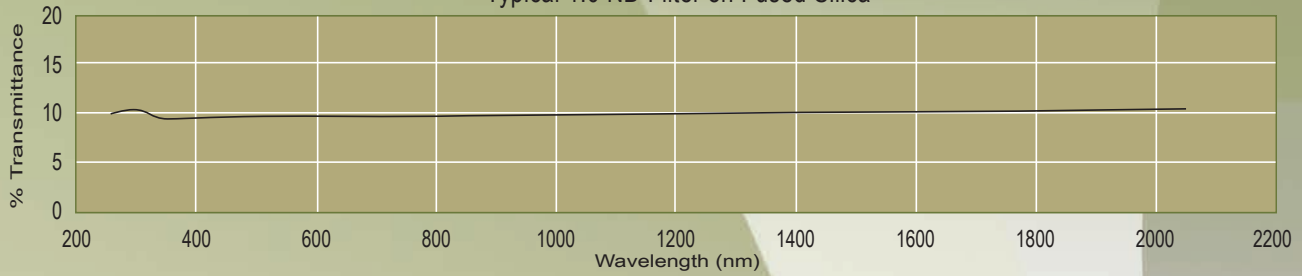
Calibration
Attenuation
Low-Power Lasers
Scientific Measurements and Research
Machine Vision and Other Imaging Applications



METALLIC NEUTRAL DENSITY SPECIFICATIONS

Optical Density	Nominal Transmission (%)	Transmission Deviation From Nominal (%)		
		250-350nm	350-800nm	800-2000nm
0.10	79.5	±9.0	±3.0	±9.0
0.15	70.8	±8.0	±3.0	±8.0
0.20	63.0	±6.0	±2.0	±6.0
0.30	50.0	±5.0	±2.0	±5.0
0.40	39.1	±4.0	±1.5	±4.0
0.50	31.6	±4.0	±1.5	±4.0
0.60	25.0	±4.0	±1.5	±4.0
0.70	20.0	±4.0	±1.5	±4.0
0.80	15.5	±4.0	±1.5	±4.0
0.90	12.6	±3.5	±1.0	±3.5
1.00	10.0	±3.5	±1.0	±3.5
1.30	5.0	±3.0	±1.0	±3.0
1.50	3.2	±1.5	±0.5	±1.5
2.00	1.0	±0.5	±0.2	±0.5
2.50	0.32	±0.15	±0.07	±0.15
3.00	0.10	±0.06	±0.05	±0.1 (nominal)
4.00	0.01	±0.008	+0.01/-0.008	±0.01 (nominal)

Typical 1.0 ND Filter on Fused Silica



VISIBLE/NEAR INFRARED REGION (Glass Substrate, 350–2000nm)

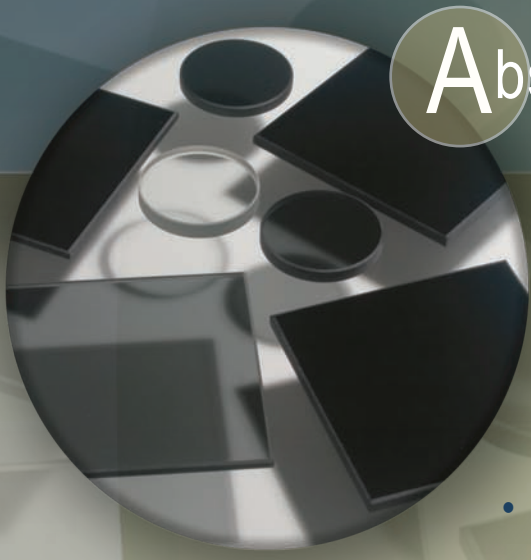
Optical Density	Nominal Transmission (%)	Size, Shape & Part Number			
		12.5mm Ø ○	25mm Ø ○	50mm Ø ○	50mm SQ □
0.10	79.43	010FN52-12.5	010FN52-25	010FN52-50	010FN52-50S
0.15	70.79	015FN52-12.5	015FN52-25	015FN52-50	015FN52-50S
0.20	63.10	020FN52-12.5	020FN52-25	020FN52-50	020FN52-50S
0.30	50.12	030FN52-12.5	030FN52-25	030FN52-50	030FN52-50S
0.40	39.81	040FN52-12.5	040FN52-25	040FN52-50	040FN52-50S
0.50	31.62	050FN52-12.5	050FN52-25	050FN52-50	050FN52-50S
0.60	25.12	060FN52-12.5	060FN52-25	060FN52-50	060FN52-50S
0.70	19.95	070FN52-12.5	070FN52-25	070FN52-50	070FN52-50S
0.80	15.85	080FN52-12.5	080FN52-25	080FN52-50	080FN52-50S
0.90	12.59	090FN52-12.5	090FN52-25	090FN52-50	090FN52-50S
1.00	10.00	100FN52-12.5	100FN52-25	100FN52-50	100FN52-50S
1.30	5.01	130FN52-12.5	130FN52-25	130FN52-50	130FN52-50S
1.50	3.16	150FN52-12.5	150FN52-25	150FN52-50	150FN52-50S
1.00	1.00	200FN52-12.5	200FN52-25	200FN52-50	200FN52-50S
2.50	0.32	250FN52-12.5	250FN52-25	250FN52-50	250FN52-50S
3.00	0.10	300FN52-12.5	300FN52-25	300FN52-50	300FN52-50S
4.00	0.01	400FN52-12.5	400FN52-25	400FN52-50	400FN52-50S

For Sets see pg 28; Infrared NDs also available - see pg 48 for details

ULTRAVIOLET/VISIBLE/NEAR INFRARED REGION (Fused Silica, 250–2000nm)

Optical Density	Nominal Transmission (%)	Size, Shape & Part Number			
		12.5mm Ø ○	25mm Ø ○	50mm Ø ○	50mm SQ □
0.10	79.43	010FN46-12.5	010FN46-25	010FN46-50	010FN46-50S
0.15	70.79	015FN46-12.5	015FN46-25	015FN46-50	015FN46-50S
0.20	63.10	020FN46-12.5	020FN46-25	020FN46-50	020FN46-50S
0.30	50.12	030FN46-12.5	030FN46-25	030FN46-50	030FN46-50S
0.40	39.81	040FN46-12.5	040FN46-25	040FN46-50	040FN46-50S
0.50	31.62	050FN46-12.5	050FN46-25	050FN46-50	050FN46-50S
0.60	25.12	060FN46-12.5	060FN46-25	060FN46-50	060FN46-50S
0.70	19.95	070FN46-12.5	070FN46-25	070FN46-50	070FN46-50S
0.80	15.85	080FN46-12.5	080FN46-25	080FN46-50	080FN46-50S
0.90	12.59	090FN46-12.5	090FN46-25	090FN46-50	090FN46-50S
1.00	10.00	100FN46-12.5	100FN46-25	100FN46-50	100FN46-50S
1.30	5.01	130FN46-12.5	130FN46-25	130FN46-50	130FN46-50S
1.50	3.16	150FN46-12.5	150FN46-25	150FN46-50	150FN46-50S
1.00	1.00	200FN46-12.5	200FN46-25	200FN46-50	200FN46-50S
2.50	0.32	250FN46-12.5	250FN46-25	250FN46-50	250FN46-50S
3.00	0.10	300FN46-12.5	300FN46-25	300FN46-50	300FN46-50S
4.00	0.01	400FN46-12.5	400FN46-25	400FN46-50	400FN46-50S

Absorptive Neutral Density Filters



- Sets provide a uniform series of filters for adjusting illumination
- Custom substrate materials and dimensions available

Absorptive

With their ability to minimize back-reflections and scattered light, absorptive neutral density (ND) filters are ideal for calibration. In contrast to the metallic type, absorption-type filters achieve their optical density by absorbing light within the substrate. For this reason, thickness is a key determinant of opacity. Because of their absorbing quality, these filters are suitable for low-power applications only.

Infrared NDs also available - see pg 48 for details

GENERAL SPECIFICATIONS

Thickness	5.0mm (maximum)
Dimensional Tolerance	±0.5mm
Clear Aperture	90% of outside dimension
Surface Quality	60/40 per MIL-0-13830B
Max. Operating Temperature	+100°C
Substrate Material	Schott absorption glass
Spectral Range	400–700nm
Optical Quality	Flatness of $\lambda/4$ per inch and parallelism of 30 arc seconds or better
Mechanical	Unmounted
Optional:	Mounted in threaded ring - see pg 55 for thread sizes

Applications

Photomicrography
Machine Vision
Photography
Scientific Measurements and Research



Optical Density	Density Tolerance @ 550nm (%)	Nominal Transmission (%)	Thickness (mm)	Size, Shape & Part Number	
				25mm Ø ○	50mm SQ □
0.10	±20.00	79.5	3.73	010ABND-25	010ABND-50S
0.20	±10.00	63.0	1.53	020ABND-25	020ABND-50S
0.30	±10.00	50.0	2.46	030ABND-25	030ABND-50S
0.40	±10.00	39.8	3.39	040ABND-25	040ABND-50S
0.50	±10.00	31.6	1.91	050ABND-25	050ABND-50S
0.60	±10.00	25.0	2.32	060ABND-25	060ABND-50S
0.70	±10.00	20.0	2.73	070ABND-25	070ABND-50S
0.80	±10.00	15.8	3.13	080ABND-25	080ABND-50S
0.90	±10.00	12.6	1.75	090ABND-25	090ABND-50S
1.00	±10.00	10.0	1.95	100ABND-25	100ABND-50S
1.50	±10.00	3.2	2.96	150ABND-25	150ABND-50S
2.00	±10.00	1.0	1.96	200ABND-25	200ABND-50S
3.00	±10.00	0.10	2.96	300ABND-25	300ABND-50S
4.00	±10.00	0.01	2.84	400ABND-25	400ABND-50S

Neutral Density Sets



If you're looking to purchase more than just a few filters, may we recommend our Metallic-Coated Sets. Or you may want to build your own set. Either way you'll SAVE! All filter sets are favorably discounted, and come with a quality hardwood case for secure storage.



Metallic-Coated Sets

Andover's metallic-coated neutral density filter sets feature both round and square filters in your choice of four sizes and two substrates.

7 Piece Set

Includes seven filters with optical densities ranging from 0.10 to 4.00, in your choice of four set sizes, and in either glass or fused silica substrates.

0.10
0.30
0.50
1.00
2.00
3.00
4.00

Size, Shape & Part Number				
Substrate	12.5mm Ø ○	25mm Ø ○	50mm Ø ○	50mm SQ □
Glass	128FA52-12.5	128FA52-25	128FA52-50	128FA52-50S
Fused Silica	130FA46-12.5	130FA46-25	130FA46-50	130FA46-50S

17 Piece Set

Includes seventeen filters with optical densities ranging from 0.10 to 4.00, in your choice of four set sizes, and in either glass or fused silica substrates.

0.10 0.90
0.15 1.00
0.20 1.30
0.30 1.50
0.40 2.00
0.50 2.50
0.60 3.00
0.70 4.00
0.80

Size, Shape & Part Number				
Substrate	12.5mm Ø ○	25mm Ø ○	50mm Ø ○	50mm SQ □
Glass	132FA52-12.5	132FA52-25	132FA52-50	132FA52-50S
Fused Silica	134FA46-12.5	134FA46-25	134FA46-50	134FA46-50S

Absorptive Sets

Andover's absorptive neutral density filter sets provide a choice of either round or square filters.

7 Piece Set

Includes seven filters with optical densities ranging from 0.10 to 4.00.

0.10
0.30
0.50
1.00
2.00
3.00
4.00

Size, Shape & Part Number	
25mm Ø ○	50mm SQ □
135FAND-25	135FAND-50S

14 Piece Set

Includes fourteen filters with optical densities ranging from 0.10 to 4.00.

0.10 0.80
0.20 0.90
0.30 1.00
0.40 1.50
0.50 2.00
0.60 3.00
0.70 4.00

Size, Shape & Part Number	
25mm Ø ○	50mm SQ □
136FAND-25	136FAND-50S

Heat Control Filters



Heat Control Filters

A combination of hot and cold mirrors can essentially eliminate 99% of the radiation generated by high-power illumination systems. The cold mirror, mounted at a 45° angle of incidence, transmits much of the heat while reflecting the visible light. The hot mirror, mounted perpendicular to the light beam, reflects the remaining heat while transmitting 90% of the visible light.

- Cold mirrors transmit near-IR and reflect visible light
- Hot mirrors reflect near-IR and transmit visible light
- Together, they effectively cool high-power illumination systems

GENERAL SPECIFICATIONS

Thickness	3.0mm ±0.5mm (6.0mm ±0.5mm for IR Suppressing)
Size Tolerance	+0.0mm/-0.5mm
Min. Clear Aperture	95% of outside dimension
Substrate Material	Borosilicate glass
Flatness	5–10 waves per 25mm
Parallelism	3 arc minutes or better
Surface Quality	80/50 per MIL-O-13830
Humidity and Abrasion	Per MIL-C-675A
Max. Operating Temperature	+200°C (+100°C for IR suppressing)
Mechanical	Unmounted
Optional:	Mounted in threaded ring - see pg 55 for thread sizes

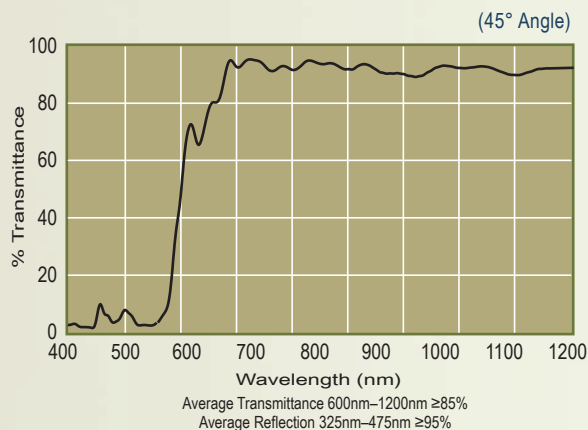
Applications

Projection Systems
 Photocopiers
 Surgical and Dental
 Lighting
 Film and Photographic
 Apparatus
 Illumination Systems
 Scientific Instruments

Ultraviolet Cold Mirrors

Ultraviolet mirrors differ slightly from the standard cold mirror in that they reflect the ultraviolet and transmit the visible and infrared. They are excellent for applications that call for separating the ultraviolet from the visible and near infrared.

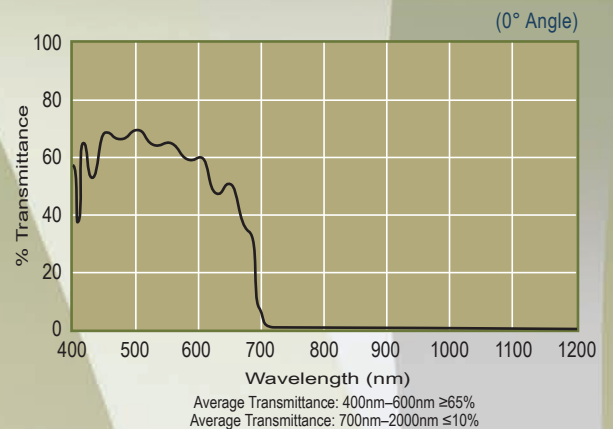
Size, Shape & Part Number		
25mm Ø ○	50mm Ø ○	50mm SQ □
375FV86-25	375FV86-50	375FV86-50S



Infrared Suppressing Filters

These filters extend the blocking of standard hot mirrors across the infrared range using a combination of reflection from the dielectric stack and absorption from an infrared-absorbing filter glass. Because of this absorption factor, these filters are suitable only in low-power applications with a maximum filter temperature of 100°C.

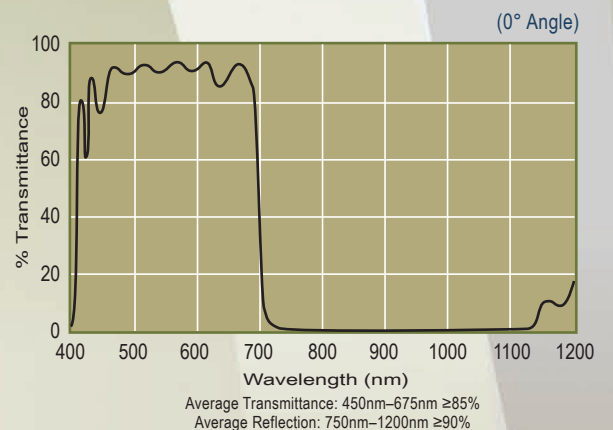
Size, Shape & Part Number		
25mm Ø ○	50mm Ø ○	50mm SQ □
800FB72-25	800FB72-50	800FB72-50S



Hot Mirrors

Hot mirrors are heat-reflecting filters designed to transmit visible wavelengths and reflect near-infrared heat-generating wavelengths. Andover's hot mirrors have hard, first-surface dielectric coatings that meet or exceed the humidity and abrasion specifications listed above. The coatings are deposited onto a low-expansion material such as borosilicate glass to prevent cracking or crazing from high heat applications.

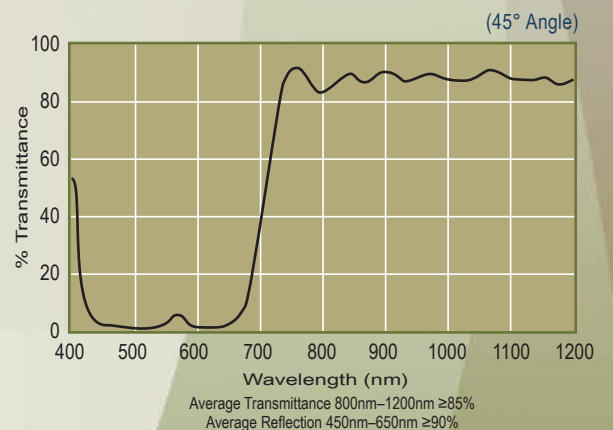
Size, Shape & Part Number		
25mm Ø ○	50mm Ø ○	50mm SQ □
775FW82-25	775FW82-50	775FW82-50S



Cold Mirrors

Cold mirrors are heat-transmitting filters designed to reflect visible wavelengths and transmit near-infrared wavelengths. Andover's cold mirrors have first-surface coatings that are deposited onto a low-expansion material such as borosilicate glass.

Size, Shape & Part Number		
25mm Ø ○	50mm Ø ○	50mm SQ □
645FK84-25	645FK84-50	645FK84-50S



Dichroic Filters



Dichroics

Far more durable than dyed plastic or gel-coated types, dichroic glass filters have a hard dielectric film created by thin layers of metallic oxides. These color separation filters are designed to isolate certain regions of the visible spectrum, reflecting rather than absorbing unwanted frequencies. As a result, they not only produce pure, intense color but also withstand the heat and UV energy from high-energy light sources. Commonly used as light balancing filters in color enlargers and photocopiers, dichroic filters are suitable for any application that requires separating the incident energy into two or more light beams.

- Provide sharp separation between transmission and reflection
- Spectrally stable at changing temperatures and humidity
- Available in custom designs, colors, angles of incidence, substrates, dimensions, and coatings

GENERAL SPECIFICATIONS

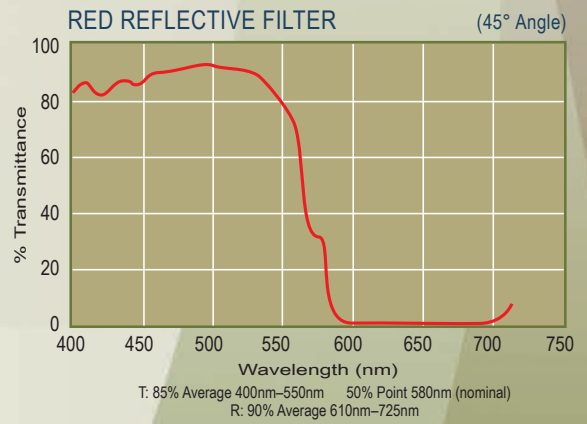
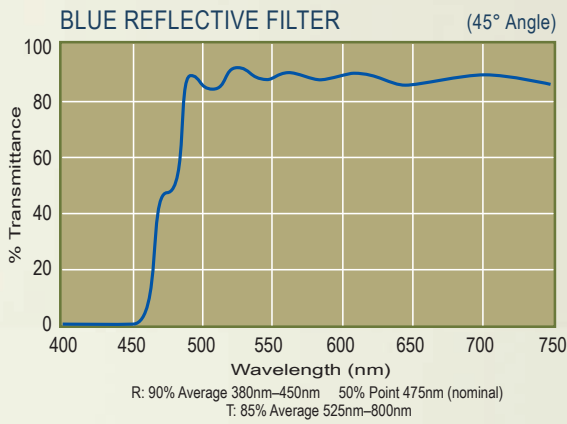
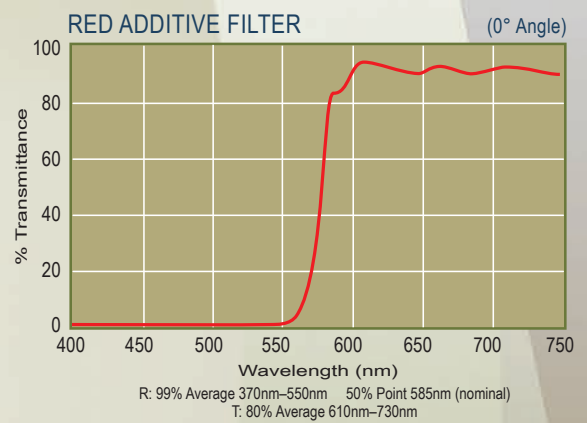
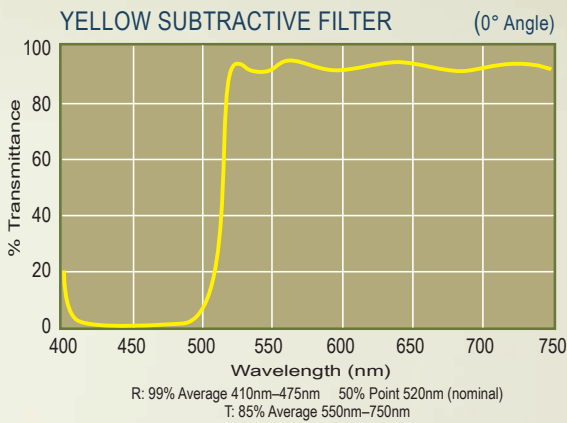
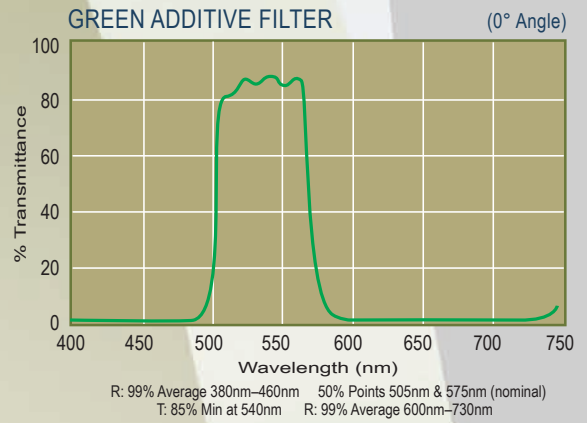
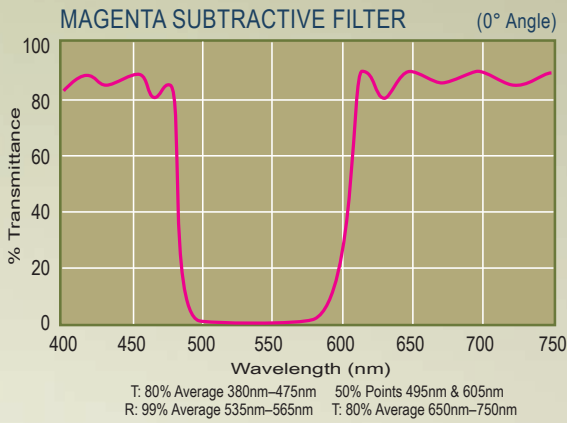
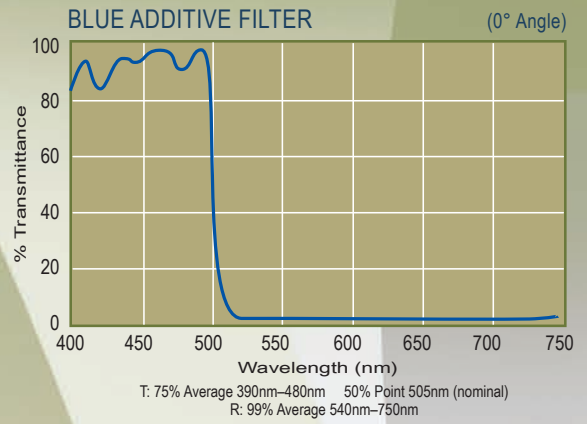
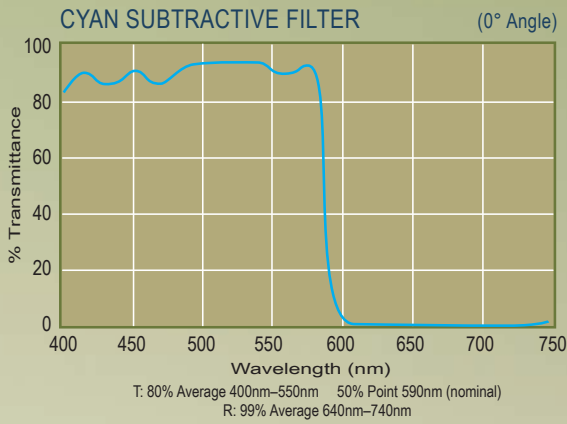
Thickness	1.0mm ±0.25mm
Size Tolerance	+0.0mm/-0.25mm
Min. Clear Aperture	95% of outside dimension
Substrate Material	Soda lime glass
Flatness	3–5 waves per 25mm
Parallelism	3 arc minutes or better
Surface Quality	80/50 per MIL-C-48497A
Humidity and Abrasion	Per MIL-C-48497A
Max. Operating Temperature	+200°C
Mechanical	Unmounted
Optional:	Mounted in threaded ring - see pg 55 for thread sizes

Applications

Fluorescence Microscopy
 UV-VIS Irradiation
 Camera Imaging
 Stage Lighting
 Architectural Lighting
 Projection Displays
 Color Enlargers
 Photocopiers



Type	Color	Size, Shape & Part Number		
		25mm Ø ○	50mm Ø ○	50mm SQ □
Subtractive	Cyan	590FD22-25	590FD22-50	590FD22-50S
	Magenta	550FD26-25	550FD26-50	550FD26-50S
	Yellow	520FD24-25	520FD24-50	520FD24-50S
Additive	Blue	505FD64-25	505FD64-50	505FD64-50S
	Green	540FD66-25	540FD66-50	540FD66-50S
	Red	585FD62-25	585FD62-50	585FD62-50S
Reflective	Blue	475FD68-25	475FD68-50	475FD68-50S
	Red	580FD70-25	580FD70-50	580FD70-50S





If you're looking to purchase more than just one or two filters, may we recommend our Standard 3-piece sets. Or you may want to build your own set. Either way you'll SAVE! All filter sets are favorably discounted, and come with a quality hardwood case for secure storage.



USER-DEFINED DICHOIC FILTER SETS

User-Defined Sets	Size, Shape & Number		
	25mm Ø ○	50mm Ø ○	50mm Ø □
3-Piece Set	000FS03-25	000FS03-50	000FS03-50S
6-Piece Set	000FS06-25	000FS06-50	000FS06-50S
8-Piece Set	000FS08-25	000FS08-50	000FS08-50S

Standard Dichroic Filter Sets

Excellent for color process work, Andover's select dichroic filter sets come in two configurations. Each set is accompanied by complete spectral curve data sheet and shipped in a protective storage case.

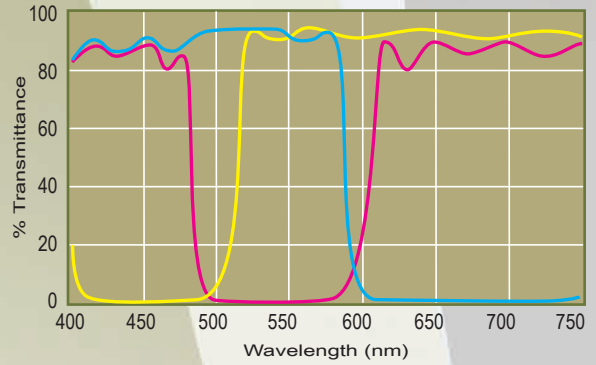
COLOR SUBRACTIVE SET

3 Piece Set Includes Yellow, Magenta and Cyan filters in your choice of three sizes.

Size, Shape & Part Number		
25mm Ø ○	50mm Ø ○	50mm SQ □
126FA46-25	126FA46-50	126FA46-50S



- Cyan**
 T: 80% Average 400nm–550nm 50% Point 590nm (nominal)
 R: 99% Average 640nm–740nm
- Magenta**
 T: 80% Average 380nm–475nm 50% Points 495nm & 605nm (nominal)
 R: 99% Average 535nm–565nm
 T: 80% Average 650nm–750nm
- Yellow**
 R: 99% Average 410nm–475nm 50% Cut-on 520nm (nominal)
 T: 85% Average 550nm–750nm



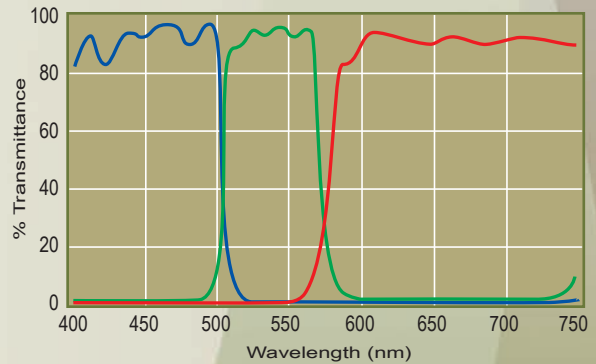
COLOR ADDITIVE SET

3 Piece Set Includes Blue, Green and Red filters in your choice of three sizes.

Size, Shape & Part Number		
25mm Ø ○	50mm Ø ○	50mm SQ □
126FA44-25	126FA44-50	126FA44-50S



- Blue**
 T: 80% Average 390nm–480nm 50% Point 505nm (nominal)
 R: 99% Average 540nm–750nm
- Green**
 R: 99% Average 380nm–460nm 50% Points 505nm & 575nm (nominal)
 T: 85% Minimum at 540nm
 R: 99% Average 600nm–730nm
- Red**
 R: 1% Average 370nm–550nm 50% Cut-on 585nm (nominal)
 T: 85% Average 610nm–730nm



Edge Filters



Edge Filters

Often referred to as long wave pass (LWP) and short wave pass (SWP) filters, edge filters provide a well-defined transition between reflecting and transmitting regions. Essentially a modified quarter-wave stack, the filters use interference effects rather than absorption to isolate their spectral bands. Because edge filters will shift shorter with an increase in the angle of incidence, they are a good choice for fine-tuning the cut-on/cut-off wavelength. With their durable, first-surface dielectric coatings, Andover's edge filters are built to withstand the normal cleaning and handling required by any high-quality optical component.

- Useful for redirecting a particular band of light
- Provide steeper transition than color glass filters
- Offer coverage over the 400-1000nm range

GENERAL SPECIFICATIONS

Thickness	4.0mm maximum
Size Tolerance	+0.0mm/-0.5mm
Min. Clear Aperture	85% of outside dimension
Substrate Material	Glass (Note: BK-7 or Borofloat available as an option for higher Tx)
Flatness	3-5 waves per 25mm
Surface Quality	80/50 per MIL-C-48497A
Humidity and Abrasion	Per MIL-C-675A
Operating Temperature	-50°C to +100°C
Cut-on/cut-off Slopes	6% maximum
Cut-on/cut-off Tolerance	±10nm
Mechanical	Unmounted
Optional:	Mounted in threaded ring - see pg 55 for thread sizes

TRANSMISSION

Long Wave Pass	85% average from the 50% cut-on point to 2000nm
Short Wave Pass	85% average from the 50% cut-off point to 0.6 x the 50% cut-off point (Note: With the exception of the 400nm filter, all SWP filters will drop off in transmission at wavelengths under 425nm.)

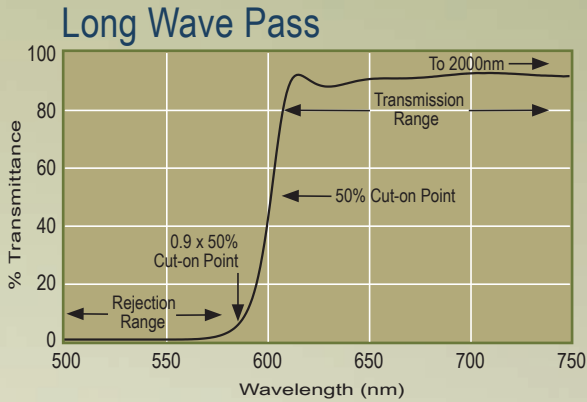
REJECTION

Long Wave Pass	99% or greater from 0.9 x the 50% point to the ultra-violet
Short Wave Pass	99% or greater from 1.07 x the 50% point to 1.25 x the 50% point
Effective Index of Refraction (n*)	1.7 (approximately)

Applications

Fluorescence
Photometry
Color Enhancement
and Combining



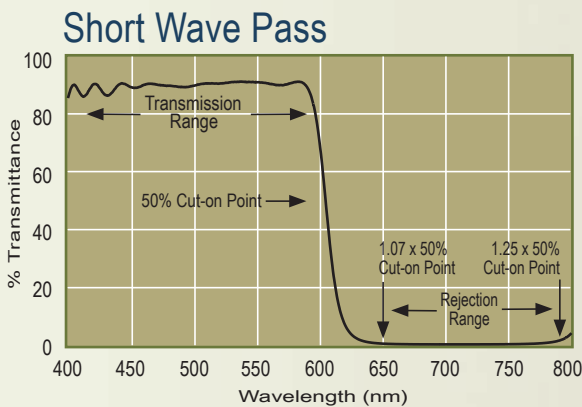


VISIBLE

50% Point	Size, Shape & Part Number		
	25mm Ø	50mm Ø	50mm SQ
400nm	400FH90-25	400FH90-50	400FH90-50S
450nm	450FH90-25	450FH90-50	450FH90-50S
500nm	500FH90-25	500FH90-50	500FH90-50S
550nm	550FH90-25	550FH9050	550FH90-50S
600nm	600FH90-25	600FH90-50	600FH90-50S
650nm	650FH90-25	650FH90-50	650FH90-50S
700nm	700FH90-25	700FH90-50	700FH90-50S

NEAR INFRARED

50% Point	Size, Shape & Part Number		
	25mm Ø	50mm Ø	50mm SQ
750nm	750FH90-25	750FH90-50	750FH90-50S
800nm	800FH90-25	800FH90-50	800FH90-50S
950nm	850FH90-25	850FH90-50	850FH90-50S
900nm	900FH90-25	900FH9050	900FH90-50S
950nm	950FH90-25	950FH90-50	950FH90-50S
1000nm	100FH90-25	100FH90-50	100FH90-50S



VISIBLE

50% Point	Size, Shape & Part Number		
	25mm Ø	50mm Ø	50mm SQ
400nm	400FL07-25	400FL0750	400FL07-50S
450nm	450FL07-25	450FL07-50	450FL07-50S
500nm	500FL07-25	500FL07-50	500FL07-50S
550nm	550FL07-25	550FL0750	550FL07-50S
600nm	600FL07-25	600FL07-50	600FL07-50S
650nm	650FL07-25	650FL07-50	650FL07-50S
700nm	700FL07-25	700FL07-50	700FL07-50S

NEAR INFRARED

50% Point	Size, Shape & Part Number		
	25mm Ø	50mm Ø	50mm SQ
750nm	750FL07-25	750FL07-50	750FL07-50S
800nm	800FL07-25	800FL07-50	800FL07-50S
950nm	850FL07-25	850FL07-50	850FL07-50S
900nm	900FL07-25	900FL07-50	900FL07-50S
950nm	950FL07-25	950FL07-50	950FL07-50S
1000nm	100FL07-25	100FL07-50	100FL07-50S

Edge Filter Sets



If you're looking to purchase more than one or two Edge filters, may we recommend our Standard sets or you may want to build your own set. Either way you'll SAVE! All filter sets are favorably discounted, and come with a quality hardwood case for secure storage.



VARIABLE PASS SETS

Visible LWP/SWP Set

14 Piece Set

Includes seven Long Wave Pass and seven Short Wave Pass filters, providing coverage of the 400nm to 700nm wavelength range.

LONG WAVE
400nm
450nm
500nm
550nm
600nm
650nm
700nm

Size, Shape & Part Number

25mm Ø	50mm Ø	50mm SQ
126FA97-25	126FA97-50	126FA90-50S

SHORT WAVE
400nm
450nm
500nm
550nm
600nm
650nm
700nm

Near Infrared LWP/SWP Set

12 Piece Set

Includes six Long Wave Pass and six Short Wave Pass filters, providing coverage of the 750nm to 1000nm wavelength range.

LONG WAVE
750nm
800nm
850nm
900nm
950nm
1000nm

Size, Shape & Part Number

25mm Ø	50mm Ø	50mm SQ
127FA97-25	127FA90-50	127FA97-50S

SHORT WAVE
750nm
800nm
850nm
900nm
950nm
1000nm

LONG WAVE PASS SETS

Visible LWP Set

7 Piece Set

Includes seven Long Wave Pass filters, spaced at 50nm increments from 400nm to 700nm.

LONG WAVE

400nm
450nm
500nm
550nm
600nm
650nm
700nm

Size, Shape & Part Number		
25mm Ø 	50mm Ø 	50mm SQ 
120FA90-25	120FA90-50	120FA90-50S




Near Infrared LWP Set

6 Piece Set

Includes six Long Wave Pass filters, spaced at 50nm increments from 750nm to 1000nm.

LONG WAVE

750nm
800nm
850nm
900nm
950nm
1000nm

Size, Shape & Part Number		
25mm Ø 	50mm Ø 	50mm SQ 
121FA90-25	121FA90-50	121FA90-50S

Visible/Near Infrared LWP Set

13 Piece Set

Includes thirteen Long Wave Pass filters, spaced at 50nm increments from 400nm to 1000nm.

LONG WAVE

400nm
450nm
500nm
550nm
600nm
650nm
700nm
750nm
800nm
850nm
900nm
950nm
1000nm

Size, Shape & Part Number		
25mm Ø 	50mm Ø 	50mm SQ 
122FA90-25	122FA90-50	122FA90-50S

SHORT WAVE PASS SETS




Visible SWP Set

7 Piece Set

Includes seven Short Wave Pass filters, spaced at 50nm increments from 400nm to 700nm.

SHORT WAVE

400nm
450nm
500nm
550nm
600nm
650nm
700nm

Size, Shape & Part Number		
25mm Ø 	50mm Ø 	50mm SQ 
123FA07-25	123FA07-50	123FA07-50S


Near Infrared SWP Set

6 Piece Set

Includes six Short Wave Pass filters, spaced at 50nm increments from 750nm to 1000nm.

SHORT WAVE

750nm
800nm
850nm
900nm
950nm
1000nm

Size, Shape & Part Number		
25mm Ø 	50mm Ø 	50mm SQ 
124FA07-25	124FA07-50	124FA07-50S




Visible/Near Infrared SWP Set

13 Piece Set

Includes thirteen Short Wave Pass filters, spaced at 50nm increments from 400nm to 1000nm.

SHORT WAVE

400nm
450nm
500nm
550nm
600nm
650nm
700nm
750nm
800nm
850nm
900nm
950nm
1000nm

Size, Shape & Part Number		
25mm Ø 	50mm Ø 	50mm SQ 
125FA07-25	125FA07-50	125FA07-50S

Infrared Filters & Coatings



Infrared Windows & Substrates

Andover stocks a variety of optical-quality infrared-transmitting substrates. All substrates are optically polished. A/R coatings are also available; see next page for details.

For your convenience and economy, we offer the windows in two standard sizes: 25 mm and 50 mm dia. However, we can produce custom sizes and shapes. Contact our technical sales department for a quotation.

- High optical quality
- Available from stock
- Custom sizes available

GENERAL SPECIFICATIONS

Thickness	1.0 ±.2mm
Diameter tolerance	+0/- .1mm
Surface Quality:	60/40 per MIL-C-48497A
CTE:	Coefficient of Thermal Expansion (see tables)

Threaded ring mounting available - see pg 55 for thread sizes

Applications

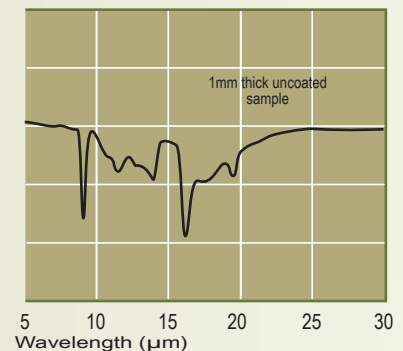
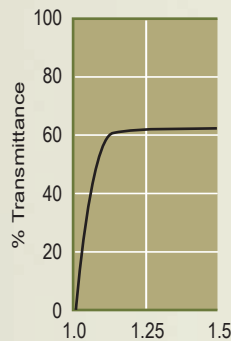
Thermal Imaging
Weapons Systems
Detector Windows
IR Photography

Substrate Material	Size, Shape & Part Number	
	25mm Ø ○	50mm Ø ○
Silicon (Si)	IRWS100-25	IRWS100-50
Germanium (Ge)	IRWS200-25	IRWS200-50
Sapphire (Al ₂ O ₃)	IRWS300-25	IRWS300-50
Fused Silica (SiO ₂)	IRWS400-25	IRWS400-50
Calcium Fluoride (CaF ₂)	IRWS500-25	IRWS500-50
Zinc Selenide (ZnSe)	IRWS600-25	IRWS600-50

SILICON

Silicon (Si) is an economical choice for many IR applications.

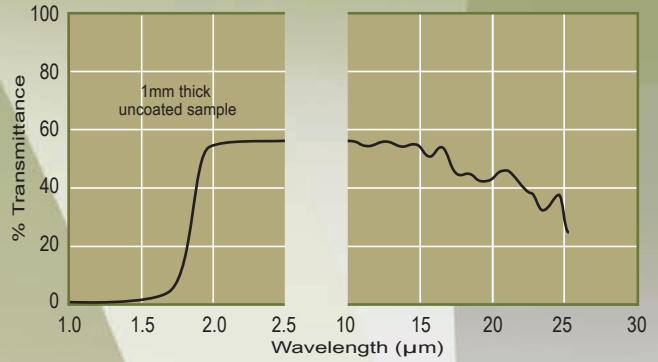
Refractive index:	3.43 at 3.0µm
CTE (10 ⁻⁶ /°C):	4.15
Hardness (Knoop):	820



GERMANIUM

Germanium (Ge) is widely used for lenses and windows in the Mid-IR region.

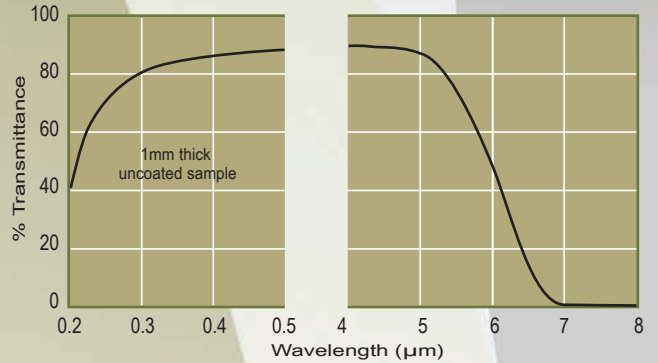
Refractive index: 4.00 at 10.6 μ m
CTE ($10^{-6}/^{\circ}$ C): 5.7
Hardness (Knoop): 692



SAPPHIRE

Sapphire (Al_2O_3) is transparent over a wide range, and has excellent mechanical strength.

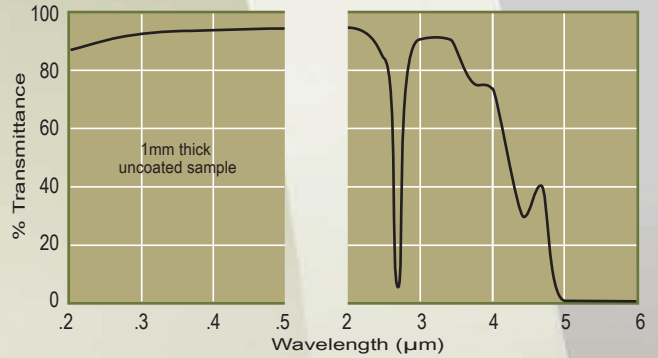
Refractive index: 1.737 at 2.0 μ m
CTE ($10^{-6}/^{\circ}$ C): 7.7
Hardness (Knoop): 1920



FUSED SILICA

Fused silica (SiO_2) has good transmission from the UV to the near IR, exhibits minimal fluorescence, and has a very low CTE.

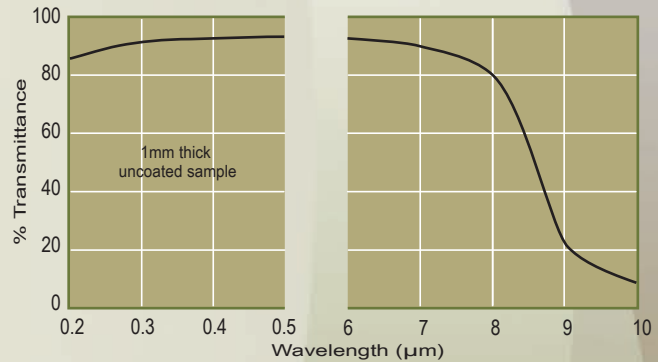
Refractive index: 1.45 at 1.0 μ m
CTE ($10^{-6}/^{\circ}$ C): 0.55
Hardness (Knoop): 741



CALCIUM FLUORIDE

Calcium Fluoride (CaF_2) has good transmission from the UV to the Mid-IR.

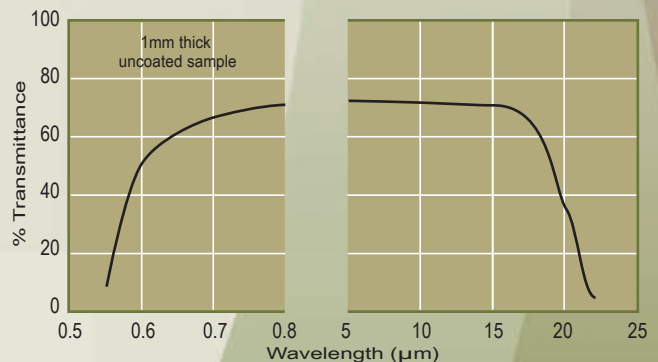
Refractive index: 1.40 at 5.0 μ m
CTE ($10^{-6}/^{\circ}$ C): 18.9
Hardness (Knoop): 160



ZINC SELENIDE

Zinc Selenide ($ZnSe$) is widely used for lenses and windows in the Mid-IR region.

Refractive index: 2.40 at 10.6 μ m
CTE ($10^{-6}/^{\circ}$ C): 7.6
Hardness (Knoop): 100



Infrared Filters & Coatings



Broadband A/R Coating on Germanium

Andover produces a non-radioactive dielectric multilayer coating designed to reduce the reflection of Germanium substrates in the infrared. Reflection is reduced from 36% per surface to less than 1% per surface.

Constructed of hard, durable first-surface dielectric coatings on optical-quality germanium substrates, these filters will withstand cleaning and handling associated with any high-quality optical component.

For your convenience and economy, we offer the filters in two standard sizes: 25 mm and 50 mm dia. However, we can produce custom sizes and shapes, as well as custom optical characteristics. Contact our technical sales department for a quotation.

- Reduces reflection from 36% to 1% per surface
- Constructed of hard, durable, non-radioactive materials
- Meets MIL-C-48497

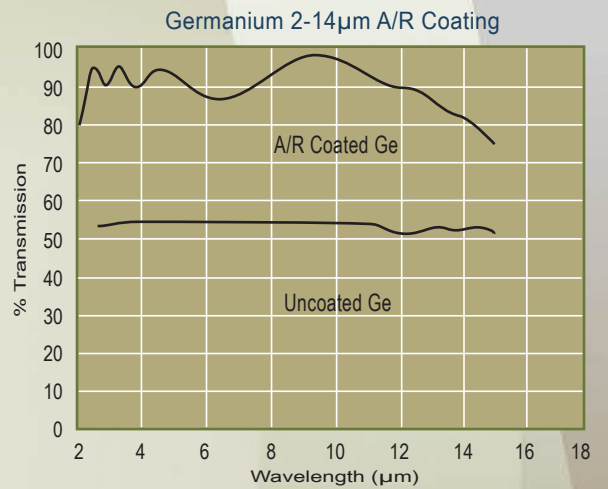
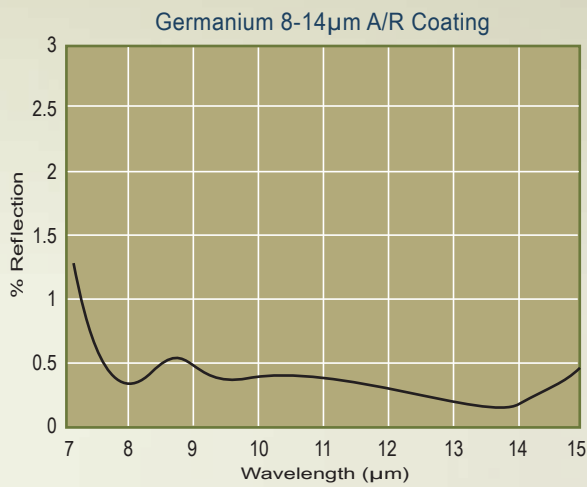
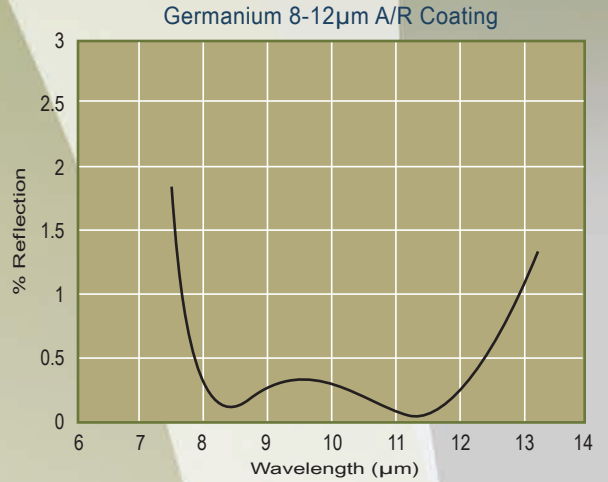
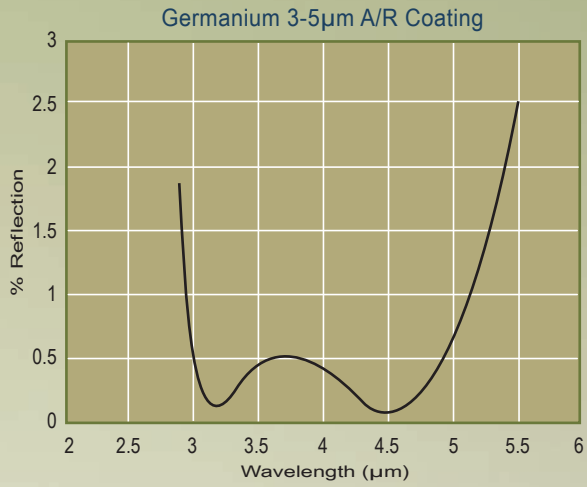
GENERAL SPECIFICATIONS



Thickness	1.0 ±.2mm
Diameter Tolerance	+0/-.1mm
Min. Clear Aperture	90% of outside dimension
Substrate Material	Germanium (other substrates available)
Flatness:	2 waves at 632.8nm
Parallelism:	<10 arc minutes
Surface Quality:	60/40 per MIL-C-48497A
Coating Quality:	60/40 per MIL-C-48497A
24-hour humidity	per MIL-C-48497A
Moderate Abrasion	per MIL-C-48497A
Adhesion	per MIL-C-48497A
Operating Temperature	-62°C to +71°C
Mechanical	Unmounted
Optional:	Mounted in threaded ring - see pg 55 for thread sizes

Applications

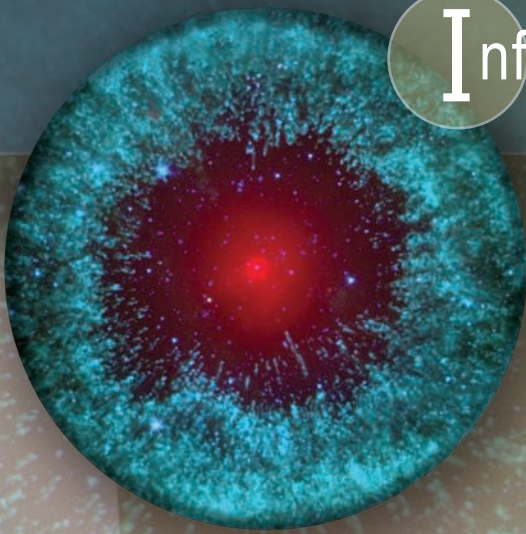
Thermal Imaging
Weapons Systems
Detector Windows
Dewar Windows





A/R Coating	25mm Ø 	50mm Ø 
3-5 μm A/R coated Germanium Window	GEBBAR-3-5-25	GEBBAR-3-5-50
8-12 μm A/R coated Germanium Window	GEBBAR-8-12-25	GEBBAR-8-12-50
8-14 μm A/R coated Germanium Window	GEBBAR-8-14-25	GEBBAR-8-14-50
2-14 μm A/R coated Germanium Window	GEBBAR-2-14-25	GEBBAR-2-14-50

Infrared Filters & Coatings



Standard Long Wave Pass Filters

Long wave pass filters provide a sharp cut-off below a particular wavelength. Often used for order sorting, they isolate broad regions of the spectrum, simultaneously providing high transmission of desired energy, and deep rejection of unwanted energy.

Constructed of hard, durable first-surface dielectric coatings on optical-quality IR-transmitting substrates, these filters will withstand normal cleaning and handling associated with any high-quality optical component.

For your convenience and economy, we offer the filters in two standard sizes: 25 mm and 50 mm dia. However, we can produce custom sizes and shapes, as well as custom optical characteristics. Contact our technical sales department for a quotation.

- Useful for isolating broad spectral regions
- Constructed of hard, durable first-surface coatings
- Available in standard and custom wavelengths

GENERAL SPECIFICATIONS

Thickness:	1.0 ±.2mm
Diameter Tolerance:	+0/-.1mm
Min. Clear Aperture:	90% of outside dimension
Substrate Material:	Silicon or Germanium
Flatness:	3-5 waves at cut-on W/L
Surface Quality:	60/40 per MIL-C-48497A
Coating Quality:	60/40 per MIL-C-48497A
24-hour humidity	per MIL-C-48497A
Operating Temperature	-62°C to +71°C
Parallelism:	<10 arc minutes
Transmission (Ave):	>80% from 1.05 x cut-on to 2.0 x cut-on
Rejection (Ave):	<0.1%
Slope:	<6% (12% for 1.05µm filter)
Optional:	Mounted in threaded ring - see pg 55 for thread sizes

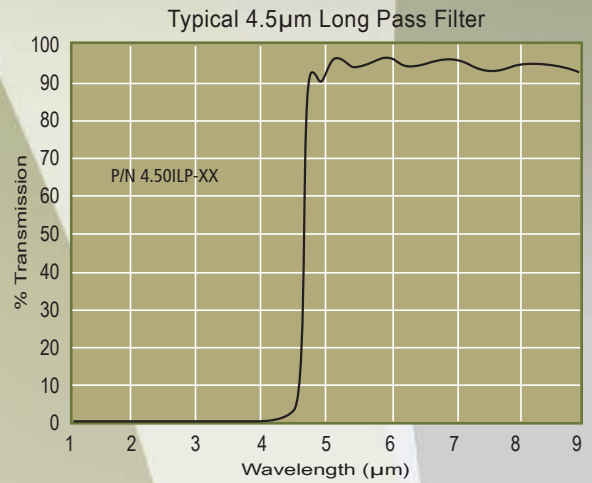
Applications

Order Sorting
FTIR Spectroscopy
Thermal Imaging



STANDARD LONG PASS FILTERS

5% point cut-on W/L	Size, Shape & Part Number	
	25mm Ø	50mm Ø
1.05µm ± 0.04µm	1.05ILP-25	1.05ILP-50
1.65µm ± 0.07µm	1.65ILP-25	1.65ILP-50
2.40µm ± 0.09µm	2.40ILP-25	2.40ILP-50
3.60µm ± 0.14µm	3.60ILP-25	3.60ILP-50
4.50µm ± 0.18µm	4.50ILP-25	4.50ILP-50
7.30µm ± 0.29µm	7.30ILP-25	7.30ILP-50



Custom IR Long Wave Pass Filters

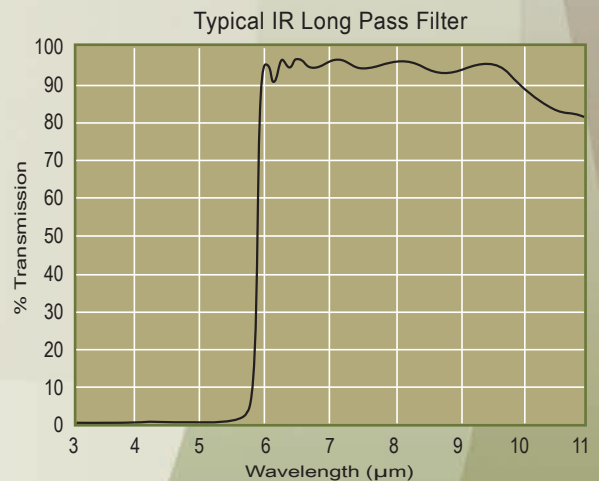
Andover can design and fabricate long pass and short pass filters to suit your particular requirements. Every phase of the process is performed in-house, including thin-film coating design, mechanical design, substrate fabrication and coating, inspection, and environmental testing.

We can coat a variety of substrate materials, including Germanium, Sapphire, Silicon, Zinc Sulfide, and Zinc Selenide.

Contact us for a quotation, whether it is for prototype quantities, or production quantities.

CUSTOM LONG PASS FILTERS

5% point cut-on W/L	Size, Shape & Part Number	
	25mm Ø	50mm Ø
0.1µm - 2.1µm	IRLWP08-25	IRLWP08-50
2.2µm - 5.0µm	IRLWP10-25	IRLWP10-50
5.1µm - 7.0µm	IRLWP12-25	IRLWP12-50
7.1µm - 11.0µm	IRLWP14-25	IRLWP14-50



Infrared Filters & Coatings



- Useful for isolating narrow spectral regions
- Constructed of hard, durable first-surface coatings
- Available in standard and custom wavelengths up to 14µm

Standard IR Bandpass Filters

Bandpass filters isolate specific regions of the spectrum, simultaneously providing high transmission of desired energy, and deep rejection of unwanted energy. Available in wide or narrow bandwidths, they can be tailored to suit your specific requirements.

Constructed of hard, durable first-surface dielectric coatings on optical-quality IR-transmitting substrates, these filters will withstand normal cleaning and handling associated with any high-quality optical component.

For your convenience and economy, we offer the filters in 25mm dia. However, we can produce custom sizes and shapes, as well as custom optical characteristics. Contact our technical sales department for a quotation.

GENERAL SPECIFICATIONS

Diameter Tolerance	+0/- .1mm
Min. Clear Aperture	21mm Dia.
Transmission (Typ.):	60 - 80%
Blocking:	T < 0. 1% Average to 30 µm
Surface Quality:	60/40 per MIL-C-48497A
Coating Quality:	100/80 per MIL-C-48497A
24-hour humidity	per MIL-C-48497A
Moderate Abrasion	per MIL-C-48497A
Adhesion	per MIL-C-48497A
Optional:	Mounted in threaded ring - see pg 55 for thread sizes

Applications
Environmental Monitoring
Security Systems
FLIR Systems
Avionics

STANDARD IR GAS ANALYSIS BANDPASS FILTERS

Gas	Center W/L	Bandwidth	Part Number
Water Vapor	2.70 ±.03 µm	120 ±30nm	2.70GA05-25
	2.95 ±.03 µm	130 ±30nm	2.95GA05-25
Methane and Ethanol	3.46 ±.04 µm	140 ±30nm	3.46GA05-25
Formaldehyde	3.60 ±.04 µm	140 ±30nm	3.60GA05-25
CO2	4.26 ±.04 µm	120 ±30nm	4.26GA05-25
CO	4.67 ±.05 µm	150 ±30nm	4.70GA05-25
NO	5.30 ±.05 µm	420 ±50nm	5.30GA05-25

Custom Infrared Bandpass Filters

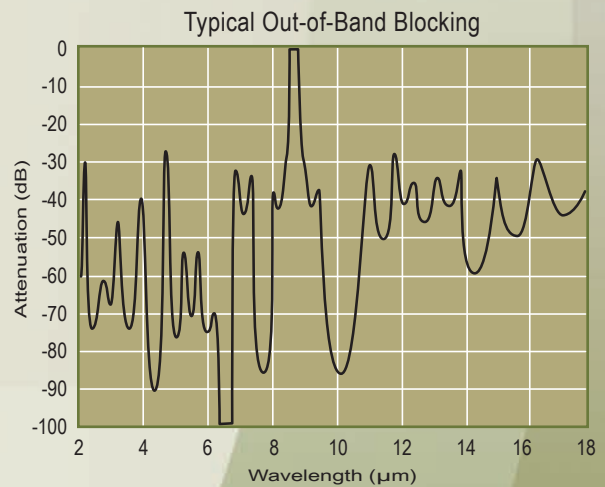
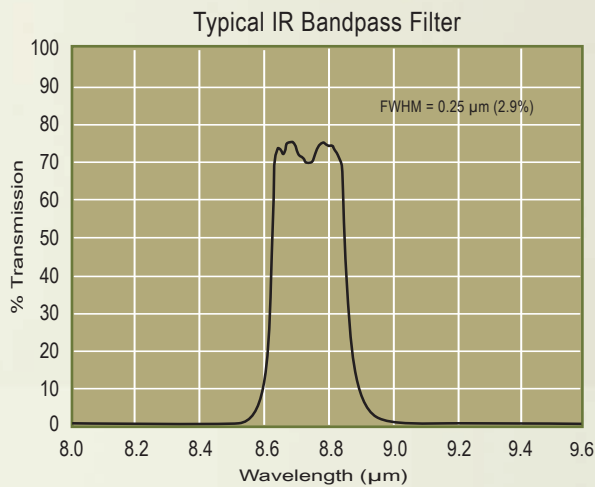
Andover can design and fabricate custom bandpass filters to suit your particular requirements. Every phase of the process is performed in-house, including thin-film coating design, mechanical design, substrate fabrication and polishing, coating, inspection, and environmental testing.

We can coat a variety of substrate materials, including Germanium, Sapphire, Silicon, Calcium Fluoride, Zinc Sulfide, and Zinc Selenide. Contact us for a quotation, whether it is for prototype quantities, or production quantities.

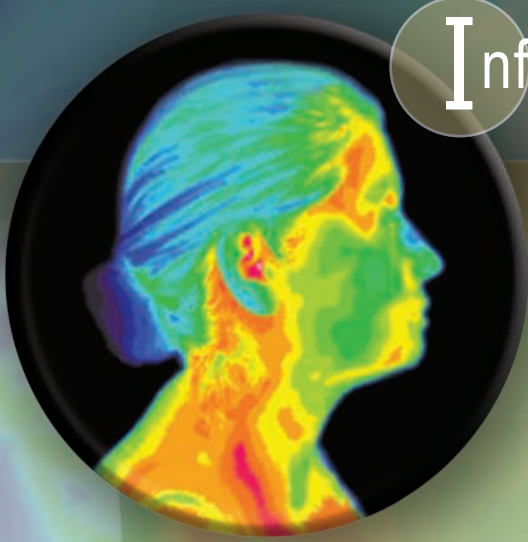
CUSTOM IR BANDPASS FILTER SPECIFICATIONS

Bandwidth (% of CW/L)	W/L Range	Transmission (Typ.)	Blocking	Part Numbers
>10%	2.4 μm - 5.0 μm	70 - 80%	0.3 to 40 μm	IRFC10-25
	5.1 μm - 6.5 μm	70 - 80%	0.3 to 15 μm	IRFC12-25
	6.6 μm - 8.5 μm	60 - 70%	0.3 to 15 μm	IRFC14-25
	8.6 μm - 10.3 μm	60 - 70%	0.3 to 15 μm	IRFC16-25
	10.4 μm - 14.0 μm	50 - 60%	0.3 to 15 μm	IRFC18-25
1.6 - 10.0%	2.4 μm - 5.0 μm	70 - 80%	0.3 to 40 μm	IRFC20-25
	5.1 μm - 6.5 μm	70 - 80%	0.3 to 15 μm	IRFC22-25
	6.6 μm - 8.5 μm	60 - 70%	0.3 to 15 μm	IRFC24-25
	8.6 μm - 10.3 μm	50 - 60%	0.3 to 15 μm	IRFC26-25
	10.4 μm - 14.0 μm	40 - 60%	0.3 to 15 μm	IRFC28-25
1.0 - 1.5%	2.4 μm - 5.0 μm	50 - 80%	0.3 to 40 μm	IRFC30-25
	5.1 μm - 6.5 μm	50 - 80%	0.3 to 15 μm	IRFC32-25
	6.6 μm - 8.5 μm	40 - 70%	0.3 to 15 μm	IRFC34-25
	8.6 μm - 10.3 μm	40 - 60%	0.3 to 15 μm	IRFC36-25
	10.4 μm - 14.0 μm	30 - 60%	0.3 to 15 μm	IRFC38-25

Custom spectral and physical properties available upon request



Infrared Filters & Coatings



Infrared Neutral Density Filters

Metallic-coated neutral density (ND) filters obtain their optical density from a metal alloy coating on a substrate determined by the wavelength region of interest. Unlike the all-dielectric or absorption type, the metallic type ND filter employs a combination of absorption and reflection to reduce the intensity of light.

- Provides attenuation with greater linearity over a wide spectral range
- Delivers superior durability
- Custom substrates available

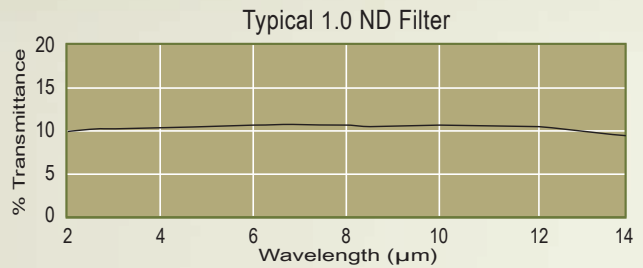
Applications

Thermal Imaging
 Medical Imaging
 IR Test Bench
 IR Photography

GENERAL SPECIFICATIONS

Dimensional Tolerances	±0.2mm
Thickness	1.0mm
Clear Aperture	90% of outside dimension
Surface Quality	60/40 per MIL-0-13830B
Coating Quality	60/40 per MIL-0-13830B
Coating Adherence	Per MIL-M-13508C
Humidity	Per MIL-STD-810F
Substrate Material	Germanium
Optical Quality	Flatness of 3-5 waves per inch and parallelism of 10 arc minutes or better
Mechanical	Unmounted

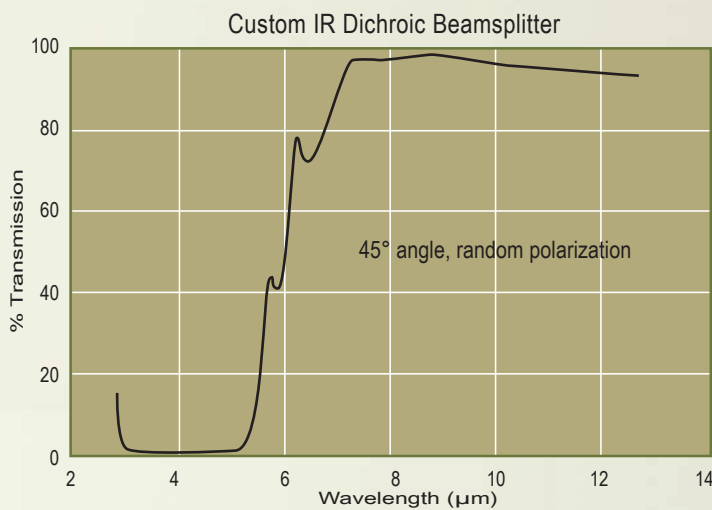
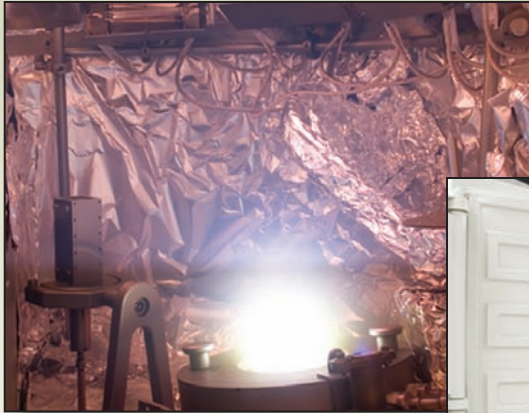
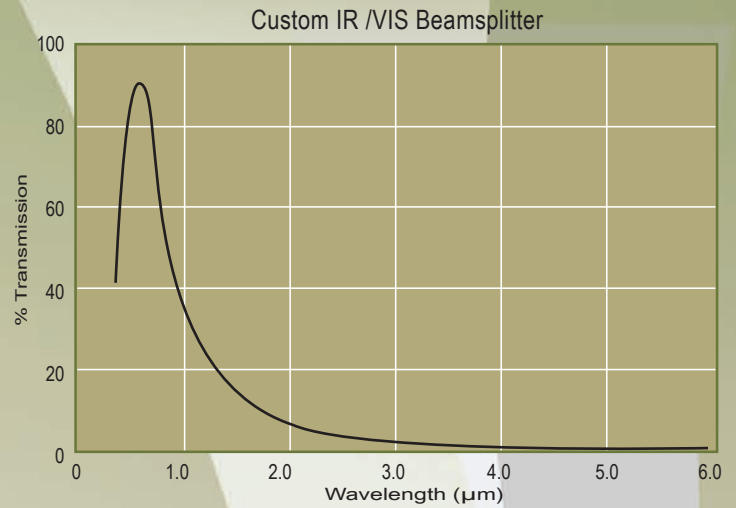
Optional: Mounted in threaded ring - see pg 55 for thread sizes



Optical Density	Nominal Transmittance (%)	Max deviation from nom (%)	Size, Shape & Part Number	
			25mm Ø ○	50mm Ø ○
0.3	50.12	±4.0	030FNIR-25	030FNIR-50
0.5	31.62	±2.0	050FNIR-25	050FNIR-50
1.0	10.00	±1.5	100FNIR-25	100FNIR-50
2.0	1.00	±0.25	200FNIR-25	200FNIR-50
3.0	0.10	+0.08 / -.05	300FNIR-25	300FNIR-50
Set of five filters (includes storage box)			FNIR-SET-25	FNIR-SET-50

Custom IR Coatings

Andover Corporation offers optical coatings for the long wave infrared band, on substrate materials such as Germanium, Zinc Selenide, Zinc Sulfide, Silicon, Sapphire and chalcogenides. Coating types include A/R, bandpass, long and short pass, dichroic, and more.



Andover can also design infrared coatings to function as dichroics, reflecting one region while allowing the transmittance of another. While generally operating at 0° or 45°, the coatings can be optimized for any particular angle or range of angles of incidence. Also available are custom dichroics that transmit visible and far infrared light simultaneously.

Colored Glass Filters



Colored Glass Filters

Colored glass filters are unique in their ability to transmit a very broad band of light. The long wave pass type, often used as order/wavelength sorting filters, transmit the longer wavelengths and absorb the shorter wavelengths. The bandpass type, useful for enhancing the signal-to-noise ratio of illumination systems, transmit a broad band of energy while blocking the shorter and longer wavelengths. As with all optical components, colored glass filters should not be exposed to high temperatures or sharp temperature changes.

- Fabricated from high-quality optical filter glass
- Excellent color consistency as well as sharp contrast
- Both surfaces precision polished
- Options span ultraviolet to infrared region

GENERAL SPECIFICATIONS

Optical Thickness	3mm ±0.5mm
Mechanical Thickness	Add 0.8mm for ring mount
Size Tolerance	+0.00/-0.25mm
Surface Quality	80/50 per MIL-M-13508
Max. Operating Temperature	+100°C
Transmitted wavefront (TWF)	1/4 wave per inch
Parallelism	30 arc seconds or better
Spectral Data	Stated as internal transmittance
Mechanical	Unmounted
Optional:	Mounted in threaded ring - see pg 55 for thread sizes

Applications

Machine Vision
Astronomy
Microscopy
Electronic Instrumentation
Calibration
Medical Devices



Note: Corners are cropped on all 165mm sq. parts unless otherwise requested.

3 Types

BANDPASS TYPE

Ultraviolet Transmitting
Blue and Blue - Green

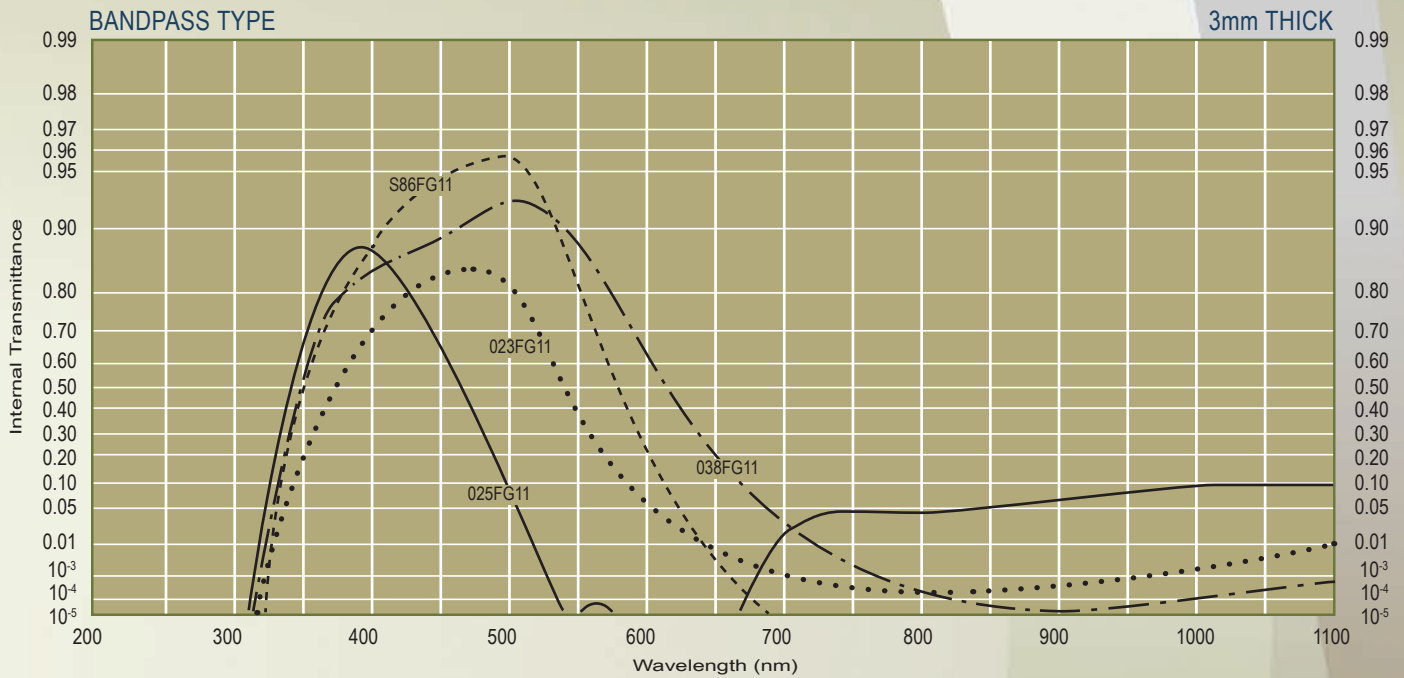
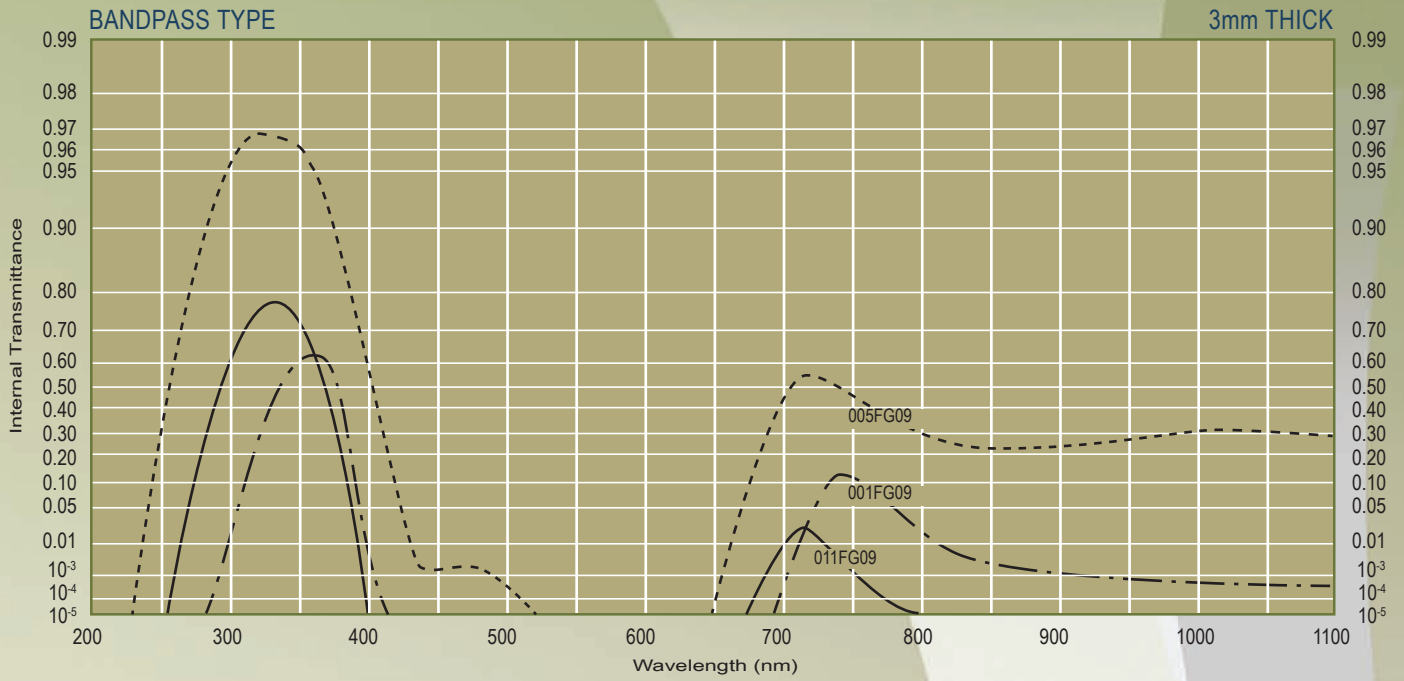
HEAT ABSORBING TYPE

Infrared Absorbing

LONG WAVE PASS TYPE

Near Infrared Transmitting
Yellow
Orange
Ultraviolet Transmitting

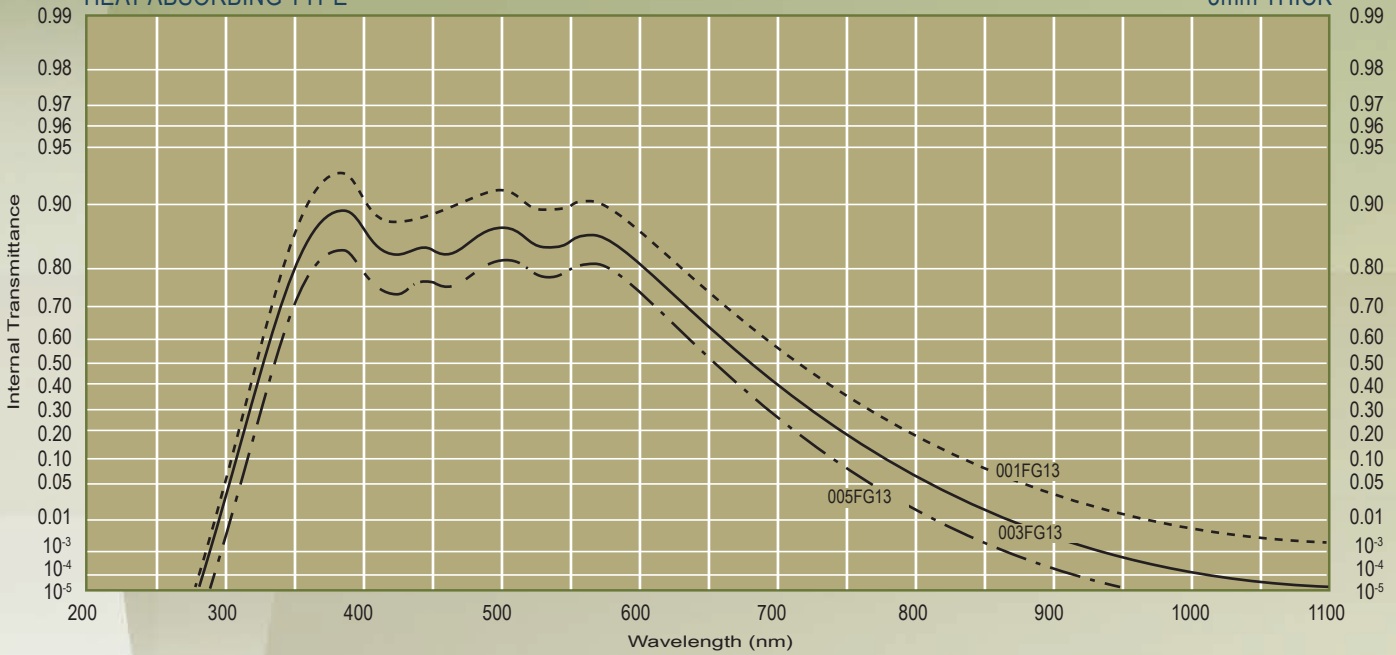
We check all filter glass for striae, bubbles, and inclusions using our tunable interferometer and custom-designed inclusion tester. These instruments detect minute defects, even in materials that do not transmit visible light.



Glass Type	Size, Shape & Part Number			
	25mm Ø <input type="radio"/>	50mm Ø <input type="radio"/>	50mm SQ <input type="checkbox"/>	165mm SQ <input type="checkbox"/>
UV Transmitting	001FG09-25	001FG09-50	001FG09-50S	001FG09-165S
	005FG09-25	005FG09-50	005FG09-50S	005FG09-165S
	011FG09-25	011FG09-50	011FG09-50S	011FG09-165S
Blue glass	023FG11-25	023FG11-50	023FG11-50S	023FG11-165S
	025FG11-25	025FG11-50	025FG11-50S	025FG11-165S
	038FG11-25	038FG11-50	038FG11-50S	038FG11-165S
	S86FG11-25	S86FG11-50	S86FG11-50S	S86FG11-165S

HEAT ABSORBING TYPE

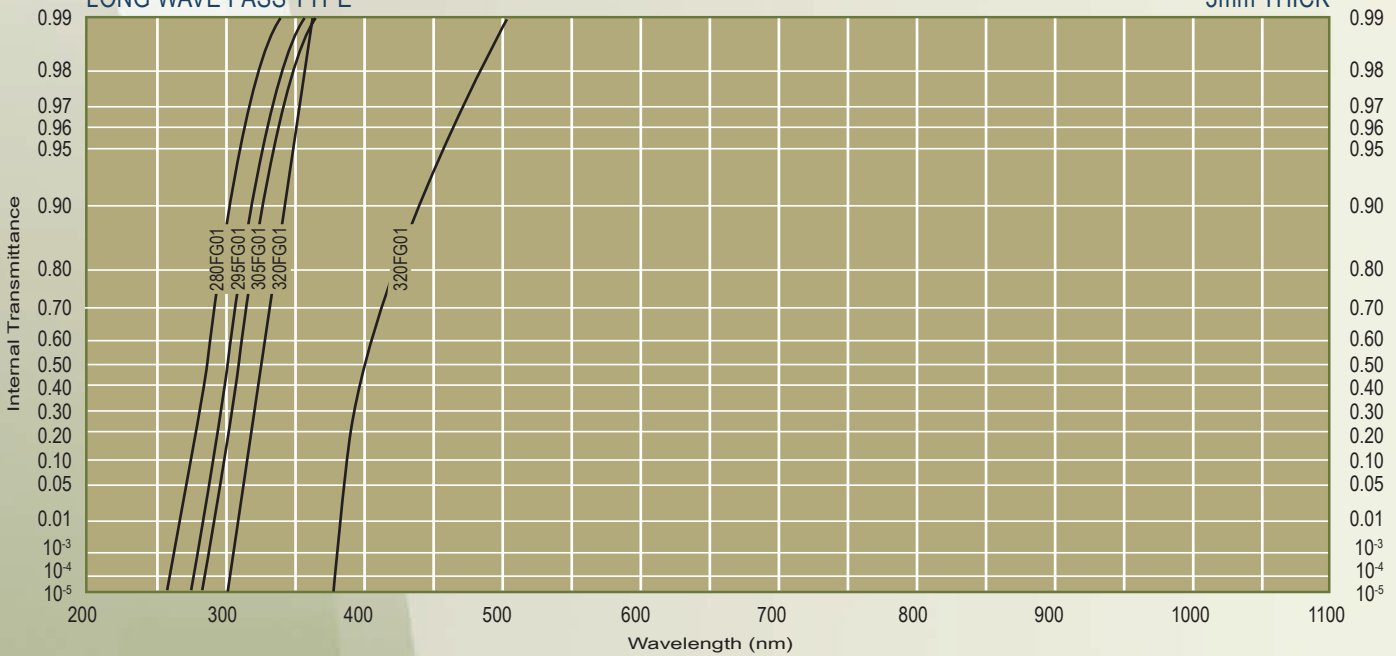
3mm THICK

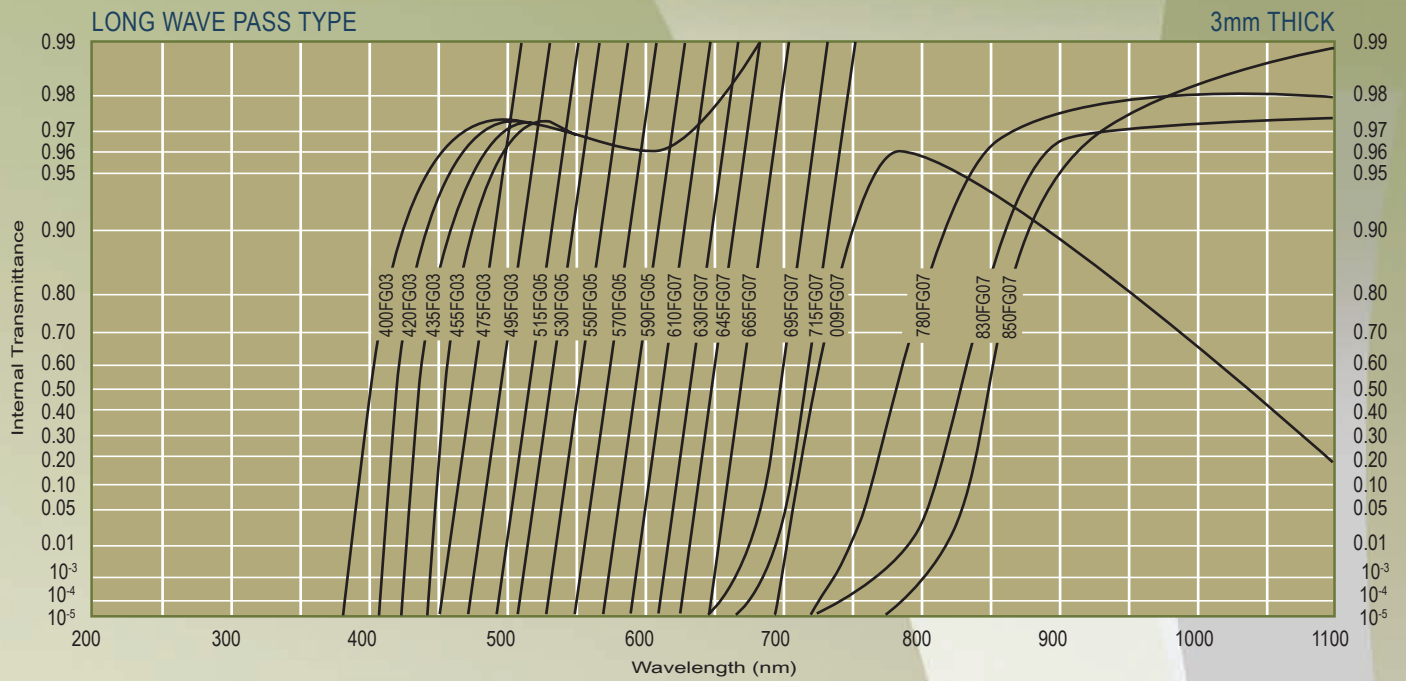


Glass Type	Size, Shape & Part Number			
	25mm Ø ○	50mm Ø ○	50mm SQ □	165mm SQ □
Heat Absorbing	001FG13-25	001FG13-50	001FG13-50S	001FG13-165S
	003FG13-25	003FG13-50	003FG13-50S	003FG13-165S
	005FG13-25	005FG13-50	005FG13-50S	005FG13-165S
White Glass	280FG01-25	280FG01-50	280FG01-50S	280FG01-165S
	295FG01-25	295FG01-50	295FG01-50S	295FG01-165S
	305FG01-25	305FG01-50	305FG01-50S	305FG01-165S
	320FG01-25	320FG01-50	320FG01-50S	320FG01-165S
Green Glass	395FG03-25	395FG03-50	395FG03-50S	395FG03-165S

LONG WAVE PASS TYPE

3mm THICK





Glass Type	Size, Shape & Part Number			
	25mm Ø ○	50mm Ø ○	50mm SQ □	165mm SQ □
Green Glass	400FG03-25	400FG03-50	400FG03-50S	400FG03-165S
	420FG03-25	420FG03-50	420FG03-50S	420FG03-165S
	435FG03-25	435FG03-50	435FG03-50S	435FG03-165S
	455FG03-25	455FG03-50	455FG03-50S	455FG03-165S
	475FG03-25	475FG03-50	475FG03-50S	475FG03-165S
	495FG03-25	495FG03-50	495FG03-50S	495FG03-165S
Orange Glass	515FG05-25	515FG01-50	515FG01-50S	515FG01-165S
	530FG05-25	530FG01-50	530FG01-50S	530FG01-165S
	550FG05-25	550FG01-50	550FG01-50S	550FG01-165S
	570FG05-25	570FG01-50	570FG01-50S	570FG01-165S
	590FG05-25	590FG03-50	590FG03-50S	590FG03-165S
Red Glass	610FG07-25	610FG07-50	610FG07-50S	610FG07-165S
	630FG07-25	630FG07-50	630FG07-50S	630FG07-165S
	645FG07-25	645FG07-50	645FG07-50S	645FG07-165S
	665FG07-25	665FG07-50	665FG07-50S	665FG07-165S
	695FG07-25	695FG07-50	695FG07-50S	695FG07-165S
	715FG07-25	715FG07-50	715FG07-50S	715FG07-165S
IR Transmitting	009FG07-25	009FG07-50	009FG07-50S	009FG07-165S
	780FG07-25	780FG07-50	780FG07-50S	780FG07-165S
	830FG07-25	830FG07-50	830FG07-50S	830FG07-165S
	850FG07-25	850FG07-50	850FG07-50S	850FG07-165S

Accessories



Threaded Filter Rings



Motorized Filter Wheels



Temperature Controllers



Epolite FH-5313 Epoxy

Threaded Filter Rings



- Industry-standard sizes
- Adaptable to most of our standard products
- Laser-engraved identification

Rings

In addition to our standard rings, Andover offers a variety of threaded ring mounts. Standard sizes and thread pitches enable the user to attach the filter securely to equipment. Please contact our technical sales department to discuss your requirements.



THREADED RING SIZES AVAILIABLE

Thread size (mm)	OD (mm)	Clear aperture (mm)	Part Number
M27 x 0.5	29.5	23	RING-M27
M30.5 x 0.5	32.5	26.5	RING-M30.5
M37 x 0.75	39	32	RING-M37
M40.5 x 0.5	42	36.5	RING-M40.5
M46 x 0.75	48.5	41	RING-M46
M49 x 0.75	51.5	44	RING-M49
M52 x 0.75	54	47	RING-M52

Motorized Filter Wheel



Motorized Filter Wheel

These filter wheels are used for a host of applications, including color CCD photography, fluorescence microscopy, and photometry. Two 4" diameter wheels are available: one which accepts six 25mm filters, and one which accepts twelve 12.5mm filters.

- Motorized or Manual
- Local or Remote Control
- Accepts 12.5mm and 25mm diameter filters
- Labeled filter positions
- Base and post mountable
- Programmable filter sequences

GENERAL SPECIFICATIONS

Interface:

Serial	RS - 232
USB	USB 2.0
Manual	Push button switches

Mounting

1/4-20 & #8-32 (M6 & M4) or SM1/SM05 thread

Size

5.0" x 4.49" x 1.85"

Applications

Color CCD Photography
Fluorescence Microscopy
Photometry

Programming and Remote Control

Automation of filter sequences is available through the USB 2.0 or serial (RS - 232 interface, using labview software for both Mac and Windows platforms. A simple command language facilitates retrieving filter status and making filter selections. The unit comes with the controller, filter housing, filter wheel, a 5 VDC power supply and threaded retaining rings to hold the optics in place.

Remote or Manual Operation

Filter selection can be made manually from push buttons on the unit, or remotely from either a USB 2.0 or serial (RS - 232) interface.

Interchangeable Filter Wheels

The 4" diameter wheel is easily changed, allowing quick conversions between applications. Additional wheels are available.



FILTER WHEEL ORDERING INFORMATION:

Description	Size & Part Number	
	12-Position / 12.5mm ○	6-Position / 25mm ○
Mortorized filter wheel	FW-MOT-12.5	FW-MOT-25
Manual filter Wheel	FW-MAN-12.5	FW-MAN-25
Extra wheel only	FW-12.5	FW-25

Temperature Controllers



Temperature Control

The performance of very narrow bandwidth interference filters can suffer significantly due to changes in ambient temperature or aging effects. Elevating the filter temperature can counterbalance aging shifts of up to 0.5nm and also provide a means of tuning the center wavelength to an exact value. As all our filters are bake stabilized to minimize any wavelength shifts with age, the regulated temperature controller provides protection against the influences of fluctuating ambient temperatures.

All of our filter ovens come with a universal oven controller, which will operate from 110 to 220 volts, 50–60 Hz, and include plugs for US, UK, Australia, and Europe.

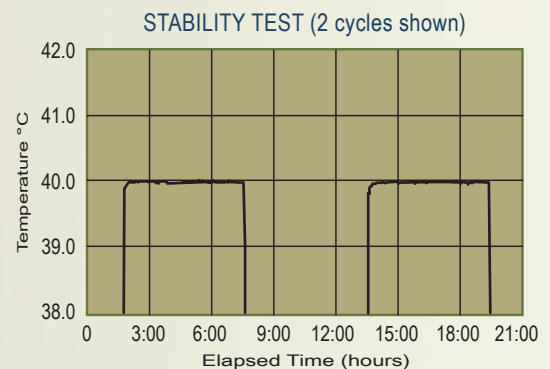
Shipped in a sturdy, reusable weatherproof case.

- Provides added control over ambient temperatures
- Effective for conducting outdoor experiments
- Custom sizes and temperature ranges also available

GENERAL SPECIFICATIONS

Regulation Accuracy	+/-0.25°C
Ambient Temperature Range	0-30°C
Min. Regulated Temperature	30°C
Max. Regulated Temperature	60°C
Power Requirements	110-220VAC
	50-60Hz, 1.0A
Cable Length	3'

Custom cable lengths are available upon request



Our Temperature Controllers are subjected to a 120 hour stability test.

Ordering:

To ensure you have the appropriate Filter Oven and Controller that best suit your specifications, please follow steps 1 and 2 on the next page.



FILTER OVEN / CONTROLLER

1 Step Select the Filter Oven and Controller.

Filter Oven Controller	Part Number
Filter Oven	101FRDC00-50
Oven Controller	101FRDC00-CTRL

The oven controller is required to operate the filter oven. For economic reasons, it may be desirable to purchase several filter ovens but fewer controllers, as dictated by your application.

ASSEMBLY KIT

2 Step Select the assembly kit that best suits your needs.

A/R Coating W/L Range	Part Number
300nm to 450nm	101FRDC01-KIT
450nm to 700nm	101FRDC02-KIT
700nm to 1200nm	101FRDC03-KIT
1200nm to 1600nm	101FRDC04-KIT

The assembly kits include the necessary hardware to mount a filter into the filter oven as well as instructions for assembly. The windows supplied are broadband antireflective (A/R) coated over the specified wavelength range for an average reflectance of $\leq 0.5\%$ per surface. The substrate material is either Schott BK-7 or fused silica, as appropriate, and are polished flat to λ wave and parallel to 30 arc seconds or better.

Epolite FH-5313 Epoxy



- Ideal for bonding a variety of optical substrates and potting electronic assemblies
- Excellent chemical resistance, and mechanical strength

Epoxy

Fuller Epolite FH-5313 is a 100% solid, room-temperature curing, optically clear, electrical grade epoxy. Proven to be a superior bonding agent for ferrite pot cures, this system is designed for continuous operation at temperatures up to 200°F. Resin and hardener are sold individually or in kits, and in pre-measured A-Paks.

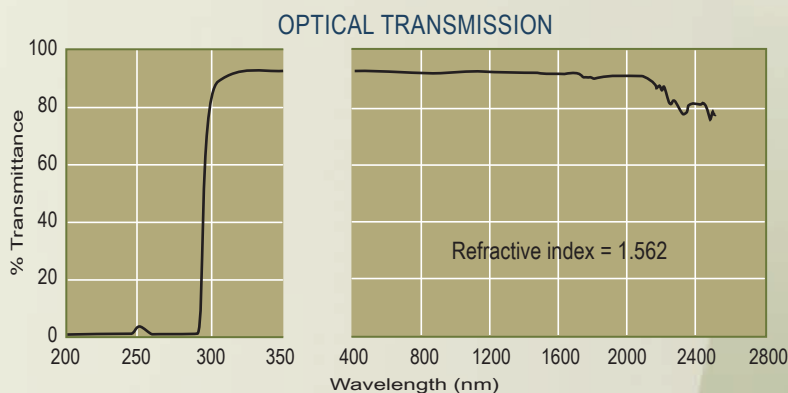


EPOXY

Type	Weight & Content	Part Number
Pre-measured A-Pak	5.2 grams Resin, .8 grams Hardener	FH-5313A-A-PAK
Resin & Hardener Kit	16oz. Resin, 2oz. Hardener & 6 Droppers	FH-5313A-KIT
Resin Only	16oz. 64oz. 128oz.	FH-5313A-RESIN/16 FH-5313A-RESIN/64 FH-5313A-RESIN/128
Hardener Only	2oz. 8oz. 16oz.	FH-5313A-HARD/2 FH-5313A-HARD/8 FH-5313A-HARD/16

Certified results from an independent testing lab.

GENERAL PROPERTIES	VALUE	TEST METHOD
Specific Gravity	1.17	ASTM-D-792-00
Hardness, Shore D 04e1	81	ASTM-D-2240-
Strength		
Tensile	7,940 psi	ASTM-D-683-03
Shear	782 psi	ASTM-D-1002-01
Compressive	15,440 psi	ASTM-D-695-02a
Flexural	13,860 psi	ASTM-D-790-03
Coefficient of Linear Thermal Expansion	93.5 ppm/°C	ASTM-E-831-03
Mixed Viscosity	1,970 cP	MIL-STD-883E
Pot Life Minutes at 77°F	30	ERF 13-70
Cure Schedule Hours at 77°F	12	
Cure Schedule Hours at 150°F	1	
Mix Ratio by Weight (A:B)	100:15	
ELECTRICAL PROPERTIES		
Dielectric Strength	2,128 volts/mil	ASTM-D-149-97a
Dielectric Constant @100 Hz	4.06	ASTM-D-150-98
Dissipation Factor @100 Hz	0.001	ASTM-D-150-98
Volume Resistivity, ohm/cm	8.4 x 10 ¹⁴	ASTM-D-257-99
CHEMICAL RESISTANCE		
Isopropyl Alcohol		
Weight Change	0.15%	ASTM-D-543-95
Thickness Change	0.902%	ASTM-D-543-95
Jet A		
Weight Change	0.055%	ASTM-D-543-95
Thickness Change	0.519%	ASTM-D-543-95
OUTGASSING PROPERTIES		
Total Mass Loss	0.56%	ASTM-E-595-03e2
Collected Volatile Condensable Material	<0.01%	ASTM-E-595-03e2
Water Vapor Regain	0.29%	ASTM-E-595-03e2



Based on 0.001"-thick sample sandwiched between two 1mm-thick fused silica substrates.

Please note: The original hardener supplied with this resin was diethylenetriamine (UN 2079) which is subject to HazMat shipping regulations. We now use Dow Plastics D.E.H. 29 hardener, which is not regulated for transport. If your application relies upon some characteristic of the original hardener, we can still supply that. Please contact our technical sales department for more information.

GLOSSARY

A			
AR Coating	Antireflective coating that reduces the surface reflection of an optic	F	Fabry-Perot Filter
Absorptance	The ratio of absorbed to incident radiation		Dielectric filter construction based on the Fabry-Perot interferometer. Consists of two reflective stacks separated by an even-ordered spacer
B		FIR	Far Infrared (wavelengths from 6 μ m to 30 μ m)
B/W	Bandwidth	FWHM	Full width at half maximum or the bandwidth of the filter
Bandpass Filter	A filter that transmits a specific band of energy and rejects all other energy at higher and lower wavelengths	H	Hot Mirror
Bandwidth	The spectral width of a filter measured at half of the peak transmission; also referred to as full width at half maximum (FWHM)		A filter that reflects the near infrared energy (heat) and transmits the visible energy
Blocking Range	The spectral range of unwanted radiation	I	Image Quality
C			A filter designed for use in imaging applications
Cavity	An internal structure of a bandpass filter, consisting of two reflecting stacks of dielectric material separated by an even-ordered spacer. The number of cavities determines the shape of the passband	Index of Refraction	The ratio of the velocity of light in a vacuum to the velocity of light in a refractive material
Center Wavelength	The wavelength coinciding with the midpoint of the passband	Interferometer	An instrument that measures the accuracy of an optical element utilizing interference phenomena based on the wave characteristics of light
Cold Mirror	A filter which reflects the visible energy and transmits the near infrared energy	IR	Infrared Spectrum (wavelengths from 3 μ m to 30 μ m)
Commercial Quality	A filter designed for use in non-imaging instrumentation applications	L	Long Pass Filter
CW/L	Center wavelength		A filter which transmits the longer wavelengths and rejects the shorter wavelengths
		M	MDM
			MWIR
			Metal-Dielectric-Metal
			Midwave Infrared Spectrum (2.6 μ m to 6.0 μ m)

N	N*	The effective refractive index of the filter	T T or Tx Transmittance	Transmittance
	ND Filter	A neutral density filter that transmits a specific amount of energy equally over all wavelengths		The ratio of the radiant energy transmitted to the total radiant energy incident on the filter
	NIR	Near Infrared Spectrum (wavelengths from 750nm to 2.5µm)	U UV	Ultraviolet spectrum (wavelengths below 400nm)
P	Passband	The band of energy that is transmitted (passed) by the filter		V VIS
	Polarization	A process or state in which rays of light exhibit different properties in different directions, especially the state in which all vibration takes place in one plane		
R	R/T ratio	The ratio of reflectance to transmittance		
	Reflectance	The ratio of the total amount of radiation reflected by a surface to the total amount of radiation incident on the surface		
	Refractive Index	The ratio of the velocity of light in a vacuum to the velocity of light in a refractive material		
S	Short Pass Filter	A filter that transmits the shorter wavelengths and rejects the longer wavelengths		
	Spectrophotometer	An instrument that measures intensity of light at varying wavelengths		
	SWIR	Shortwave Infrared Spectrum (1.5µm to 3.0µm)		

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4 Ways to Order

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LIMITED WARRANTY

Andover warrants that all products shall conform to the product specifications and shall be free from defects in materials and workmanship for a period of one year from date of purchase. This Limited Warranty shall not apply in the event of any failure caused by accident, misuse, neglect, alteration or improper installation or repair by the purchaser.

DISCLAIMER OF OTHER WARRANTIES. The limited warranty set forth above is in place of other warranties, express or implied, and Andover expressly disclaims all other warranties; including warranties of merchantability and fitness for a particular purpose. Specifically, it is the purchaser's responsibility to test and determine the suitability of the products for purchaser's intended use, which shall be the sole responsibility of the purchaser.

LIMITATION OF REMEDIES AND DAMAGES. Andover's sole obligation and the purchaser's sole and exclusive remedy under the Limited Warranty set forth above shall be limited to (a) replacement of defective products provided that written claim of the defect is sent to Andover within the Limited Warranty period, the original product is returned with transportation prepaid, and Andover's inspection establishes the existence of such defect; or (b) at the sole discretion of Andover, return of the original purchase price received by Andover from the purchaser. Andover shall in no event be liable for any damages, including without limitation, lost profits, incidental or consequential damages by reason of or in connection with the purchase or use of the products.

INDEMNIFICATION. The purchaser agrees to indemnify and hold Andover harmless from and against any claim, loss, cost or expense resulting from purchaser's use of the products, whether such claim arises in contract, tort or otherwise.

GOVERNING LAW. All matters arising under this Limited Warranty and other terms and conditions of sale shall be governed by the laws of the State of New Hampshire. The purchaser consents to the exclusive jurisdiction of the courts of the State of New Hampshire in all matters relating to the purchase, sale and use of the products.



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