ANDOVER CORPORATION

Quality Optical Filters and Coatings

2010 - 2011

Thank you for your interest in our latest catalog of products and services. If there is a type of filter you need but don't see available, please let us know. We value your business and take great pride in responding quickly whenever you require a customized solution. We also welcome any comments you may have about how we might serve you better.

Attention to Service

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

CONTENTS

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 antireflective 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.

ORDERING INFORMATION

Four Ways to Order

Online	**www.andovercorp.com**
Email	**sales@andovercorp.com**
Telephone	**US toll-free 1.888.893.9992** **International +00.1.603.893.6888**
Fax	**603.893.6508**

Pricing

Current prices are available at andovercorp.com by clicking on the part numbers for particular items. For a complete price list or a specific quote, please contact our sales department.

Purchase Orders

Andover Corporation accepts e-mail, written, and online orders from customers with an open line of credit. New customers must confirm their orders in writing and supply credit references upon request.

Blanket Orders

Andover Corporation can help reduce your inventory by scheduling automatic delivery of you order over time. Complete details are availble here: http://www.andovercorp.com/info

Payment Terms

Net 30 days from date of invoice for customers with established lines of credit. International customers should check with the sales department to determine if prepayment is required. All foreign orders are subject to shipping and banking fees. For blanket orders, please contact our sales department for special terms and conditions. Visa, MasterCard and American Express accepted.

Shipping

Most standard items ship within two days of receipt of an order. All out-of-stock products are shipped within two weeks. For rush orders, one-day shipping may be available.

All prices are FOB Salem, New Hampshire, USA. Shipments are freight prepaid and billed to the buyer.

Order online for free ground shipping within the US.

Return Policy

Andover Corporation accepts returns of defective items up to one year from the invoice date. Before returning any items, please contact our technical sales staff for a Return Goods Authorization (RGA) number and complete shipping instructions.

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.

ABOUT 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.

Minimizing Wavelength Shift

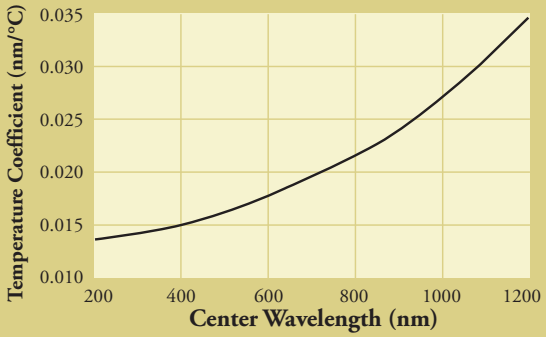
Ambient temperature and optical path geometry are important factors to consider in selecting or specifying bandpass filters.

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 ambient temperature of passband filters. *(For more information, see page 66.)*

TEMPERATURE WAVELENGTH SHIFT COEFFICIENT



ANGLE OF INCIDENCE

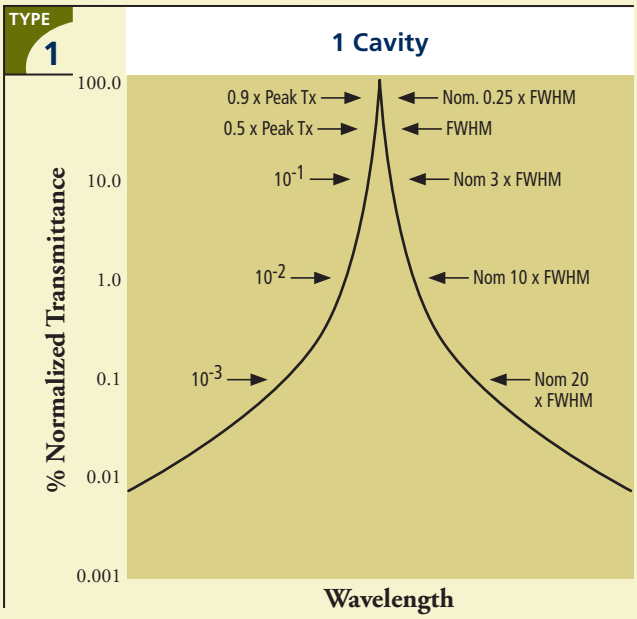
The central wavelength of the all-dielectric Fabry-Perot filter shifts lower with an increase in the incident angle. The amount of shift depends upon the incident angle and the filter's effective index (N*). This feature can be very useful in tuning a filter to the desired central wavelength. Use the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

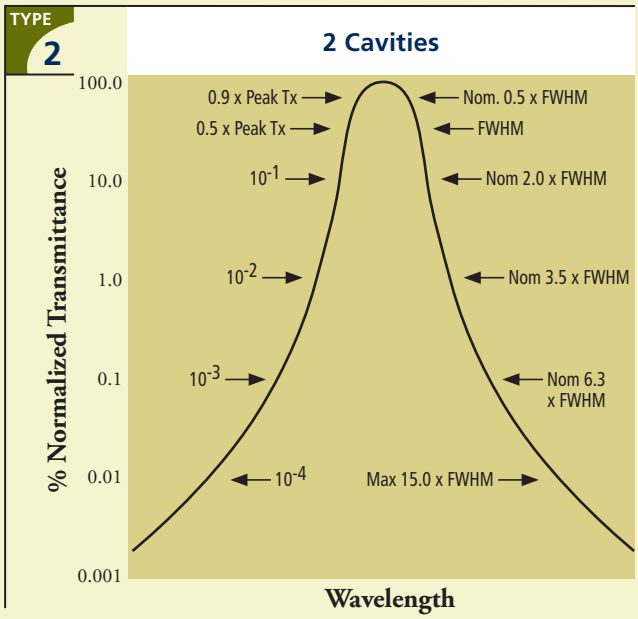
$$\lambda_\theta = \lambda_0 \left[1-\left(\frac{Ne}{N^*}\right)^2 \mathrm{Sin}^2\theta \right]^{\frac{1}{2}}$$

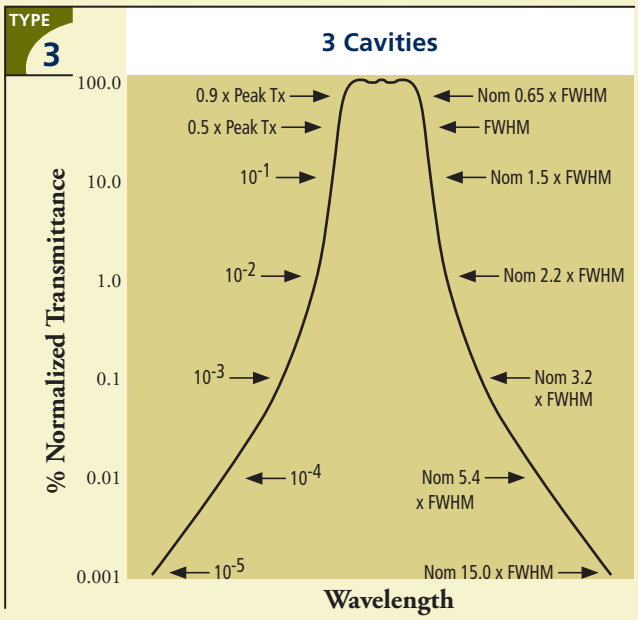
Where: λ_θ = Wavelength at angle of incidence
λ_0 = Wavelength at normal incidence
Ne = Refractive index of external medium
N* = Effective refractive index of the filter
θ = Angle of incidence

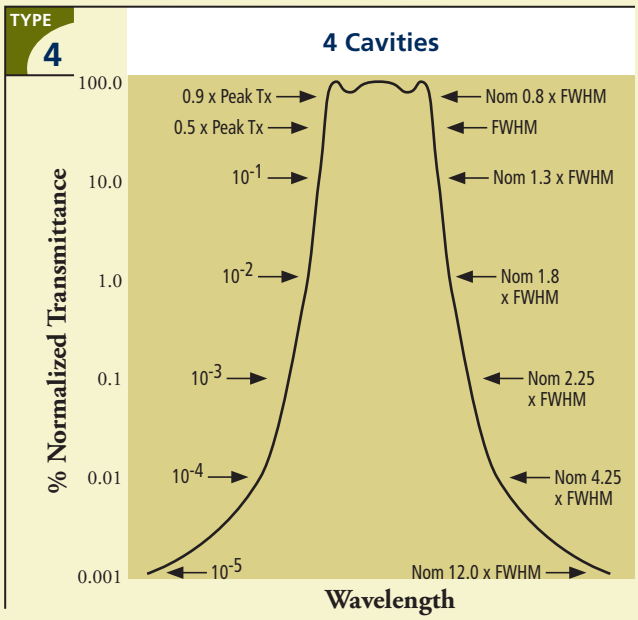
When using a filter with non-collimated light, the wavelength shift will appear somewhat less than that of collimated light at the same angle. In a cone of light, only the central ray is normal to the surface while all others are increasingly off-angle. To approximate this shift, use this same formula 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







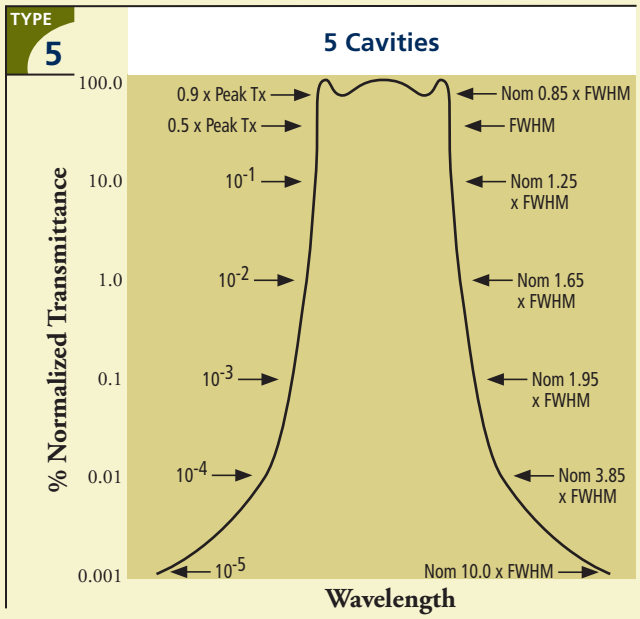


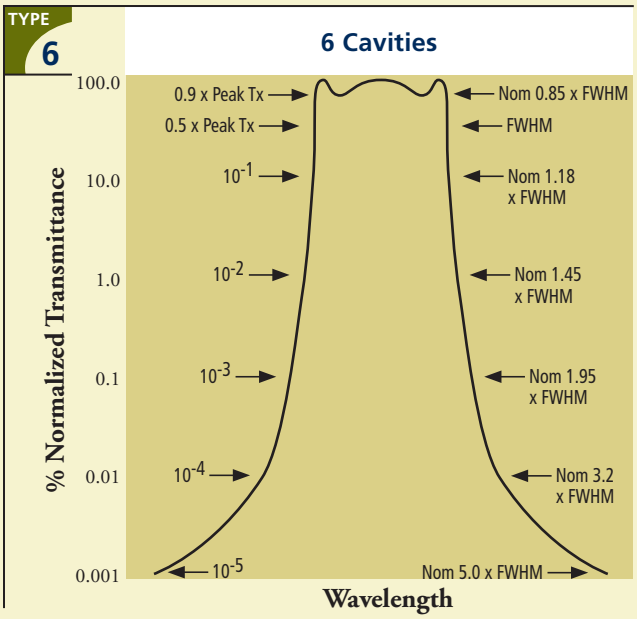
Filter types 1-6 represent unblocked filter profile. Bandshape may vary depending upon level of additional blocking.

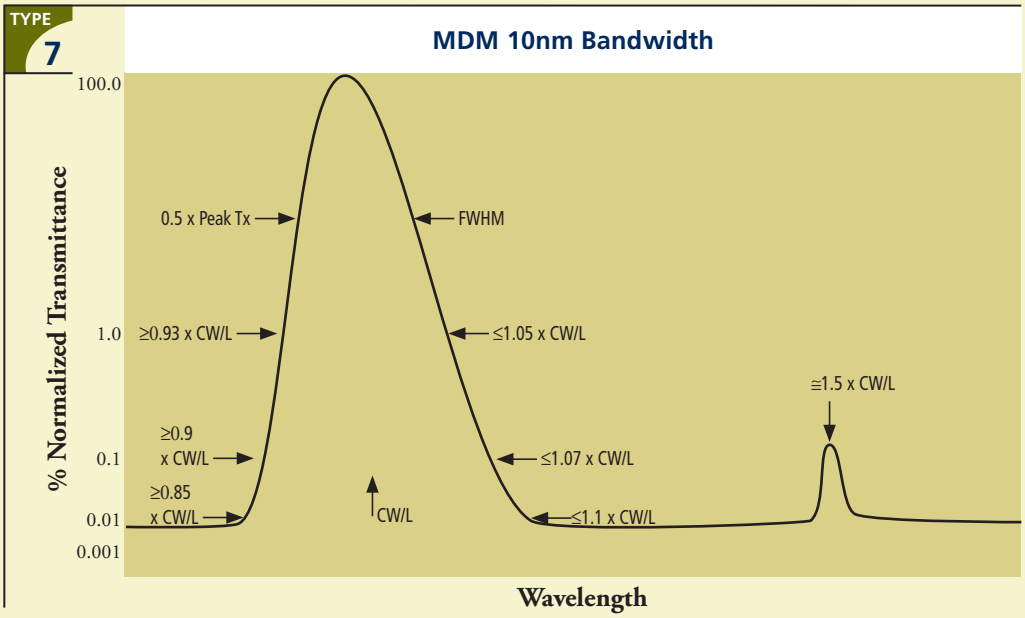
Normalized Transmittance of Peak (%)	Full Bandwidth Multiplier (Nominal)			
	1 Cavity	2 Cavities	3 Cavities	4 Cavities
90.0	0.25 nom.	0.5 nom.	0.65–0.70	0.8–0.9
10.0	2.5–3.0	1.6–2.0	1.2–1.5	1.1–1.3
1.0	8.0–10.0	2.8–3.5	1.9–2.2	1.5–1.8
0.1	15.0–20.0	5.5–6.3	2.9–3.2	2.0–2.25
0.01	undefined	10.0–15.0	4.9–5.4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

Normalized Transmittance of Peak (%)	Full Bandwidth Multiplier (Nom.)	
	5 Cavity	6 Cavities
90.0	0.85–0.90	0.85–0.90
10.0	1.1–1.25	1.1–1.25
1.0	1.5–1.65	1.5–1.65
0.1	2.0–2.25	2.0–2.25
0.01	3.1–3.85	2.9–3.2
0.001	8.0–10.0	4.0–5.0

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



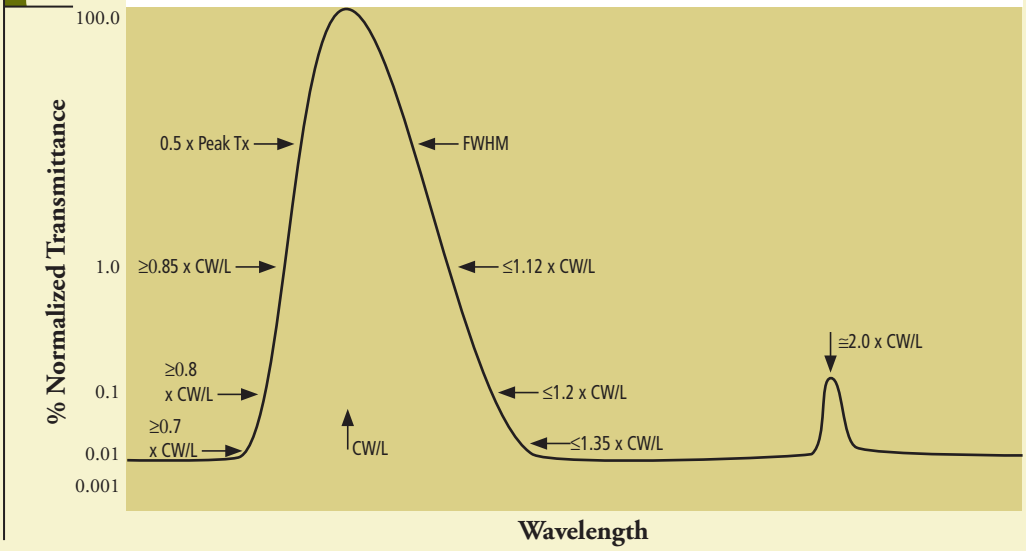




MDM= Metal-Dielectric-Metal

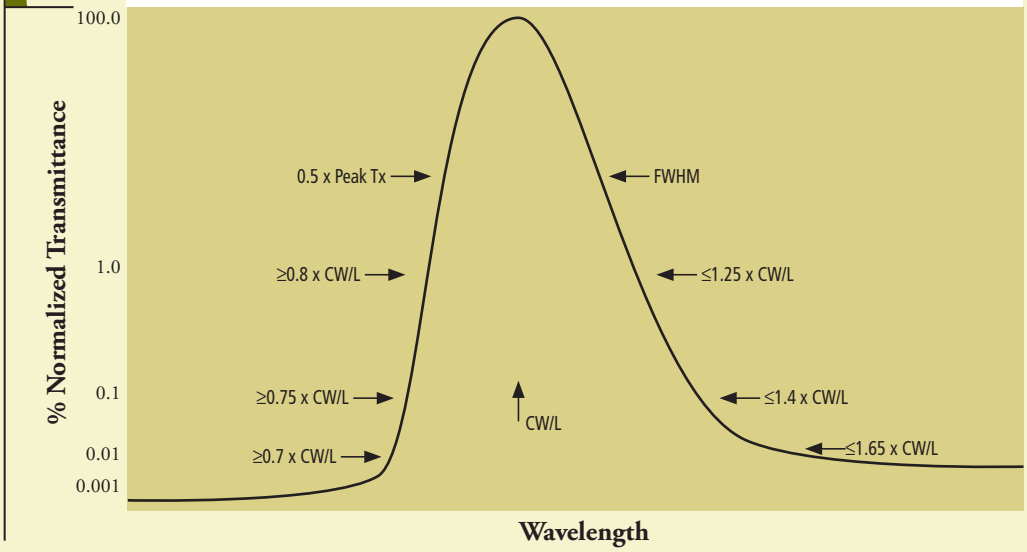
TYPE 8

MDM 25nm Bandwidth



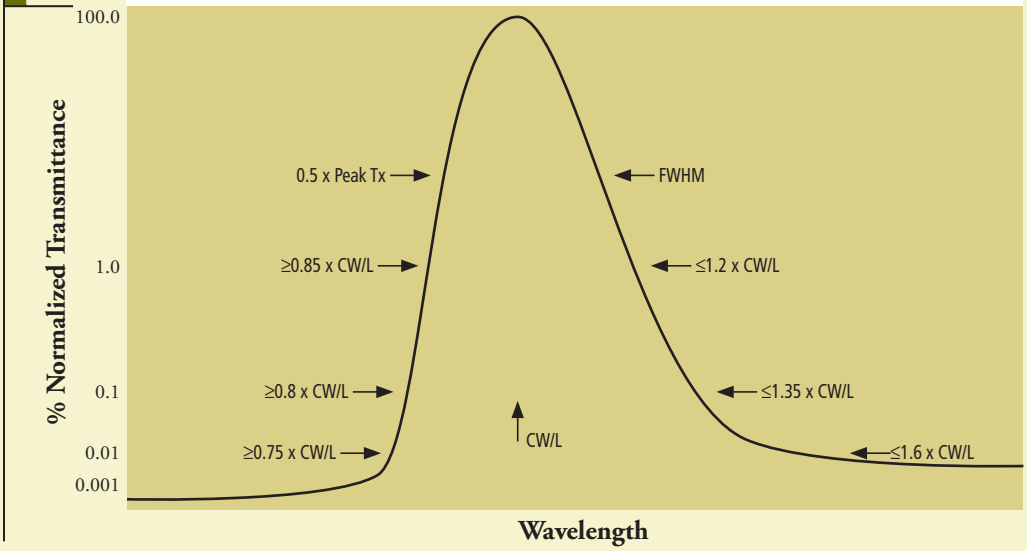
TYPE 9

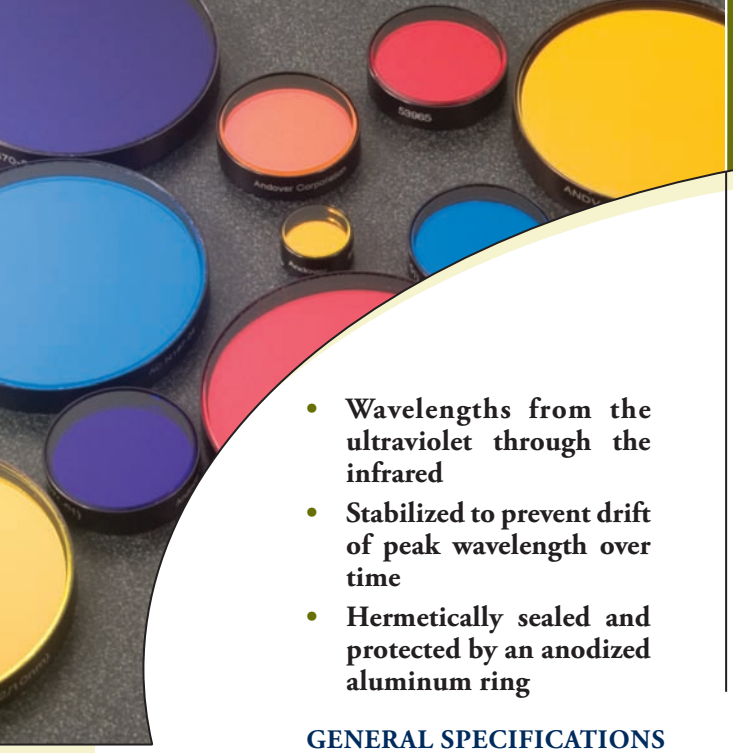
MDM 40-70nm Bandwidth



TYPE 10

MDM 80–100nm Bandwidth





STANDARD BANDPASS FILTERS

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

Andover offers one of the most extensive selections of band-pass 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.

GENERAL SPECIFICATIONS

Diameter Tolerance	+0/-.25mm	
Usable Aperture 12.5mm Ø	Filter Size 9.0mm Ø 25.0mm Ø 50.0mm Ø	Usable Aperture 21.0mm 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 from X-ray to FIR	
Specification Temperature	+23°C	
Max. Survival Temp Range	CW/L 214–380nm CW/L 380.1–2400nm	-50°C to +50°C -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 23 for thread sizes	

Applications

Spectral Radiometry
Medical Diagnostics
Chemical Analysis
Colorimetry

Line	CW/L (NM)	FWHM (nm)	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (mm)	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	231FS10-50
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

MDM= Metal-Dielectric-Metal

STANDARD BANDPASS FILTERS

Line	CW/L (NM)	FWHM (nm)	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (mm)	Size, Shape & Part Number		
							12.5mm Ø ○	25mm Ø ○	50mm Ø ○
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
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	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

MDM= Metal-Dielectric-Metal

STANDARD BANDPASS FILTERS

Line	CW/L (NM)	FWHM (nm)	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (mm)	Size, Shape & Part Number		
							12.5mm Ø ○	25mm Ø ○	50mm Ø ○
-	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
-	400.0 +25/-0	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 +25/-0	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/Ion Laser	457.9 +0.2/-0	1 ±0.2	2/2	40	1.45	8.5	458FS02-12.5	458FS02-25	458FS02-50
Ar/Ion Laser	457.9 +0.5/-0	3 ±0.5	2/2	45	1.45	8.5	458FS03-12.5	458FS03-25	458FS03-50
Ar/Ion 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
Hβ	486.1 +2/-0	10 ±2	3/3	50	2.05	7.0	486FS10-12.5	486FS10-25	486FS10-50
Ar/Ion Laser	488.0 +.2/-0	1 ±0.2	2/2	45	2.05	8.5	488FS02-12.5	488FS02-25	488FS02-50
Ar/Ion Laser	488.0 +0.5/-0	3 ±0.5	2/2	50	2.05	8.5	488FS03-12.5	488FS03-25	488FS03-50
Ar/Ion 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 +25/-0	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/Ion Laser	514.5 +0.2/-0	1 ±0.2	2/2	45	2.05	8.5	515FS02-12.5	515FS02-25	515FS02-50
Ar/Ion Laser	514.5 +0.5/-0	3 ±0.5	2/2	50	2.05	8.5	515FS03-12.5	515FS03-25	515FS03-50
Ar/Ion 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

MDM= Metal-Dielectric-Metal

STANDARD BANDPASS FILTERS

Line	CW/L (NM)	FWHM (nm)	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (mm)	Size, Shape & Part Number		
							12.5mm Ø ○	25mm Ø ○	50mm Ø ○
-	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
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 +25/-0	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 +25/-0	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 +25/-0	80 ±16	MDM/9	70	-	7.0	650FS80-12.5	650FS80-25	650FS80-50
Hα	656.3 +0.2/-0	1 ±0.2	2/2	45	2.05	8.5	656FS02-12.5	656FS02-25	656FS02-50
Hα	656.3 +0.5/-0	3 ±0.5	2/2	50	2.05	8.5	656FS03-12.5	656FS03-25	656FS03-50
Hα	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

MDM= Metal-Dielectric-Metal

STANDARD BANDPASS FILTERS

Line	CW/L (NM)	FWHM (nm)	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (mm)	Size, Shape & Part Number		
							12.5mm Ø ○	25mm Ø ○	50mm Ø ○
-	670.0 +3/-0	10 ±2	3/3	55	2.05	7.0	670FS10-12.5	670FS10-25	670FS10-50
Li	670.8 +2/-0	10 ±2	3/3	55	2.05	7.0	671FS10-12.5	671FS10-25	671FS10-50
Laser Diode	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 +25/-0	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 +25/-0	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 +25/-0	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 +25/-0	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

MDM= Metal-Dielectric-Metal

STANDARD BANDPASS FILTERS

Line	CW/L (NM)	FWHM (nm)	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (mm)	Size, Shape & Part Number		
							12.5mm Ø ○	25mm Ø ○	50mm Ø ○
-	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
-	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 +25/-0	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 +25/-0	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 +25/-0	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

MDM= Metal-Dielectric-Metal

STANDARD BANDPASS SETS

Andover's standard bandpass filter sets cover the spectral region from the ultraviolet to the near infrared. Each set, including complete spectral data, is shipped in a convenient storage case.

Ultraviolet Filter Set

Includes nine filters and is available in three sizes. Excellent choice for isolating specific spectral lines.

CW/L (nm)	FWHM (nm)	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (mm)	Size, Shape & Part Number		
						12.5mm Ø ○	25mm Ø ○	50mm Ø ○
220.0 +3/-0	10 ±2	MDM/7	12	-	4	220FS10-12.5	220FS10-25	220FS10-50
239.0 +3/-0	10 ±2	MDM/7	15	-	4	239FS10-12.5	239FS10-25	239FS10-50
260.0 +3/-0	10 ±2	MDM/7	12	-	4	260FS10-12.5	260FS10-25	260FS10-50
280.0 +3/-0	10 ±2	MDM/7	12	-	4	280FS10-12.5	280FS10-25	280FS10-50
300.0 +3/-0	10 ±2	MDM/7	15	-	4	300FS10-12.5	300FS10-25	300FS10-50
320.0 +3/-0	10 ±2	3/3	25	1.45	8	320FS10-12.5	320FS10-25	320FS10-50
340.0 +3/-0	10 ±2	3/3	25	1.45	7	340FS10-12.5	340FS10-25	340FS10-50
360.0 +3/-0	10 ±2	3/3	25	1.45	7	360FS10-12.5	360FS10-25	360FS10-50
380.0 +3/-0	10 ±2	3/3	25	1.45	7	380FS10-12.5	380FS10-25	380FS10-50
9-Piece Ultraviolet Set						106FA10-12.5	106FA10-25	106FA10-50

MDM= Metal-Dielectric-Metal

Mercury Line Filter Sets

With their sharp cut-on and cut-off slopes, plus high degree of out-of-band blocking, these sets are useful for eliminating unwanted background radiation.

CW/L (nm)	FWHM (nm)	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (mm)	Size, Shape & Part Number		
						12.5mm Ø ○	25mm Ø ○	50mm Ø ○
253.7 +3/-0	10 ±2	MDM/7	12	-	4	254FS10-12.5	254FS10-25	254FS10-50
265.0 +3/-0	10 ±2	MDM/7	12	-	4	265FS10-12.5	265FS10-25	265FS10-50
280.0 +3/-0	10 ±2	MDM/7	12	-	4	280FS10-12.5	280FS10-25	280FS10-50
289.0 +3/-0	10 ±2	MDM/7	15	-	4	289FS10-12.5	289FS10-25	289FS10-50
296.7 +3/-0	10 ±2	MDM/7	15	-	4	297FS10-12.5	297FS10-25	297FS10-50
313.0 +3/-0	10 ±2	MDM/7	15	-	4	313FS10-12.5	313FS10-25	313FS10-50
334.0 +2/-0	10 ±2	3/3	25	1.45	8	334FS10-12.5	334FS10-25	334FS10-50
365.0 +2/-0	10 ±2	3/3	25	1.45	7	365FS10-12.5	365FS10-25	365FS10-50
8-Piece Mercury Ultraviolet Set						100FA10-12.5	100FA10-25	100FA10-50

CW/L (nm)	FWHM (nm)	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (mm)	Size, Shape & Part Number		
						12.5mm Ø ○	25mm Ø ○	50mm Ø ○
404.7 +1/-0	5 ±1	2/2	35	1.45	7	405FS05-12.5	405FS05-25	405FS05-50
435.8 +1/-0	5 ±1	2/2	45	1.45	7	436FS05-12.5	436FS05-25	436FS05-50
546.1 +2/-0	10 ±2	3/3	55	2.05	7	546FS10-12.5	546FS10-25	546FS10-50
577.0 +1/-0	5 ±1	2/2	50	1.45	7	577FS05-12.5	577FS05-25	577FS05-50
1014.0 +2/-0	10 ±2	3/3	45	2.05	8.5	014FS10-12.5	014FS10-25	014FS10-50
5-Piece Mercury Visible/Near Infrared Set						102FA10-12.5	102FA10-25	102FA10-50

CW/L (nm)	FWHM (nm)	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (mm)	Size, Shape & Part Number		
						12.5mm Ø ○	25mm Ø ○	50mm Ø ○
253.7 +3/-0	10 ±2	MDM/7	12	-	4	254FS10-12.5	254FS10-25	254FS10-50
265.0 +3/-0	10 ±2	MDM/7	12	-	4	265FS10-12.5	265FS10-25	265FS10-50
280.0 +3/-0	10 ±2	MDM/7	12	-	4	280FS10-12.5	280FS10-25	280FS10-50
289.0 +3/-0	10 ±2	MDM/7	15	-	4	289FS10-12.5	289FS10-25	289FS10-50
296.7 +3/-0	10 ±2	MDM/7	15	-	4	297FS10-12.5	297FS10-25	297FS10-50
313.0 +3/-0	10 ±2	MDM/7	15	-	4	313FS10-12.5	313FS10-25	313FS10-50
334.0 +2/-0	10 ±2	3/3	25	1.45	8	334FS10-12.5	334FS10-25	334FS10-50
365.0 +2/-0	10 ±2	3/3	25	1.45	7	365FS10-12.5	365FS10-25	365FS10-50
404.7 +2/-0	10 ±2	3/3	45	1.45	7	405FS10-12.5	405FS10-25	405FS10-50
435.8 +2/-0	10 ±2	3/3	45	1.45	7	436FS10-12.5	436FS10-25	436FS10-50
546.1 +2/-0	10 ±2	3/3	55	2.05	7	546FS10-12.5	546FS10-25	546FS10-50
577.0 +2/-0	10 ±2	3/3	55	2.05	7	577FS10-12.5	577FS10-25	577FS10-50
1014.0 +2/-0	10 ±2	3/3	45	2.05	8.5	014FS10-12.5	014FS10-25	014FS10-50
13-Piece Mercury Ultraviolet/Visible/Near Infrared Set						104FA10-12.5	104FA10-25	104FA10-50

MDM= Metal-Dielectric-Metal

Visible Filter Sets

Consists of three options in different bandwidths.

CW/L (nm)	FWHM (nm)	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (mm)	Size, Shape & Part Number		
						12.5mm Ø ○	25mm Ø ○	50mm Ø ○
400.0 +3/-0	10 ±2	3/3	45	1.45	7	400FS10-12.5	400FS10-25	400FS10-50
450.0 +3/-0	10 ±2	3/3	45	1.45	7	450FS10-12.5	450FS10-25	450FS10-50
500.0 +3/-0	10 ±2	3/3	55	2.05	7	500FS10-12.5	500FS10-25	500FS10-50
550.0 +3/-0	10 ±2	3/3	55	2.05	7	550FS10-12.5	550FS10-25	550FS10-50
600.0 +3/-0	10 ±2	3/3	55	2.05	7	600FS10-12.5	600FS10-25	600FS10-50
650.0 +3/-0	10 ±2	3/3	55	2.05	7	650FS10-12.5	650FS10-25	650FS10-50
700.0 +3/-0	10 ±2	3/3	55	2.05	7	700FS10-12.5	700FS10-25	700FS10-50
7-Piece Visible (10nm Bandwidth) Set						108FA10-12.5	108FA10-25	108FA10-50

CW/L (nm)	FWHM (nm)	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (mm)	Size, Shape & Part Number		
						12.5mm Ø ○	25mm Ø ○	50mm Ø ○
400.0 +10/-0	40 ±8	3/3	45	1.45	7	400FS40-12.5	400FS40-25	400FS40-50
450.0 +10/-0	40 ±8	3/3	55	1.45	7	450FS40-12.5	450FS40-25	450FS40-50
500.0 +10/-0	40 ±8	3/3	55	2.05	7	500FS40-12.5	500FS40-25	500FS40-50
550.0 +10/-0	40 ±8	3/3	55	2.05	7	550FS40-12.5	550FS40-25	550FS40-50
600.0 +10/-0	40 ±8	3/3	55	2.05	7	600FS40-12.5	600FS40-25	600FS40-50
650.0 +10/-0	40 ±8	3/3	50	2.05	7	650FS40-12.5	650FS40-25	650FS40-50
700.0 +10/-0	40 ±8	3/3	50	2.05	7	700FS40-12.5	700FS40-25	700FS40-50
7-Piece Visible (40nm Bandwith) Set						110FA40-12.5	110FA40-25	110FA40-50

CW/L (nm)	FWHM (nm)	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (mm)	Size, Shape & Part Number		
						12.5mm Ø ○	25mm Ø ○	50mm Ø ○
400.0 +25/-0	70 ±16	MDM/10	60	-	7	400FS70-12.5	400FS70-25	400FS70-50
450.0 +25/-0	80 ±16	MDM/9	65	-	7	450FS80-12.5	450FS80-25	450FS80-50
500.0 +25/-0	80 ±16	MDM/9	70	-	7	500FS80-12.5	500FS80-25	500FS80-50
550.0 +25/-0	80 ±16	MDM/9	70	-	7	550FS80-12.5	550FS80-25	550FS80-50
600.0 +25/-0	80 ±16	MDM/9	70	-	7	600FS80-12.5	600FS80-25	600FS80-50
650.0 +25/-0	80 ±16	MDM/9	70	-	7	650FS80-12.5	650FS80-25	650FS80-50
700.0 +25/-0	80 ±16	MDM/9	65	-	7	700FS80-12.5	700FS80-25	700FS80-50
7-Piece Visible (80nm Bandwidth) Set						112FA80-12.5	112FA80-25	112FA80-50

MDM= Metal-Dielectric-Metal

Near Infrared Filter Sets

Includes three options in different bandwidths. Useful for isolating specific lines or bands over a much broader and higher wavelength region.

CW/L (nm)	FWHM (nm)	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (mm)	Size, Shape & Part Number		
						12.5mm Ø ○	25mm Ø ○	50mm Ø ○
750.0 +3/-0	10 ±2	3/3	50	2.05	7	750FS10-12.5	750FS10-25	750FS10-50
800.0 +3/-0	10 ±2	3/3	50	2.05	7	800FS10-12.5	800FS10-25	800FS10-50
850.0 +3/-0	10 ±2	3/3	50	2.05	7	850FS10-12.5	850FS10-25	850FS10-50
900.0 +3/-0	10 ±2	3/3	50	2.05	7	900FS10-12.5	900FS10-25	900FS10-50
950.0 +3/-0	10 ±2	3/3	50	2.05	7	950FS10-12.5	950FS10-25	950FS10-50
1000.0 +3/-0	10 ±2	3/3	45	2.05	8.5	100FS10-12.5	100FS10-25	100FS10-50
1050.0 +3/-0	10 ±2	3/3	45	2.05	8.5	050FS10-12.5	050FS10-25	050FS10-50
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
1400.0 +3/-0	10 ±2	2/2	30	2.05	8.5	140FS10-12.5	140FS10-25	140FS10-50
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
15-Piece Near Infrared (10nm Bandwidth) Set						114FA10-12.5	114FA10-25	114FA10-50

CW/L (nm)	FWHM (nm)	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (mm)	Size, Shape & Part Number		
						12.5mm Ø ○	25mm Ø ○	50mm Ø ○
750.0 +10/-0	40 ±8	3/3	40	2.05	7	750FS40-12.5	750FS40-25	750FS40-50
800.0 +10/-0	40 ±8	3/3	50	2.05	7	800FS40-12.5	800FS40-25	800FS40-50
850.0 +10/-0	40 ±8	3/3	50	2.05	7	850FS40-12.5	850FS40-25	850FS40-50
900.0 +10/-0	40 ±8	3/3	50	2.05	7	900FS40-12.5	900FS40-25	900FS40-50
950.0 +10/-0	40 ±8	3/3	50	1.45	7	950FS40-12.5	950FS40-25	950FS40-50
1000.0 +10/-0	40 ±8	3/3	45	1.45	8.5	100FS40-12.5	100FS40-25	100FS40-50
6-Piece Near Infrared (40nm Bandwidth) Set						116FA40-12.5	116FA40-25	116FA40-50

CW/L (nm)	FWHM (nm)	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (mm)	Size, Shape & Part Number		
						12.5mm Ø ○	25mm Ø ○	50mm Ø ○
750.0 +25/-0	100 ±20	MDM/9	65	-	7	750FS00-12.5	750FS00-25	750FS00-50
800.0 +25/-0	100 ±20	MDM/9	65	-	7	800FS00-12.5	800FS00-25	800FS00-50
850.0 +25/-0	100 ±20	MDM/9	65	-	7	850FS00-12.5	850FS00-25	850FS00-50
900.0 +25/-0	100 ±20	MDM/9	60	-	7	900FS00-12.5	900FS00-25	900FS00-50
950.0 +25/-0	100 ±20	MDM/9	60	-	7	950FS00-12.5	950FS00-25	950FS00-50
1000.0 +25/-0	100 ±20	MDM/9	60	-	8.5	100FS00-12.5	100FS00-25	100FS00-50
6-Piece Near Infrared (100nm Bandwidth) Set						118FA00-12.5	118FA00-25	118FA00-50

MDM= Metal-Dielectric-Metal

Zinc and Cadmium Filter Sets

Available in four wavelengths and two half bandwidths. A good tool for liquid chromatography work, particularly fixed wavelength detectors.

CW/L (nm)	FWHM (nm)	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (mm)	Size, Shape & Part Number		
						12.5mm Ø ○	25mm Ø ○	50mm Ø ◯
214.0 +3/-0	10 ±2	MDM/7	12	-	4	214FS10-12.5	214FS10-25	214FS10-50
228.0 +3/-0	10 ±2	MDM/7	15	-	4	228FS10-12.5	228FS10-25	228FS10-50
307.1 +3/-0	10 ±2	MDM/7	15	-	4	307FS10-12.5	307FS10-25	307FS10-50
326.1 +2/-0	10 ±2	3/3	25	1.45	8	326FS10-12.5	326FS10-25	326FS10-50
4-Piece Zinc and Cadmium (10nm Bandwidth) Set						107FA10-12.5	107FA10-25	107FA10-50

CW/L (nm)	FWHM (nm)	Cavities/ Filter Type	Min. T (%)	N*	Max. Thickness (mm)	Size, Shape & Part Number		
						12.5mm Ø ○	25mm Ø ○	50mm Ø ◯
214.0 ±3	22 ±4	MDM/8	20	-	4	214FS22-12.5	214FS22-25	214FS22-50
228.0 ±3	25 ±5	MDM/8	20	-	4	228FS25-12.5	228FS25-25	228FS25-50
307.1 ±3	25 ±5	MDM/8	20	-	4	307FS25-12.5	307FS25-25	307FS25-50
326.1 ±3	25 ±5	3/3	25	1.45	8	326FS25-12.5	326FS25-25	326FS25-50
4-Piece Zinc and Cadmium (22/25nm Bandwidth) Set						107FA23-12.5	107FA23-25	107FA23-50

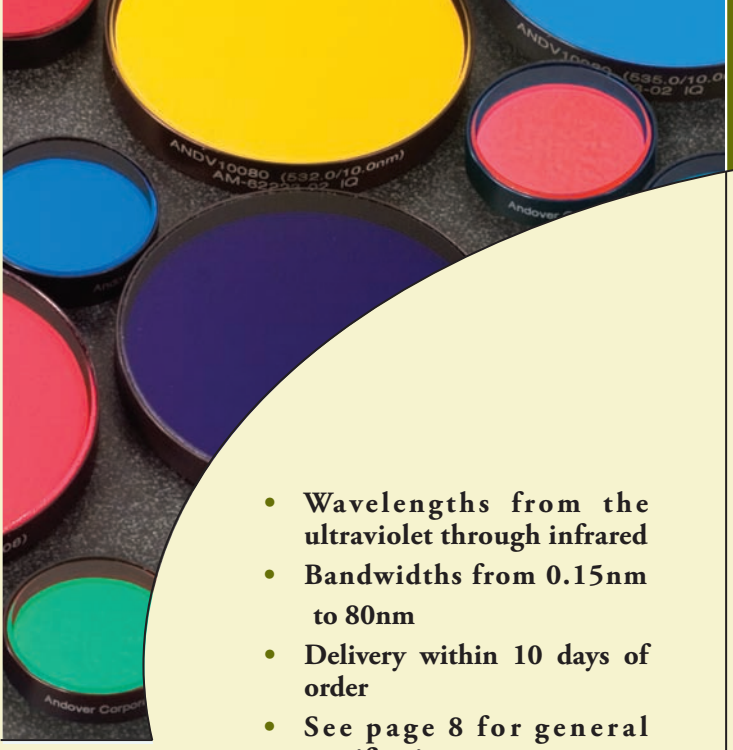
MDM= Metal-Dielectric-Metal

User-Defined Standard Sets

In addition to an extensive line of standard sets, Andover Corporation also offers customers the opportunity to build their own filter sets from across our product listings—whether bandpass, neutral density, dichroic, edge, or other filter category.

The only restriction is that the filters must be the same size. Take your choice of six-, eight-, and twelve-piece sets in one of three standard sizes. All filter sets include complete spectral curve data and are shipped with a hardwood storage case.

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



SEMI-CUSTOM BANDPASS

- **Wavelengths from the ultraviolet through infrared**
- **Bandwidths from 0.15nm to 80nm**
- **Delivery within 10 days of order**
- **See page 8 for general specifications**

Thanks to a large inventory of components, Andover Corporation can fabricate and deliver higher-performance commercial quality bandpass filters to your specifications within 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 10^{-4} within the defined spectral range. Optional threaded rings available. Image quality versions available, please call for pricing and delivery.

SELECT 1.				SELECT 2.			SELECT 3.		
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 ○
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 to 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	006FC12-50
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

SELECT 1.				SELECT 2.			SELECT 3.		
							Size, Shape & Part Number		
Bandwidth (FWHM) (nm)	Cavities/ Filter Type	CW/L Range (nm)	CW/L Tolerance (nm)	Min. T (%) When Blocked to 1µ	FIR	N*	12.5mm Ø ○	25mm Ø ○	50mm Ø ○
1.0 ± 0.2	2/2	340.0–385.0	+0.2/-0	-	10	1.45	010FC04-12.5	010FC04-25	010FC04-50
	2/2	385.1–430.0	+0.2/-0	25	20	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	320.1–385.0	+0.3/-0	-	10	1.45	015FC04-12.5	015FC04-25	015FC04-50
	2/2	385.1–430.0	+0.3/-0	25	20	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	320.1–385.0	+0.5/-0	-	10	1.45	020FC04-12.5	020FC04-25	020FC04-50
	2/2	385.1–430.0	+0.4/-0	40	35	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	320.1–385.0	+0.5/-0	-	10	1.45	030FC04-12.5	030FC04-25	030FC04-50
	2/2	385.1–430.0	+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

SELECT 1.				SELECT 2.			SELECT 3.		
							Size, Shape & Part Number		
Bandwidth (FWHM) (nm)	Cavities/ Filter Type	CW/L Range (nm)	CW/L Tolerance (nm)	Min. T (%) When Blocked to 1µ	FIR	N*	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[c]	35	2.05	050FC19-12.5	050FC19-25	050FC19-50
	2/2	1550.1–2000.0	+1/-0	50[c]	-	2.05	050FC20-12.5	050FC20-25	050FC20-50
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	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	45	2.05	050FC47-12.5	050FC47-25	050FC47-50
	4/4	950.1–1100.0	+1/-0	55	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

SELECT 1. — SELECT 2. — SELECT 3.

Bandwidth (FWHM) (nm)	Cavities/ Filter Type	CW/L Range (nm)	CW/L Tolerance (%)	Min. T (%) When Blocked to 1µ	Min. T (%) When Blocked to 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
	2/2	1550.1–2400.0	±2.0	60[e]	-	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

Threaded Filter Rings

Andover now 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.

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

Threaded Ring Sizes Available

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

CUSTOM CAPABILITIES

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

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 product, attentive service, and timely delivery.

Fabrication

Whether you need a filter that's 8mm 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.

Optical Polishing

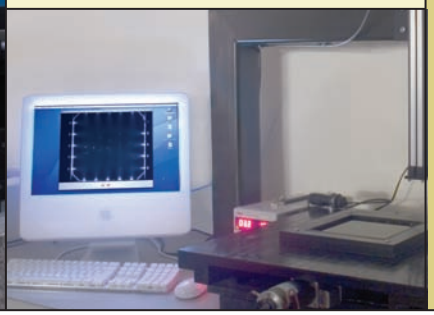
Andover's in-house polishing facility can achieve flatness up to λ/10 wave per inch and parallelism of 10 arc seconds or better, with a surface quality of 40/20.

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 form thermal evaporation to magnetron sputtering.

Total Quality Control

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



State-of-the-Art Testing

Andover Corporation tests start at the raw material and continue through the finished product.

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 on-site environmental chamber allows us to perform routine and custom product testing at various temperatures and humidity levels to ensure compliance to your custom specifications or MIL standards.

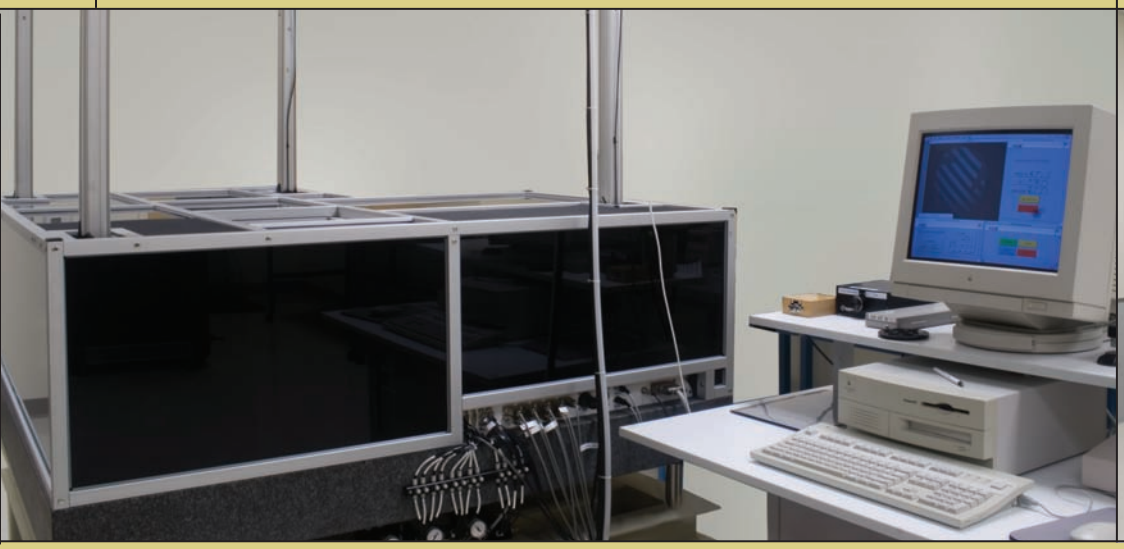


Image Quality Filters

Astronomical observations, video monitoring systems, high-resolution photography, and other imaging applications require components of the highest optical quality. To meet these demanding requirements, Andover Corporation has developed a line of custom "image quality" filters using high-grade optical material that is both striation and inclusion-free. The surfaces are ground and polished to a transmitted wavefront of λ/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. For very high-resolution applications, we can also provide image quality filters with a transmitted wavefront of λ/10 and parallelism of 10 arc seconds.

All filters come with test documentation

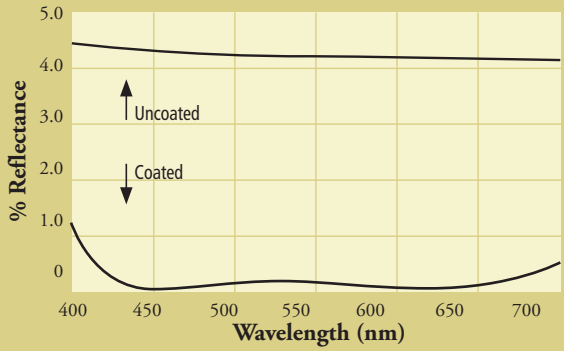
For quality custom products, please call 1.888.893.9992 (US) or +00.1.603.893.6888 (Outside US)

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 antireflective 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.

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.

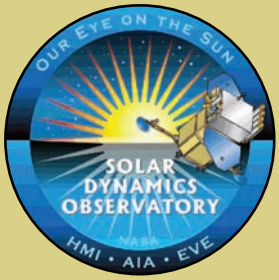
BROADBAND VISIBLE ANTIREFLECTION



A small sampling of Andover's past projects:

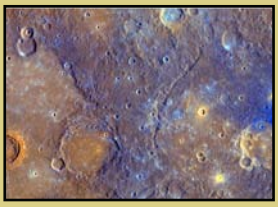
Solar Diameter Imager and Surface Mapper (SODISM) on the PICARD satellite

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.

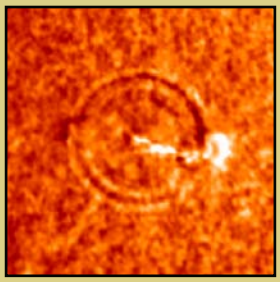


MErcury Surface, Space ENvironment, GEochemistry and Ranging (MESSENGER)

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.

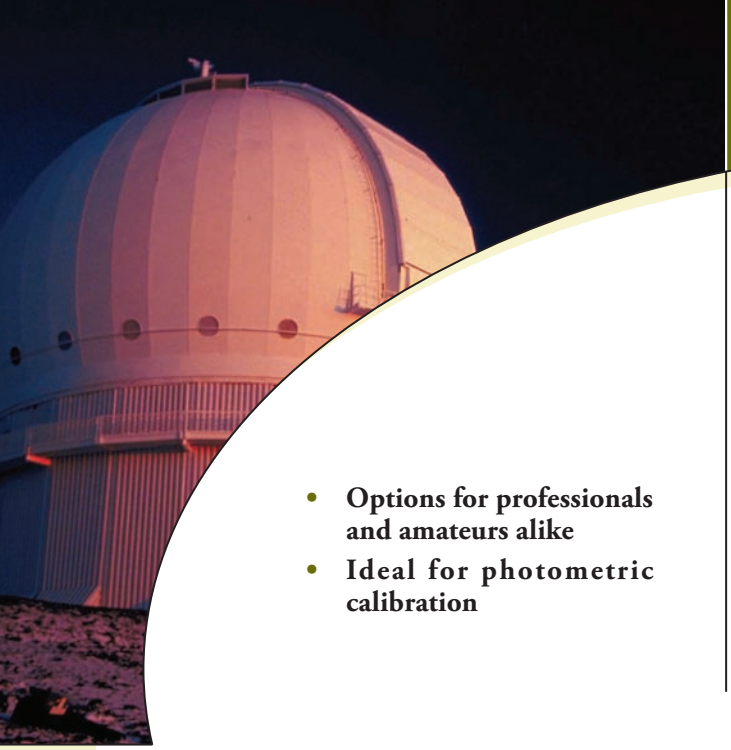
The Cross-track Infrared Sounder (CrIS)

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.



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/Bessell 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

OPTICAL SPECIFICATIONS

Transmitted Wavefront	1 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)

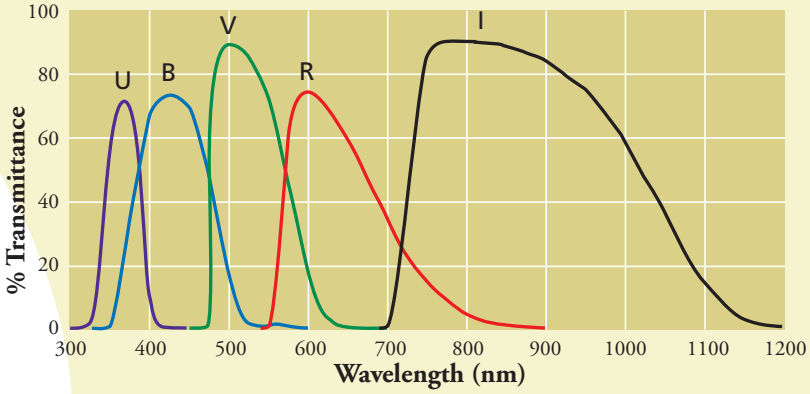
JOHNSON/BESSEL FILTER SPECIFICATIONS

	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%

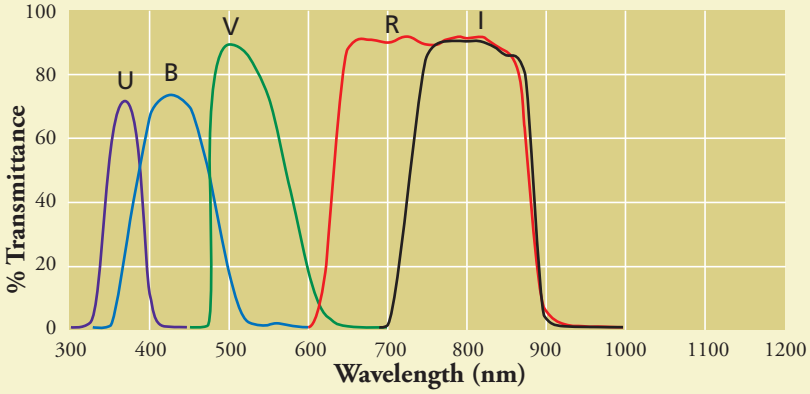
JOHNSON/BESSEL UBVRI FILTERS



Ultraviolet
Blue
Visible
Red
Infrared

Size & Shape	Part Number & Type					
	U	B	V	R	I	5-Piece Set
25mm Ø ○	JOHN-U-25	JOHN-B-25	JOHN-V-25	JOHN-R-25	JOHN-I-25	JOHN-FA-25
50mm Ø ○	JOHN-U-50	JOHN-B-50	JOHN-V-50	JOHN-R-50	JOHN-I-50	JOHN-FA-50
50 x 50mm SQ □	JOHN-U-50S	JOHN-B-50S	JOHN-V-50S	JOHN-R-50S	JOHN-I-50S	JOHN-FA-50S
31mm Ø (Mounted) ○	JOHN-U-31M	JOHN-B-31M	JOHN-V-31M	JOHN-R-31M	JOHN-I-31M	JOHN-FA-31M
50mm Ø (Mounted) ○	JOHN-U-50M	JOHN-B-50M	JOHN-V-50M	JOHN-R-50M	JOHN-I-50M	JOHN-FA-50M

KRON/COUSINS UBVRI FILTERS



Ultraviolet
Blue
Visible
Red
Infrared

- **Options for professionals and amateurs alike**
- **Ideal for eliminating light pollution**

Nebula Filters

A true nebula filter works by blocking out the sky glow (artificial light pollution) and enhancing deep-sky objects. Andover manufactures two types of filters that are considered best for viewing emission nebulae (created when a star is born) and planetary nebulae (created when a star is dying).

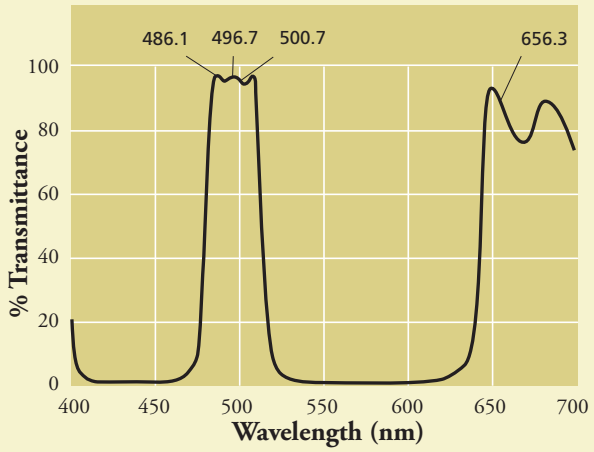
PHYSICAL SPECIFICATIONS	31mm Ø	50mm Ø
Mounting	Threaded eyepiece	Threaded ring
Construction	Laminated filter	Laminated filter
Outside Diameter	31.0mm +0/-.12mm	50.0mm +0/-.12mm
Clear Aperture	24.1mm diameter	45mm diameter
Thickness	10.0mm +0/-.5mm	8.2mm +0/-.5mm
Thread Size	1-1/8–40	M48–0.75

OPTICAL SPECIFICATIONS	
Transmitted Wavefront	3-5 waves per 25mm
Parallelism	1 arc minute or better
Surface Quality	80/50 or better per MIL-C-675
AR Coatings	BBAR on all exterior surfaces
Durability	Per MIL-C-48497A, moderate abrasion

	Size, Shape & Part Number	
	31mm Ø ○	50mm Ø ○
Three-Channel	Nebula-NB-31	Nebula-NB-50
O-III	Oxygen-III-31	Oxygen-III-50
Blue Nebula	Blue-Nebula-31	Blue-Nebula-50

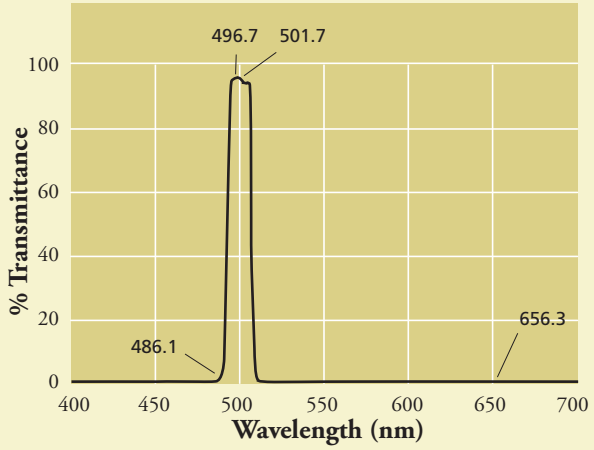
THREE-CHANNEL NEBULA FILTER

Suitable for vewing both types of nebulae, the Andover three-channel nebula filter is unique in its ability to block the sky glow and enhance the nebulae, as well as let through a selected band of blue light that improves the viewing of star clusters. This filter also transmits the hydrogen-alpha line, which is very important for photographing emission nebulae.



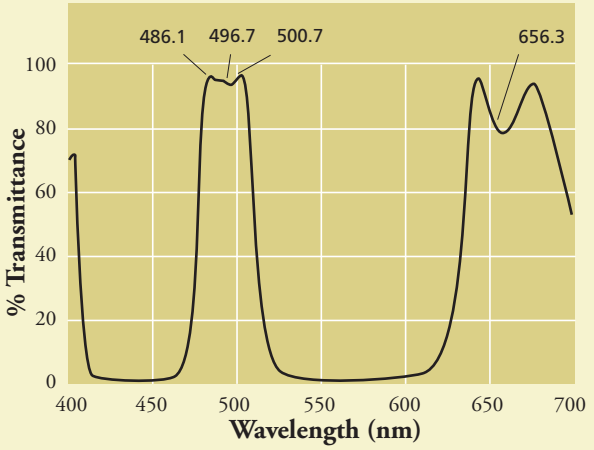
O-III NEBULA FILTER

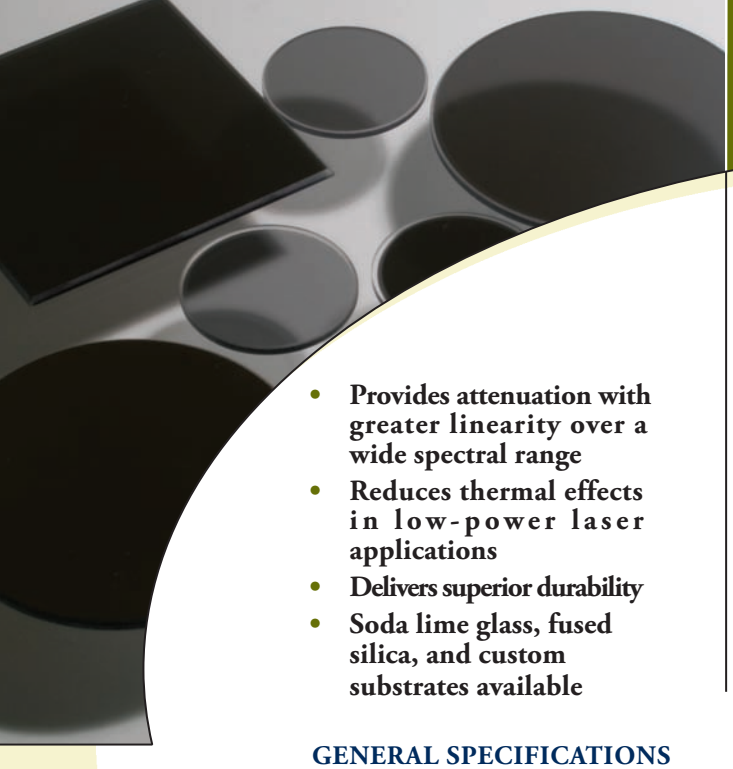
Featuring a narrower bandpass than the three-channel version, the O-III nebula filter blocks out much of the sky glow and isolates the two O-III lines centered at 496.9nm and 500.7nm. This filter significantly increases contrast, making it well-suited for viewing planetary nebulae.



BLUE NEBULA FILTER

Similar to the three-channel nebula filter, the blue nebula has greater transmission in the blue region, creating a more natural-looking view while retaining good contrast. The hard, first-surface coating renders this filter virtually indestructible.





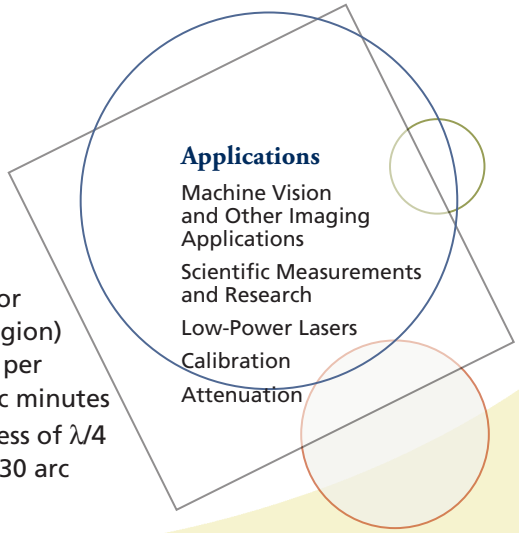
- **Provides attenuation with greater linearity over a wide spectral range**
- **Reduces thermal effects in low-power laser applications**
- **Delivers superior durability**
- **Soda lime glass, fused silica, and custom substrates available**

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.)

GENERAL SPECIFICATIONS

Thickness	1.5 ±0.5mm
Dimensional Tolerances	+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 seonds or better
Mechanical	Unmounted
Optional:	Mounted in threaded ring - see pg 23 for thread sizes



METALLIC NEUTRAL DENSITY SPECIFICATIONS

Optical Density	Nominal Transmittance (%)	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)

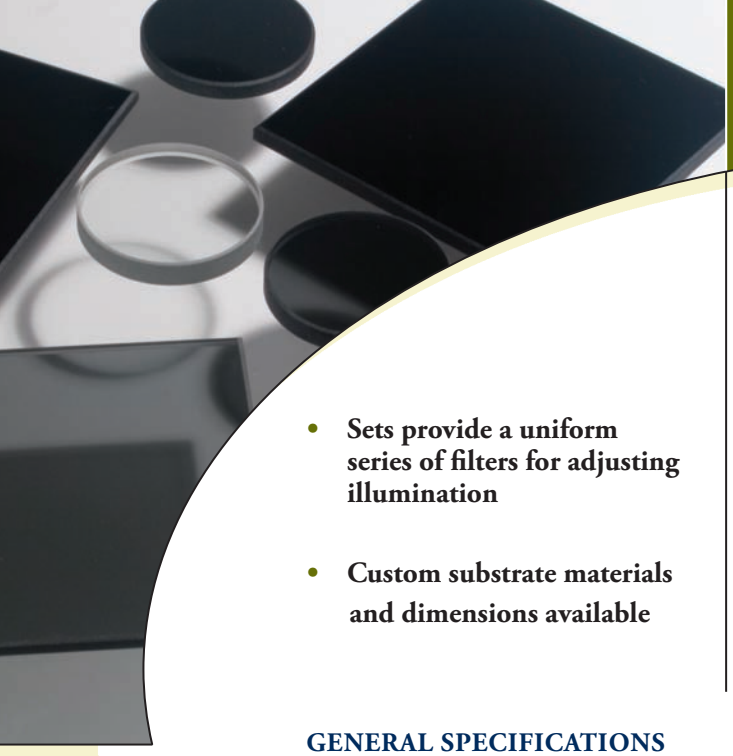
VISIBLE/NEAR INFRARED REGION (Glass Substrate, 350–2000nm)

Optical Density	Nominal Transmittance (%)	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
2.00	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

Infrared NDs also available - see pg 56 for details

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

Optical Density	Nominal Transmittance (%)	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
2.00	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



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 56 for details

GENERAL SPECIFICATIONS

Thickness	5.0mm (maximum)
Dimensional Tolerances	±0.5mm
Clear Aperture	90% of diameter
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 λ/4 per inch and parallelism of 30 arc seconds or better
Mechanical	Unmounted
Optional:	Mounted in threaded ring - see pg 23 for thread sizes

Applications

Photomicrography
Machine Vision
Scientific Measurements and Research
Photography

Optical Density	Density Tolerance @ 550 nm (%)	Nominal Transmission (%)	Thickness (mm)	Size, Shape & Part Number: 25mm Ø ○	Size, Shape & Part Number: 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

All Andover sets are shipped with a hardwood storage case for protection and convenient 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

0.10
0.30
0.50
1.00
2.00
3.00
4.00

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

	Size, Shape & Part Number			
Substrate	12.5mmØ ○	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

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

Includes 17 filters with optical densities ranging from 0.10 to 4.00, in your choice of four sizes and either glass or fused silica substrates.

	Size, Shape & Part Number			
Substrate	12.5mmØ ○	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 and square filters.

7-PIECE SET

0.10
0.30
0.50
1.00
2.00
3.00
4.00

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

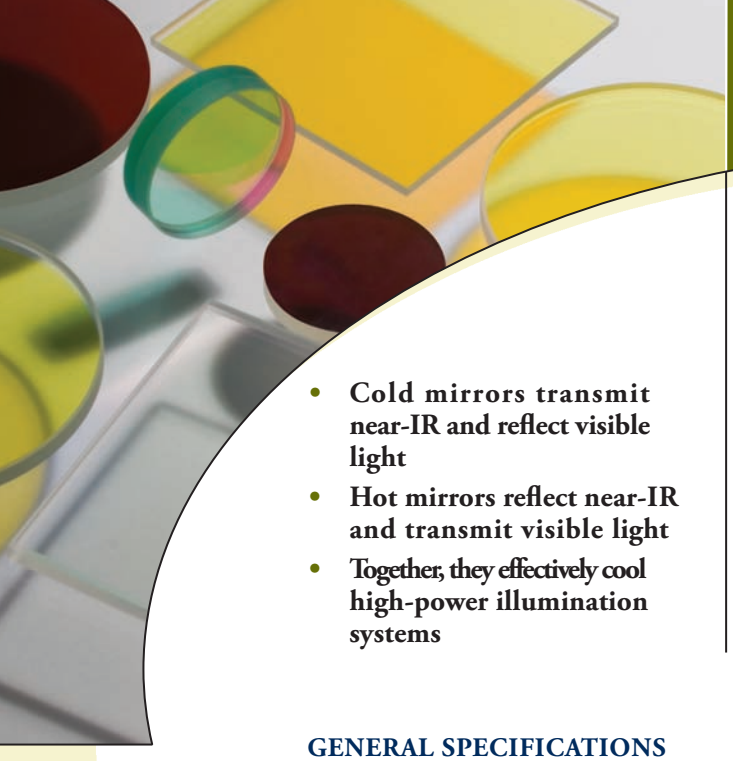
Size, Shape & Part Number	
25mm Ø ○	50mm SQ □
135FAND-25	135FAND-50S

14-PIECE SET

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

Includes 14 filters with optical densities ranging 0.10 to 4.00.

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



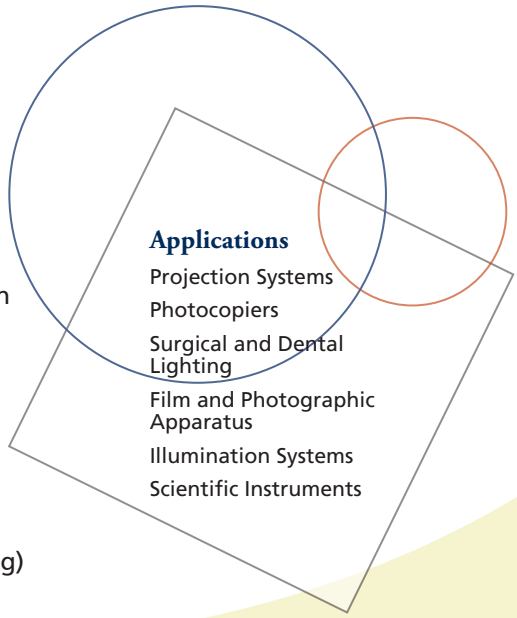
HEAT CONTROL FILTERS

- **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**

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.

GENERAL SPECIFICATIONS

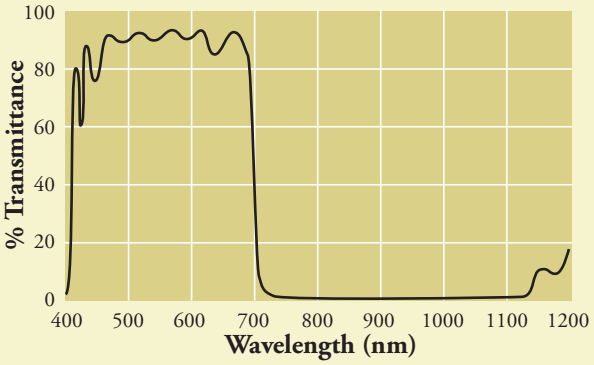
Size Tolerance	+0.0mm/-0.5mm
Thickness	3.0mm ±0.5mm (6.0mm ±0.5mm for IR Suppressing)
Min. Clear Aperture	95% of optical dimension
Substrate Material	Borosilicate glass
Flatness	5–10 waves per 25mm
Parallelism	3 arc minutes or better
Surface Quality	80/50 per MIL-O-13830
Humidity and Abrasion	Per MIL-C-675A
Max. Operating Temperature	+200°C (+100°C for IR suppressing)
Mechanical	Unmounted
Optional:	Mounted in threaded ring - see pg 23 for thread sizes



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.

(0° Angle)



Average Transmittance: 450nm–675nm ≥85%
Average Reflection: 750nm–1200nm ≥90%

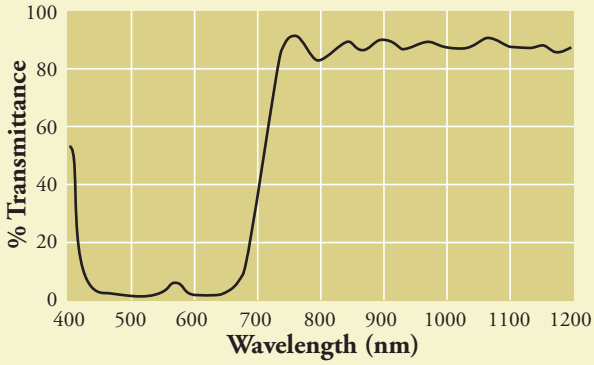
Size, Shape & Part Number		
25mm Ø ○	50mm Ø ◯	50mm SQ □
775FW82-25	775FW82-50	775FW82-50S

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

(45° Angle)



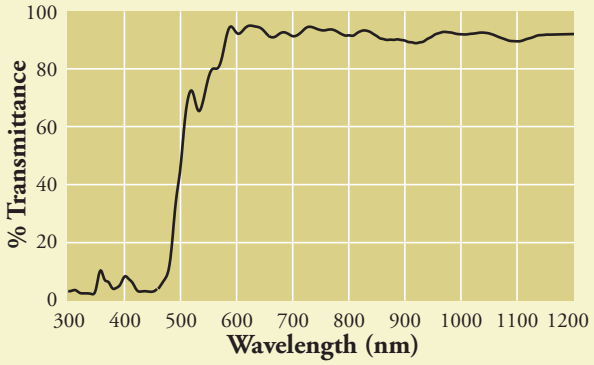
Average Transmittance 800nm–1200nm ≥85%
Average Reflection 450nm–650nm ≥90%

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

(45° Angle)



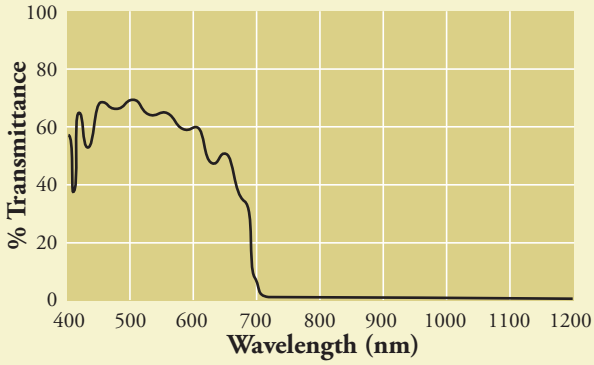
Average Transmittance: 600nm–1200nm ≥85%
Average Reflection: 325nm–475nm ≥95%

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

(0° Angle)



Average Transmittance: 400nm–600nm ≥65%
Average Transmittance: 700nm–2000nm ≤10%

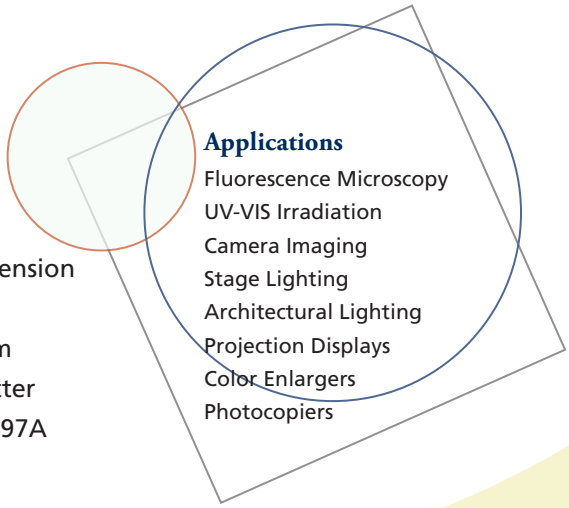
DICHROIC FILTERS

- **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**

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.

GENERAL SPECIFICATIONS

Size Tolerance	+0.0mm/-0.25mm
Thickness	1.0mm ±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 23 for thread sizes

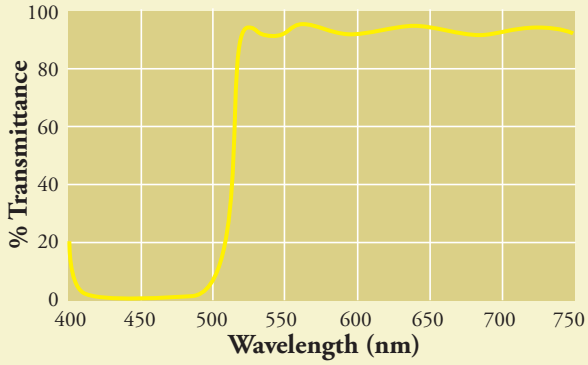


Applications

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

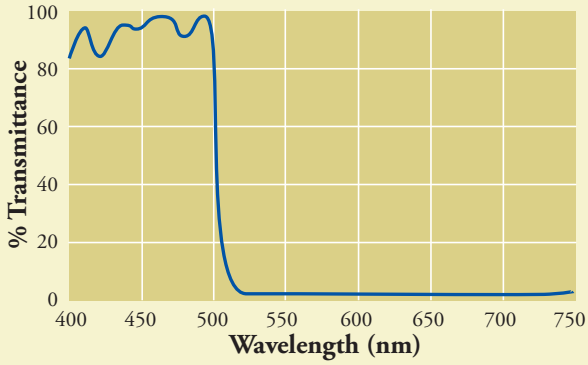
Color	Type	Size, Shape & Part Number		
		25mm Ø ○	50mm Ø ◯	50mm SQ □
Yellow	Subtractive	520FD22-25	520FD22-50	520FD22-50S
Magenta	Subtractive	550FD26-25	550FD26-50	550FD26-50S
Cyan	Subtractive	590FD24-25	590FD24-50	590FD24-50S
Blue	Additive	505FD64-25	505FD64-50	505FD64-50S
Green	Additive	540FD66-25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

YELLOW SUBTRACTIVE FILTER (0° Angle)



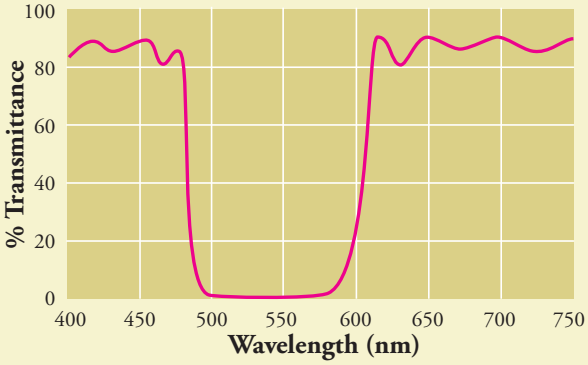
R: 99% Average 410nm–475nm 50% Cut-on 520nm (nominal)
T: 85% Average 550nm–750nm

BLUE ADDITIVE FILTER (0° Angle)



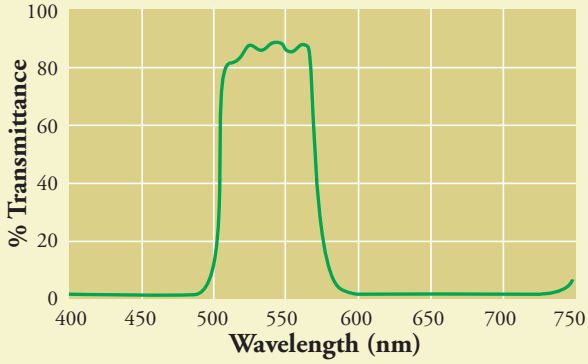
R: 99% Average 540nm–750nm 50% Point 505nm (nominal)
T: 75% Average 390nm–480nm

MAGENTA SUBTRACTIVE FILTER (0° Angle)



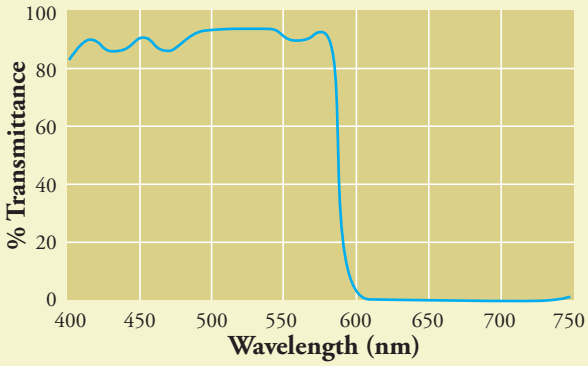
T: 80% Average 380nm–475nm 50% Points 495nm & 605nm
T: 80% Average 650nm–750nm R: 99% Average 535nm–565nm

GREEN ADDITIVE FILTER (0° Angle)



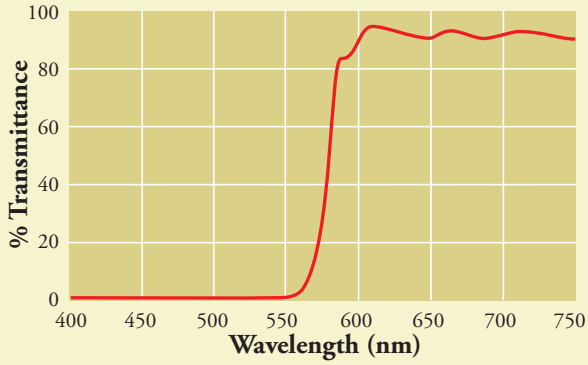
R: 99% Average 380nm–460nm 50% Points 505nm & 575nm (nominal)
R: 99% Average 600nm–730nm T: 85% Min at 540nm

CYAN SUBTRACTIVE FILTER (0° Angle)



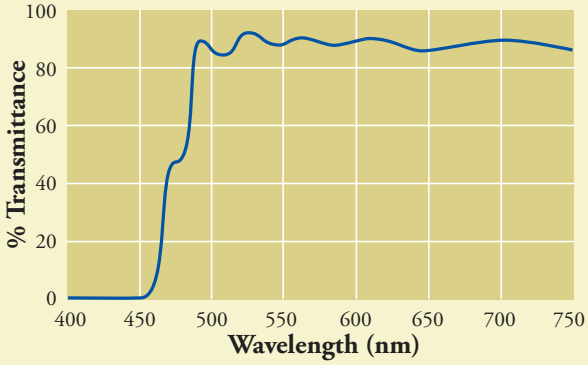
T: 80% Average 400nm–550nm 50% Point 590nm (nominal)
R: 99% Average 640nm–740nm

RED ADDITIVE FILTER (0° Angle)



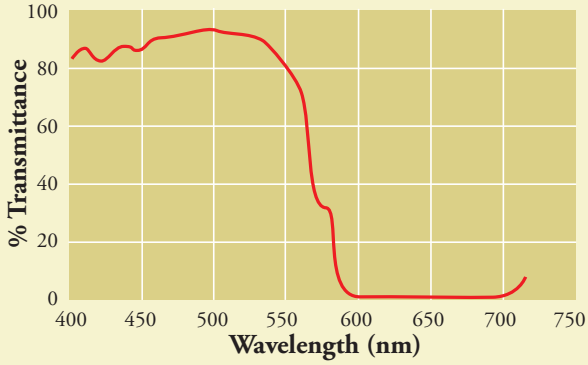
R: 99% Average 370nm–550nm 50% Point 585nm (nominal)
T: 80% Average 610nm–730nm

BLUE REFLECTIVE FILTER (45° Angle)



T: 85% Average 525nm–800nm 50% Point 475nm (nominal)
R: 90% Average 380nm–450nm

RED REFLECTIVE FILTER (45° Angle)



T: 85% Average 400nm–550nm 50% Point 580nm (nominal)
R: 90% Average 610nm–725nm

DICHROIC FILTER SETS

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

Full Color Processing Set

Combines the additive and subtractive sets with blue and red reflective filters. This versatile set allows you to separate all of the primary colors by either transmission or reflection, and to redirect them to achieve an additive or subtractive effect.

Size, Shape & Part Number		
25mm Ø ○	50mm Ø ◯	50mm SQ □
126FA48-25	126FA48-50	126FA48-50S

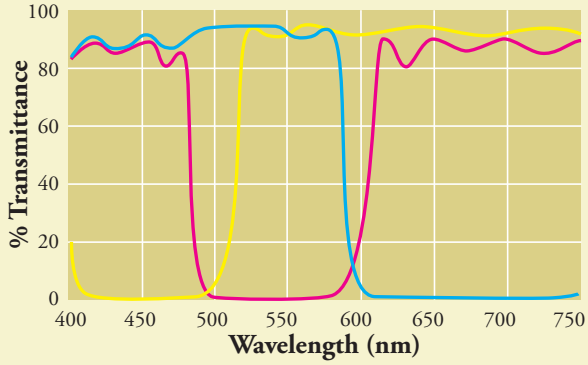
8-PIECE SET

Subtractive
Additive
Reflective

Optional: Mounted in threaded ring - see pg 23 for thread sizes

Color Subtractive Set

Includes yellow, magenta and cyan filters in your choice of three sizes.



Yellow
R: 99% Average 410nm–475nm
T: 85% Average 550nm–750nm
50% Cut-on 520nm (nominal)

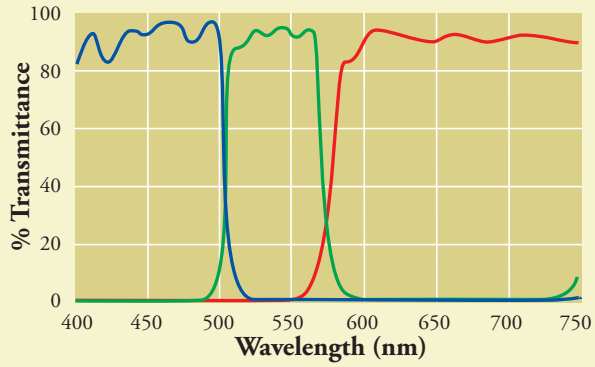
Magenta
T: 80% Average 380nm–475nm
T: 80% Average 650nm–750nm
50% Points 495nm & 605nm
R: 99% Average 535nm–565nm

Cyan
T: 80% Average 400nm–550nm
R: 99% Average 640nm–740nm
50% Point 590nm (nominal)

Size, Shape & Part Number		
25mm Ø ○	50mm Ø ◯	50mm SQ □
126FA46-25	126FA46-50	126FA44-50S

Color Additive Set

Includes blue, green and red filters in your choice of three size.



Blue
R: 99% Average 540nm–750nm
T: 80% Average 390nm–480nm
50% Point 505nm (nominal)

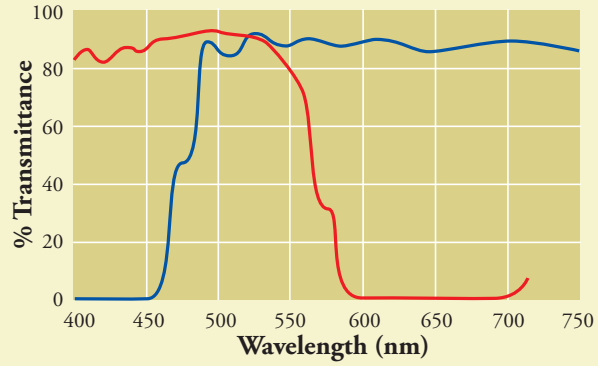
Green
R: 99% Average 380nm–460nm
R: 99% Average 600nm–730nm
50% Points 505nm & 575nm (nominal)
T: 85% Min at 540nm

Red
1% Average 370nm–550nm
80% Average 610nm–730nm
50% Point 585nm (nominal)

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

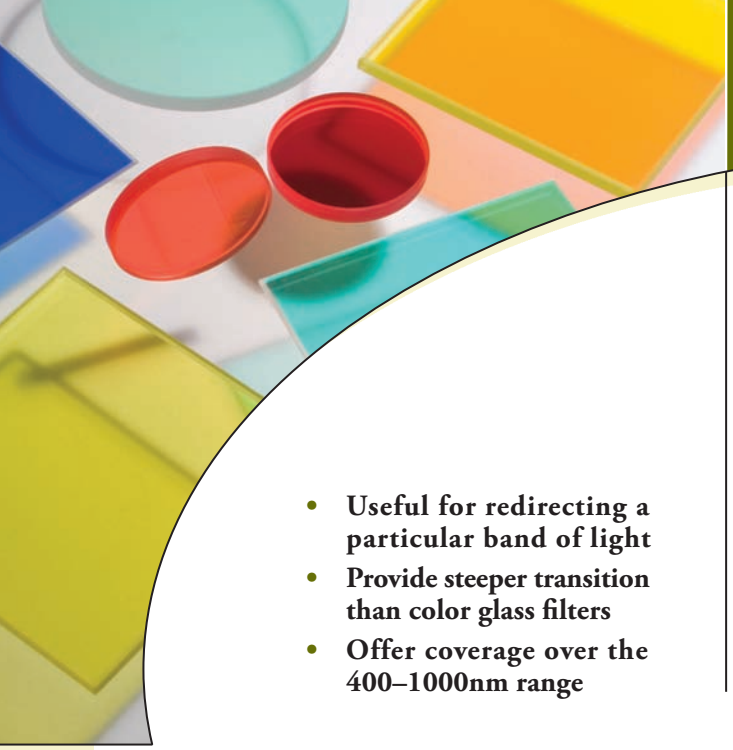
Reflective Filters

Sold individually or included in the full color processing set.



Blue
T: 85% Average 525nm–800nm
R: 90% Average 380nm–450nm
50% Point 475nm (nominal)

Red
T: 85% Average 400nm–550nm
R: 90% Average 610nm–725nm
50% Point 580nm (nominal)



EDGE FILTERS

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

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.

GENERAL SPECIFICATIONS

Size Tolerance	+0.0mm/-0.5mm
Thickness	4.0mm maximum
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 23 for thread sizes

Applications

Fluorescence
Photometry
Color Enhancement and Combining

TRANSMISSION

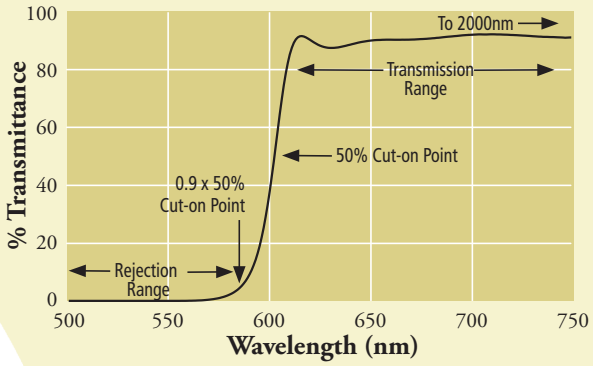
Long Wave Pass	85% average from the 50% cut-on point to 2000nm
Short Wave Pass	85% average from the 50% cut-off point to 0.6 x the 50% cut-off point

(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 ultraviolet
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)

Long Wave Pass



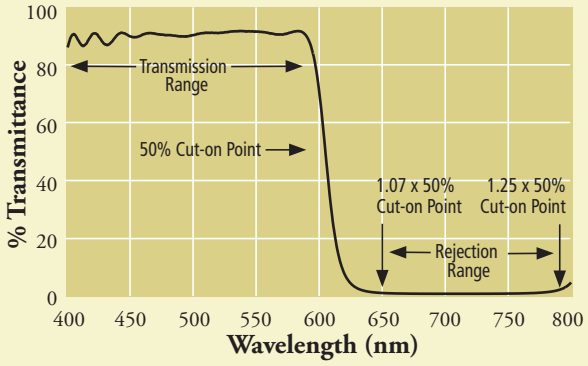
VISIBLE

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	550FH90-50	550FH90-50S
600nm	600FH90-25	600FH90-50	600FH90-50S
650nm	650FH90-25	650FH90-50	650FH90-50S
700nm	700FH90-25	700FH90-50	700FH90-50S
Full Set	120FA90-25	120FA90-50	120FA90-50S

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
850nm	850FH90-25	850FH90-50	850FH90-50S
900nm	900FH90-25	900FH90-50	900FH90-50S
950nm	950FH90-25	950FH90-50	950FH90-50S
1000nm	100FH90-25	100FH90-50	100FH90-50S
Full Set	121FA90-25	121FA90-50	121FA90-50S

Short Wave Pass



VISIBLE

50% Point	Size, Shape & Part Number 25mm Ø ○	50mm Ø ○	50mm SQ □
400nm	400FL07-25	400FL07-50	400FL07-50S
450nm	450FL07-25	450FL07-50	450FL07-50S
500nm	500FL07-25	500FL07-50	500FL07-50S
550nm	550FL07-25	550FL07-50	550FL07-50S
600nm	600FL07-25	600FL07-50	600FL07-50S
650nm	650FL07-25	650FL07-50	650FL07-50S
700nm	700FL07-25	700FL07-50	700FL07-50S
Full Set	123FA07-25	123FA07-50	123FA07-50S

NEA R 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
850nm	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
Full Set	124FA07-25	124FA07-50	124FA07-50S

EDGE FILTER SETS

Andover's long wave pass and short wave pass filter sets are available in a wide range of configurations and in three standard sizes. Also available are two variable bandpass filter ssets that combine several LWP and SWP filters.

Variable Pass Sets

VISIBLE SWP/LWP SET

Includes seven long wave pass and seven short wave pass filters, providing coverage of the 400–700nm wavelength range.

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

Size, Shape & Part Number		
25mm Ø ○	50mm Ø ○	50mm SQ □
126FA97-25	126FA97-50	126FA97-50S

NEAR INFRARED SWP/LWP SET

Includes six long wave pass and six short wave pass filters, providing coverage of the 750–1000nm wavelength range.

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

Size, Shape & Part Number		
25mm Ø ○	50mm Ø ○	50mm SQ □
127FA97-25	127FA97-50	127FA97-50S

Short Wave Pass Sets

VISIBLE SWP SET

Includes seven short wave pass filters, spaced at 50nm increments from 400 nm to 700nm.

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

Includes six long wave pass filters, spaced at 50nm increments from 750nm to 1000nm.

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

Combines the two sets listed on the left to create a 13-piece selection of filters that cover the 400–1000nm spectrum.

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

Long Wave Pass Sets

VISIBLE LWP SET

Includes seven long wave pass filters, spaced at 50nm increments from 400nm to 700nm.

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

Includes six long wave pass filters, spaced at 50nm increments from 750nm to 1000nm.

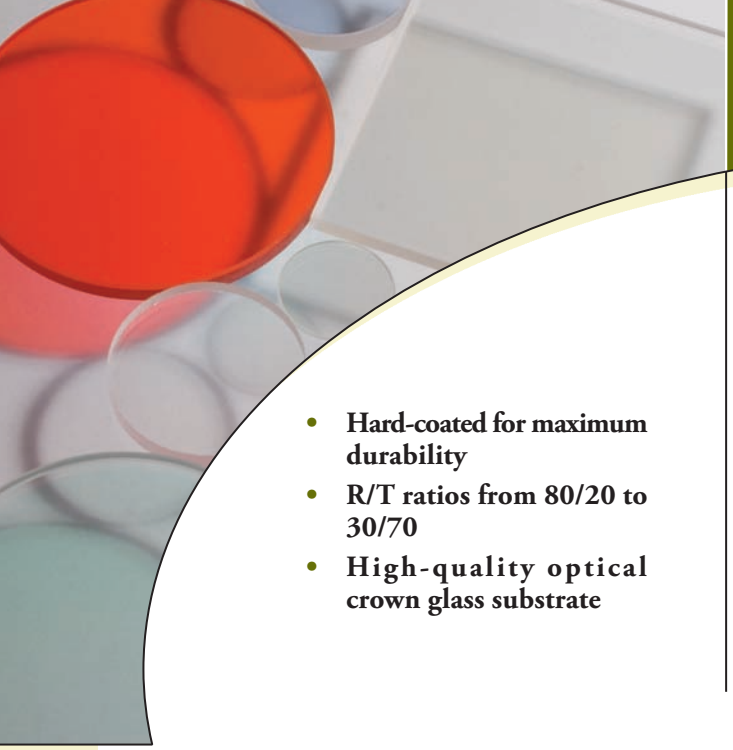
750nm
800nm
850nm
900nm
950nm
1000nm

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

VISIBLE/NEAR INFRARED LWP SET

Combines the two sets listed on the left to create a 13-piece selection of filters that cover the 400–1000nm spectrum.

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



VIS/NIR BEAMSPLITTERS

- **Hard-coated for maximum durability**
- **R/T ratios from 80/20 to 30/70**
- **High-quality optical crown glass substrate**

When using a beamsplitter in an optical system, it is critical that all light incident upon the coating be reflected [R] or transmitted [T] with minimal loss due to absorption. To meet this requirement, Andover's VIS/NIR beamsplitters are constructed of all dielectric materials that keep absorption to just 0.5–1.0%, depending on the R/T ratio. To minimize reflections, we add broadband antireflective coatings that meet or exceed the following environmental specifications. These beamsplitters are designed for use at a 45° angle of incidence in randomly polarized light.

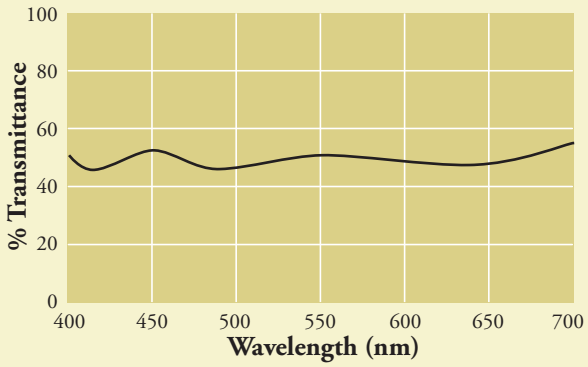
GENERAL SPECIFICATIONS

Substrate Material	Schott® BK-7
Thickness	3mm ±0.5mm
Size Tolerance	+0.00/-0.25mm
Coating Quality	60/40 per MIL-C-48497A
Surface Quality	80/50 per MIL-C-48497A
Humidity and Abrasion	Per MIL-C-48497A
Max. Operating Temperature	+100°C
Flatness	λ/4 wave per 25mm or better
Parallelism	30 arc seconds or better
Angle of Incidence	45° random polarization
Min. Clear Aperture	85% of outside dimension
Mechanical	Unmounted
Optional:	Mounted in threaded ring - see pg 23 for thread sizes

Applications
Microscopy
Spectroscopy
Interferometry
Astronomy

		Size, Shape & Part Number	
R/T Ratio	Tx Range	25mm Ø ○	50mm Sq. □
80/20	450–650nm	VBS-80/20-25	VBS-80/20-50S
70/30	450–650nm	VBS-70/30-25	VBS-70/30-50S
60/40	450–650nm	VBS-60/40-25	VBS-60/40-50S
50/50	400–700nm	VBS-50/50-25	VBS-50/50-50S
50/50	700–1100nm	RBS-50/50-25	RBS-50/50-50S
40/60	400–700nm	VBS-40/60-25	VBS-40/60-50S
30/70	400–700nm	VBS-30/70-25	VBS-30/70-50S

50/50 DIELECTRIC VISIBLE (45° Angle)



CALIBRATION FILTER SETS

- **Spectrophotometric glass filters for verifying transmittance and absorption scales**
- **Calibration standards traceable to NIST**
- **Shipped in an aluminum storage case**

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 λ/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).

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%.

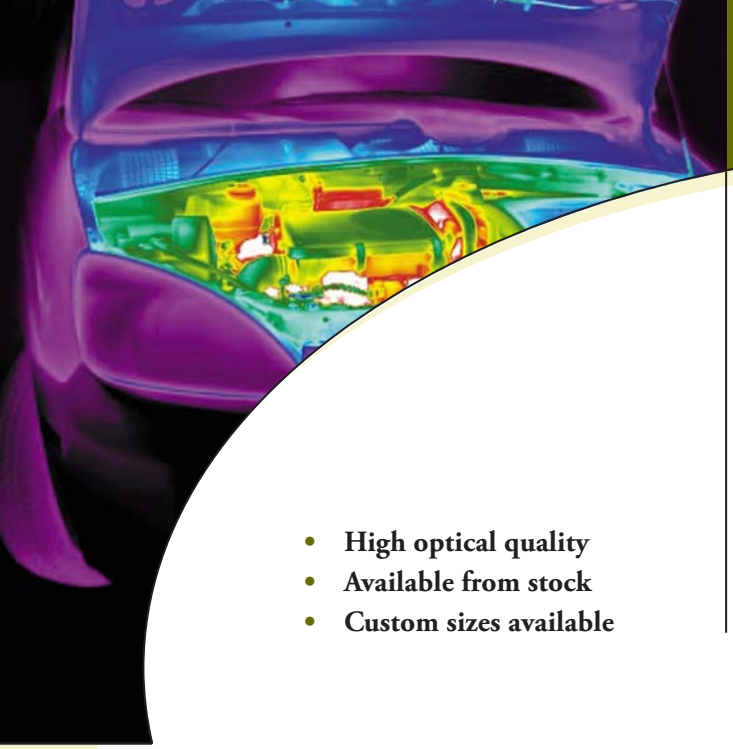
AC-1930 Filter Set

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

Recalibration 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, recalibration, and recertification. Please contact the Sales Department at (888) 893-9992 before returning your filter set.



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

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.

GENERAL SPECIFICATIONS

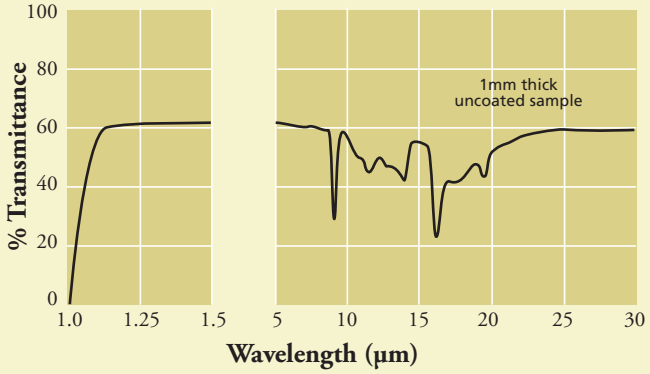
Diameter tolerance	+0/-.1mm
Thickness	1.0 ±.2mm
Surface Quality:	60/40 per MIL-C-48497A
CTE:	Coefficient of Thermal Expansion (see tables)

Threaded ring mounting available - see pg 23 for thread sizes

Applications

Thermal imaging
Weapons systems
Detector windows
IR photography

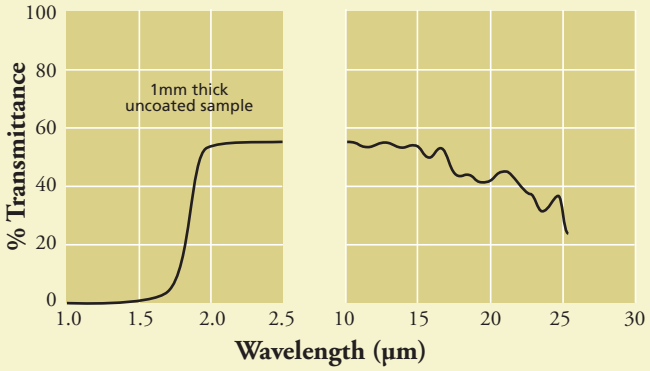
Size, Shape & Part Number		
Substrate Material	25mm Ø ○	50mm Ø ○
Silicon (Si)	IRWS100-25	IRWS100-50
Germanium (Ge)	IRWS200-25	IRWS200-50
Sapphire (Al2O3)	IRWS300-25	IRWS300-50
Fused Silica (SiO2)	IRWS400-25	IRWS400-50
Calcuim Fluoride (CaF2)	IRWS500-25	IRWS500-50
Zinc Selenide (ZnSe)	IRWS600-25	IRWS600-50



SILICON

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

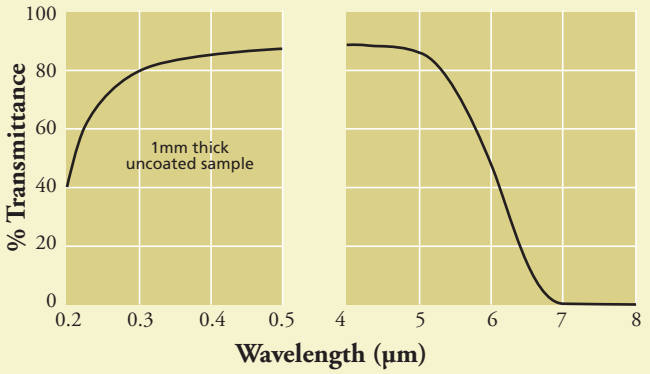
Refractive index:	3.43 at 3.0µm
CTE (10-6/°C):	4.15
Hardness (Knoop):	820



GERMANIUM

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

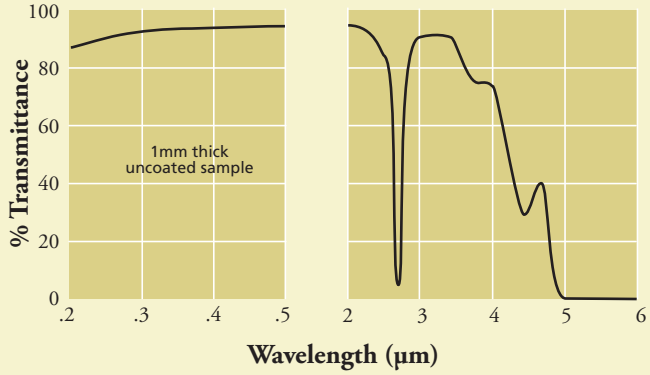
Refractive index:	4.00 at 10.6µm
CTE (10-6/°C):	5.7
Hardness (Knoop):	692



SAPPHIRE

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

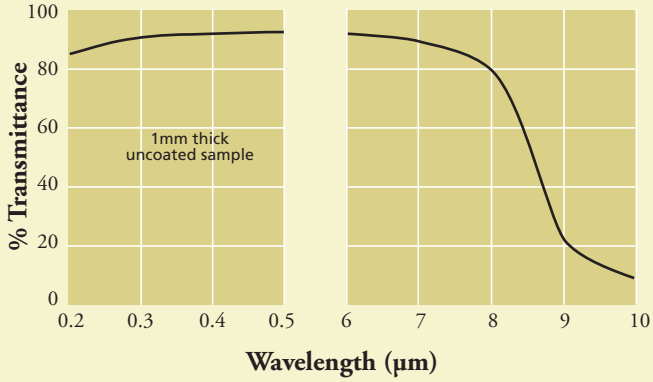
Refractive index:	1.737 at 2.0µm
CTE (10-6/°C):	7.7
Hardness (Knoop):	1920



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.

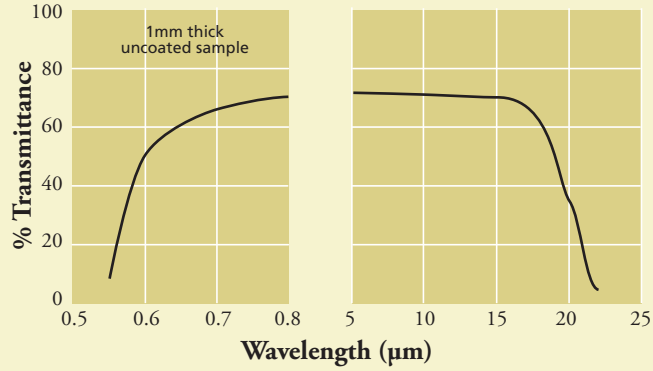
Refractive index:	1.45 at 1.0µm
CTE (10-6/°C):	0.55
Hardness (Knoop):	741



CALCIUM FLUORIDE

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

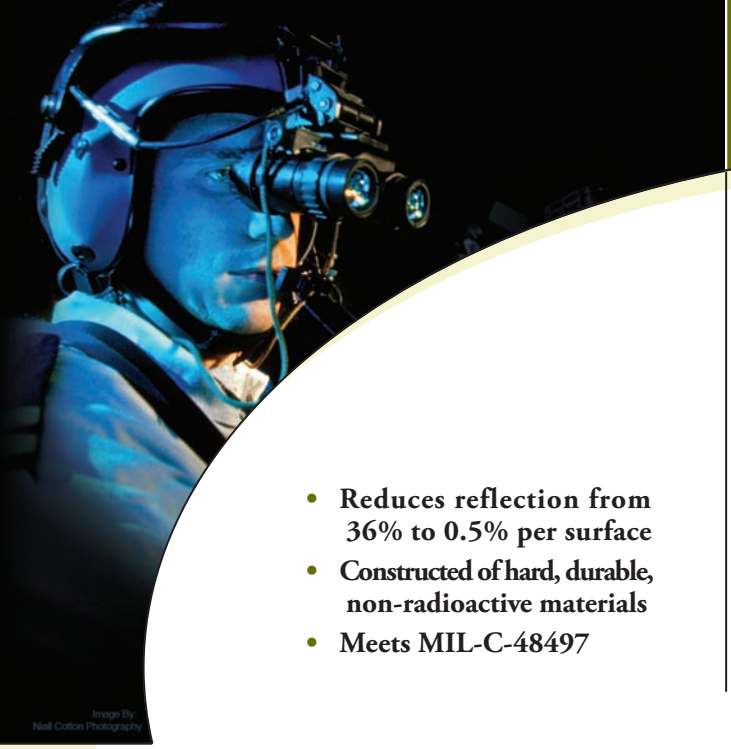
Refractive index:	1.40 at 5.0µm
CTE (10-6/°C):	18.9
Hardness (Knoop):	160



ZINC SELENIDE

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

Refractive index:	2.40 at 10.6µm
CTE (10-6/°C):	7.6
Hardness (Knoop):	100



Broadband A/R Coating on Germanium

Andover now 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 0.5% per surface.

- **Reduces reflection from 36% to 0.5% per surface**
- **Constructed of hard, durable, non-radioactive materials**
- **Meets MIL-C-48497**

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. However, we can produce custom sizes and shapes, as well as custom optical characteristics. Contact our technical sales department for a quotation.

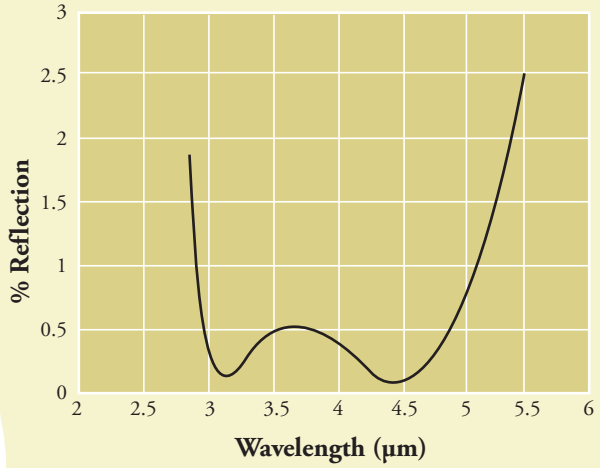
GENERAL SPECIFICATIONS

Diameter tolerance	+0/-.1mm
Thickness	1.0 ±.2mm
Min. Clear Aperture	90%
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 23 for thread sizes

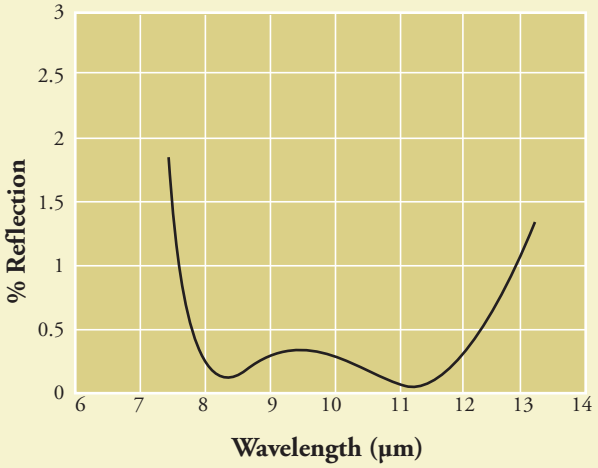
Applications

Thermal imaging
Weapons systems
Detector windows
Dewar windows

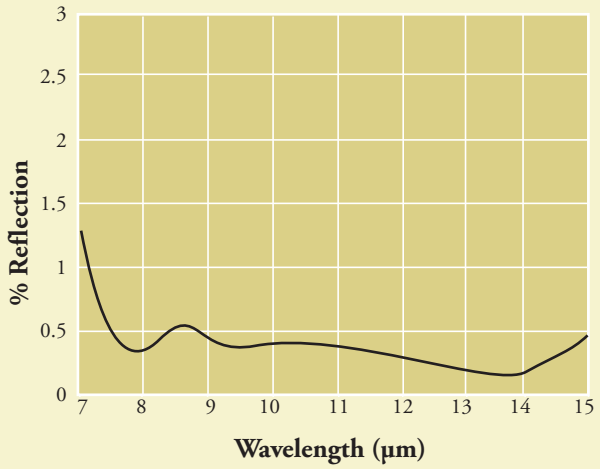
Germanium 3-5µm A/R Coating



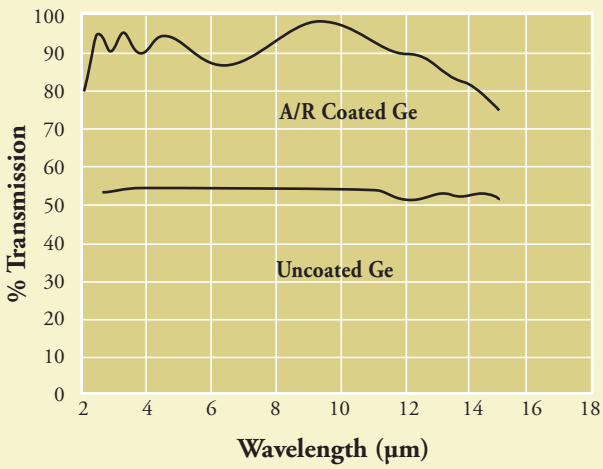
Germanium 8-12µm A/R Coating



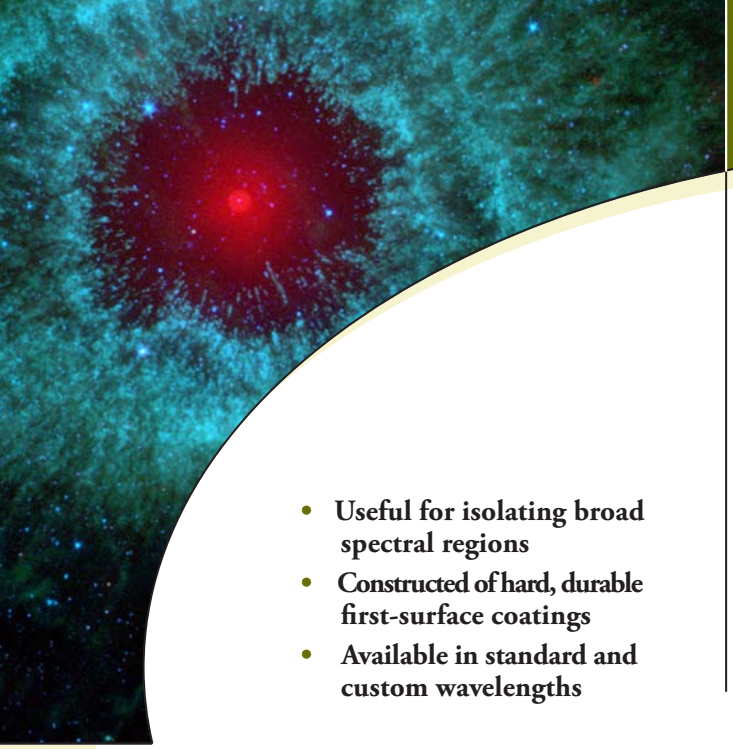
Germanium 8-14µm A/R Coating



Germanium 2-14µm A/R Coating



Size, Shape & Part Number		
	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



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

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.

GENERAL SPECIFICATIONS

Diameter tolerance:	+0/-.1mm
Thickness:	1.0 ±.2mm
Min. Clear Aperture:	90%
Substrate Material:	Silicon, Germainum, or Sapphire
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
Moderate Abrasion	per MIL-C-48497A
Adhesion	per MIL-C-48497A
Operating Temperature	-62°C to +71°C
Parallelism:	<10 arc minutes
Transmission (Ave):	>90% 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 23 for thread sizes

Applications

Order sorting
FTIR spectroscopy
Thermal imaging

STANDARD LONG PASS FILTERS

Size, Shape & Part Number		
5% point cut-on W/L	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 and Short 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 polishing, coating, inspection, and environmental testing.

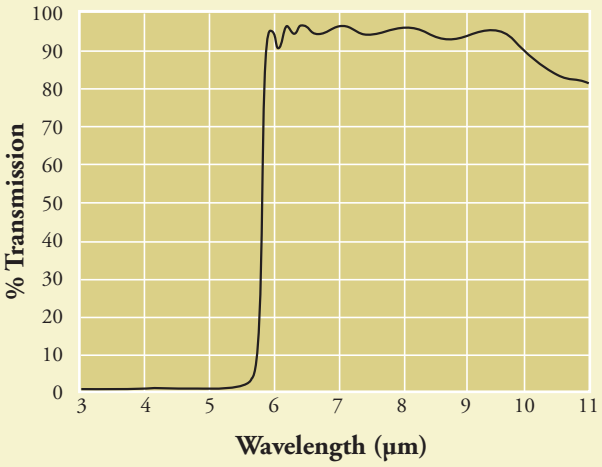
We can coat a variety of substrate materials, including Germanium, Sapphire, Silicon, Zinc Sulfide, and Zinc Selenide.

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

CUSTOM LONG PASS FILTERS

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

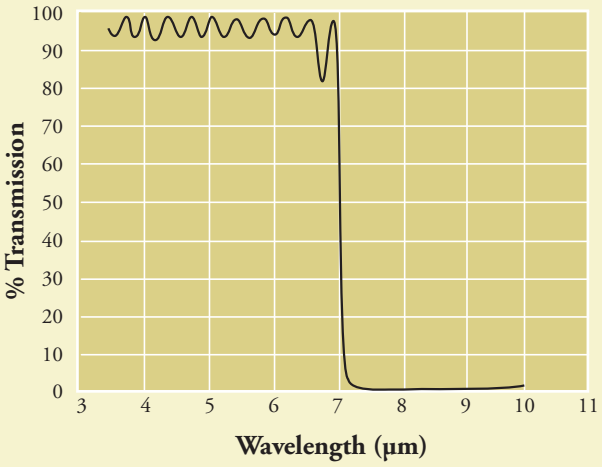
Typical IR Long Pass Filter

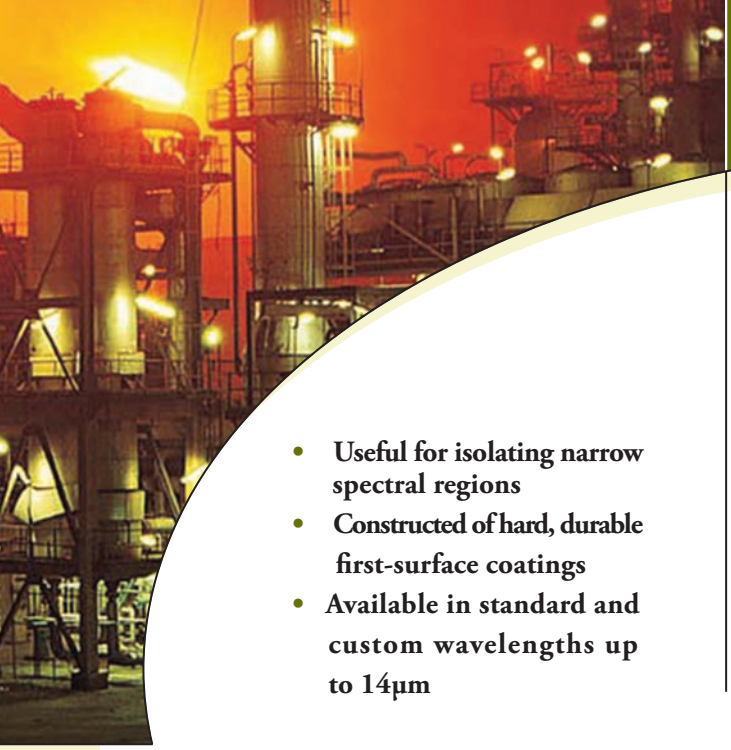


CUSTOM SHORT PASS FILTERS

Size, Shape & Part Number		
5% point cut-off W/L	25mm Ø ○	50mm Ø ◯
2.2µm - 5.0µm	IRSWP10-25	IRSWP10-50
5.1µm - 7.0µm	IRSWP12-25	IRSWP12-50
7.1µm - 11.0µm	IRSWP14-25	IRSWP14-50

Typical IR Short Pass Filter





- **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
Transmission (Typ.):	60 - 80%
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
Optional:	Mounted in threaded ring - see pg 23 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
Water Vapor	2.95 ±.03 µm	130 ±30nm	2.95GA05-25
Methane and Ethanol	3.46 ±.03 µm	140 ±30nm	3.46GA05-25
CO2	4.26 ±.03 µm	120 ±30nm	4.26GA05-25
CO	4.67 ±.03 µm	150 ±30nm	4.70GA05-25
NO	5.30 ±0.1 µm	0.6 +.1/-.05µm	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.

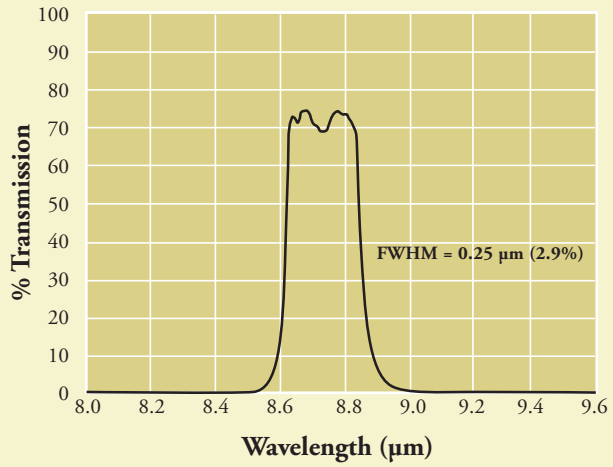
We can coat a variety of substrate materials, including Germanium, Sapphire, Silicon, Zinc Sulfide, and Zinc Selenide. Contact us for a quotation, whether it is for prototype quantities, or production quantities.

Custom IR Bandpass Filter Specifications

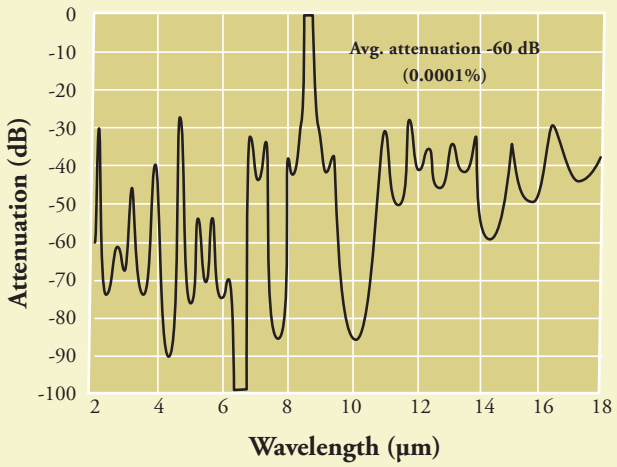
Bandwidth (% of CW/L)	W/L Range	Transmission (Typ.)	Blocking	Part Numbers
>10%	2.4 µm - 5.0 µm	70 - 80%	0.3 to 40 µm	IRFC10-25
	5.1 µm - 6.5 µm	70 - 80%	0.3 to 15 µm	IRFC12-25
	6.6 µm - 8.5 µm	60 - 70%	0.3 to 15 µm	IRFC14-25
	8.6 µm - 10.3 µm	60 - 70%	0.3 to 15 µm	IRFC16-25
	10.4 µm - 14.0 µm	50 - 60%	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

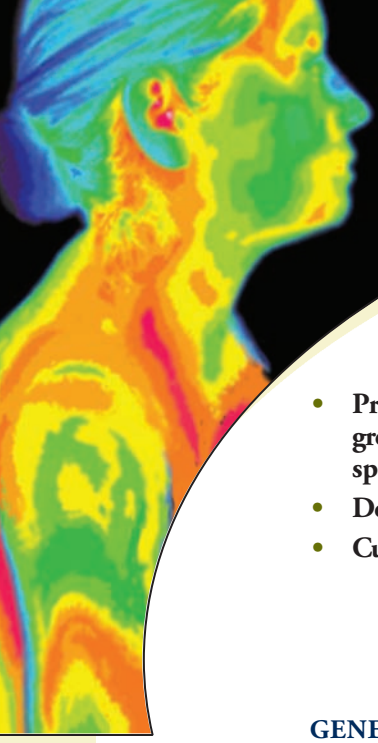
Custom spectral and physical properties available upon request

Typical IR Bandpass Filter



Typical Out-of-Band Blocking





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**

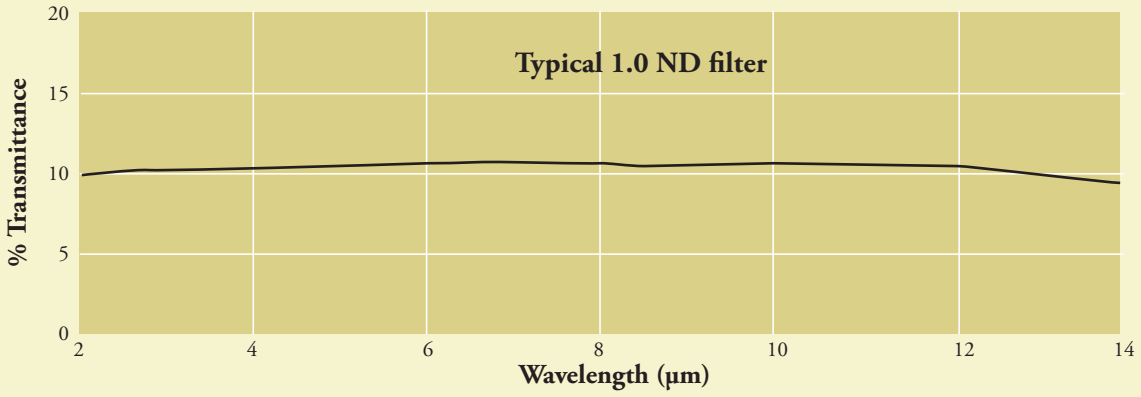
Applications

Thermal imaging
Medical Imaging
IR test bench
IR photography

GENERAL SPECIFICATIONS

Thickness	1.0mm
Dimensional Tolerances	±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
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 23 for thread sizes

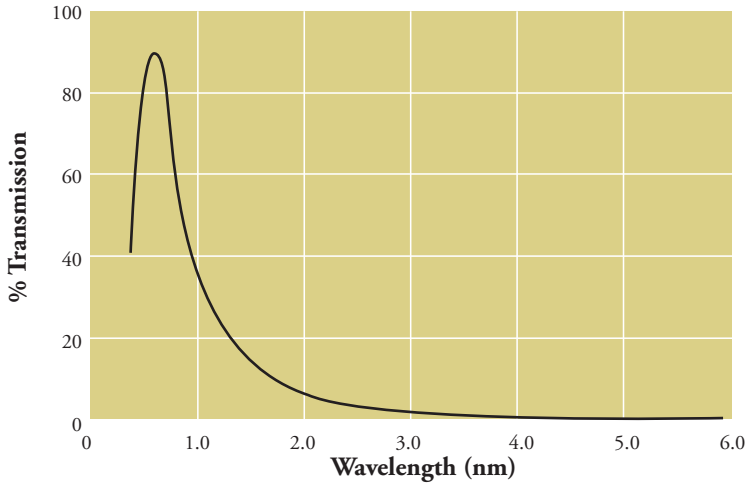
Optical Density	Nominal Transmittance (%)	Max deviation from nom (%)	Size, Shape & Part Number	
			25mm Ø ○	50mm Ø ○
0.3	50.12	±4.0	030FNIR-25	030FNIR-50
0.5	31.62	±2.0	050FNIR-25	050FNIR-50
1.0	10.00	±1.5	100FNIR-25	100FNIR-50
2.0	1.00	±0.25	200FNIR-25	200FNIR-50
3.0	0.10	+.08 / -.05	300FNIR-25	300FNIR-50
Set of five filters (includes storage box)			FNIR-SET-25	FNIR-SET-50



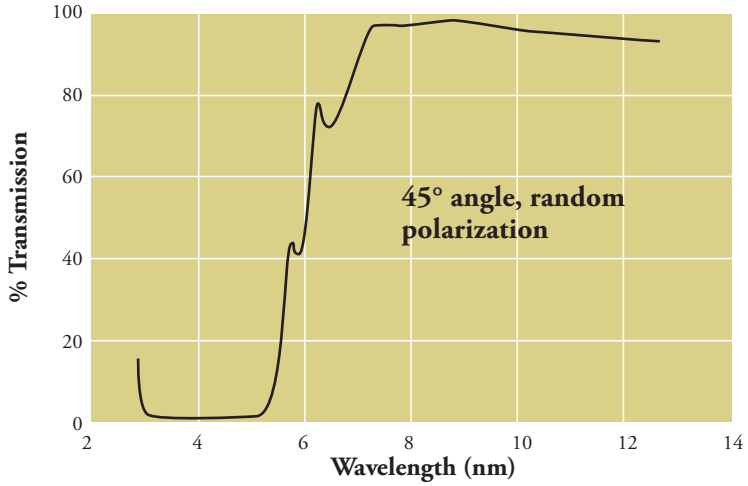
CUSTOM IR COATINGS

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.

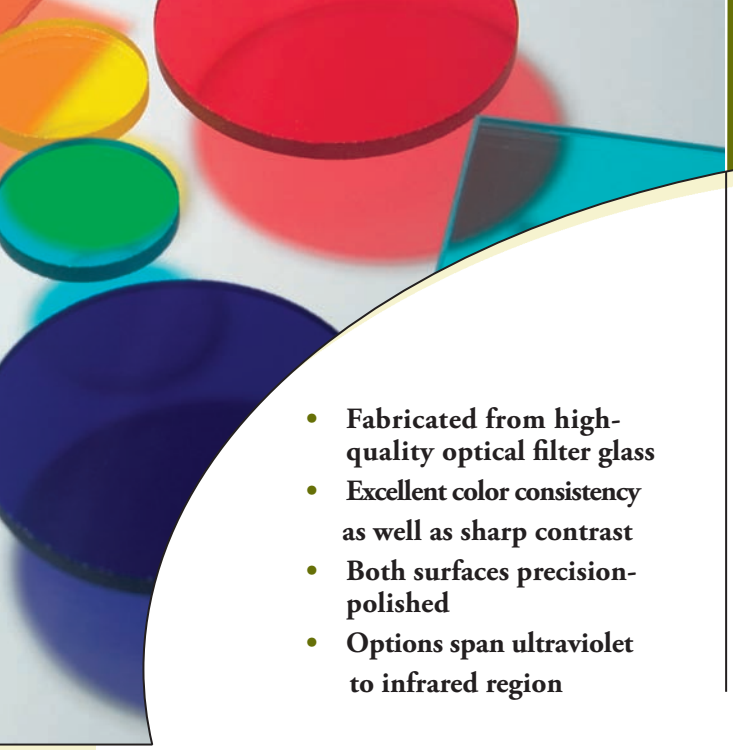
Custom IR/VIS Beamsplitter



Custom IR Dichroic Beamsplitter



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.



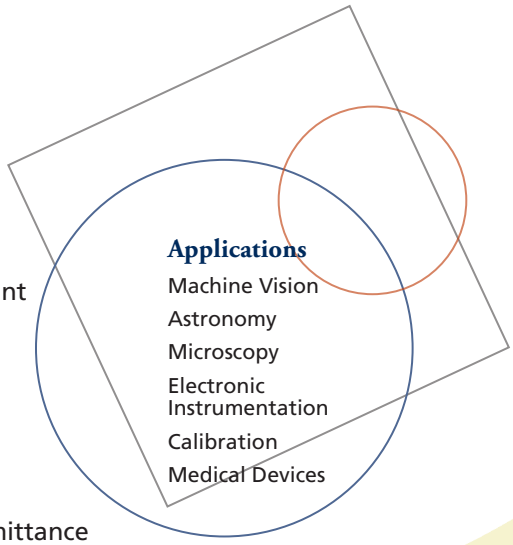
COLORED GLASS FILTERS

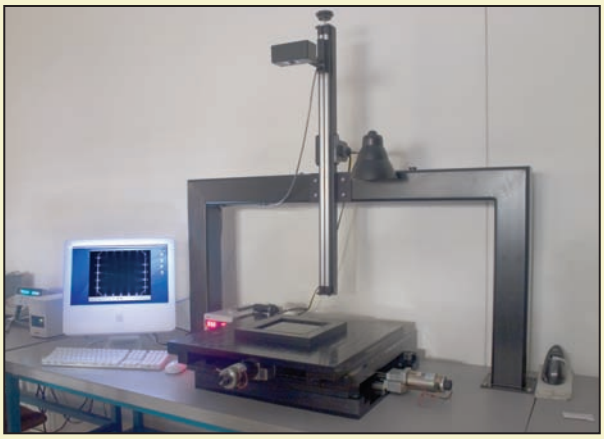
- **Fabricated from high-quality optical filter glass**
- **Excellent color consistency as well as sharp contrast**
- **Both surfaces precision-polished**
- **Options span ultraviolet to infrared region**

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.

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 23 for thread sizes





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

BANDPASS TYPE

Ultraviolet Transmitting
Blue and Blue-Green

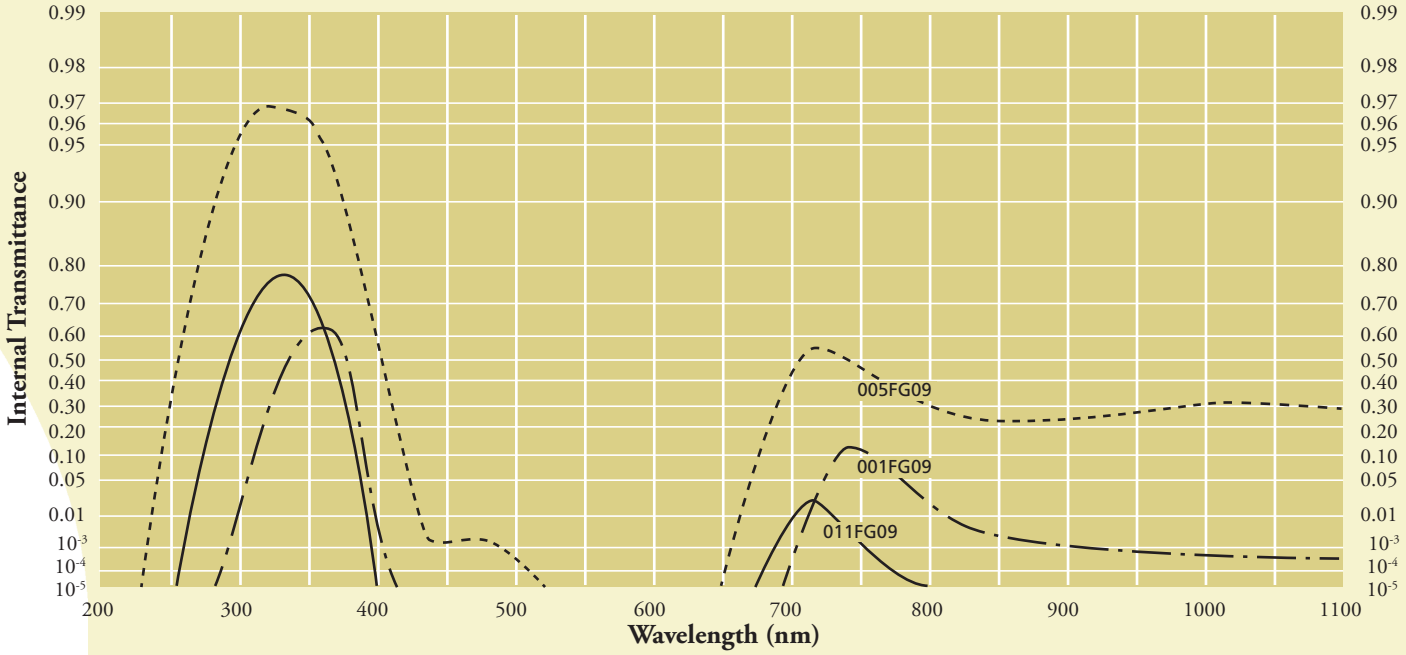
HEAT ABSORBING TYPE

Infrared Absorbing

LONG WAVE PASS TYPE

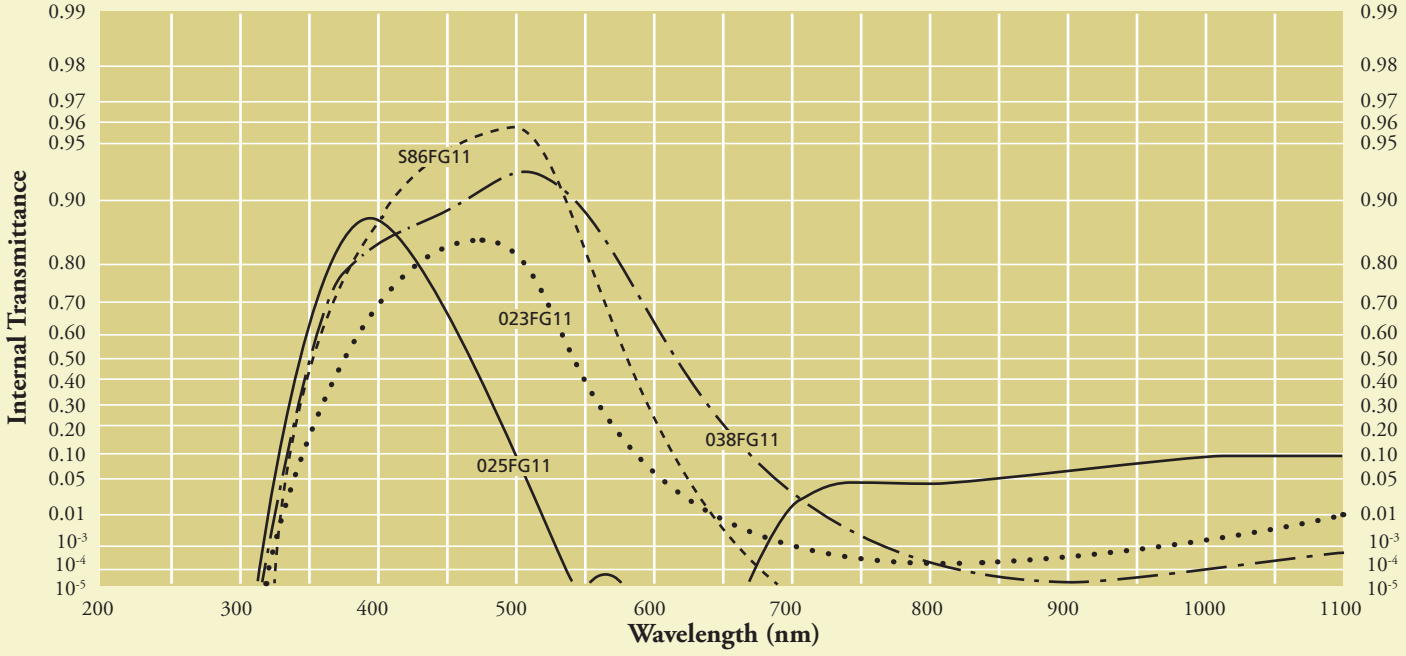
Near Infrared Transmitting
Yellow
Orange
Utraviolet Transmitting

BANDPASS TYPE

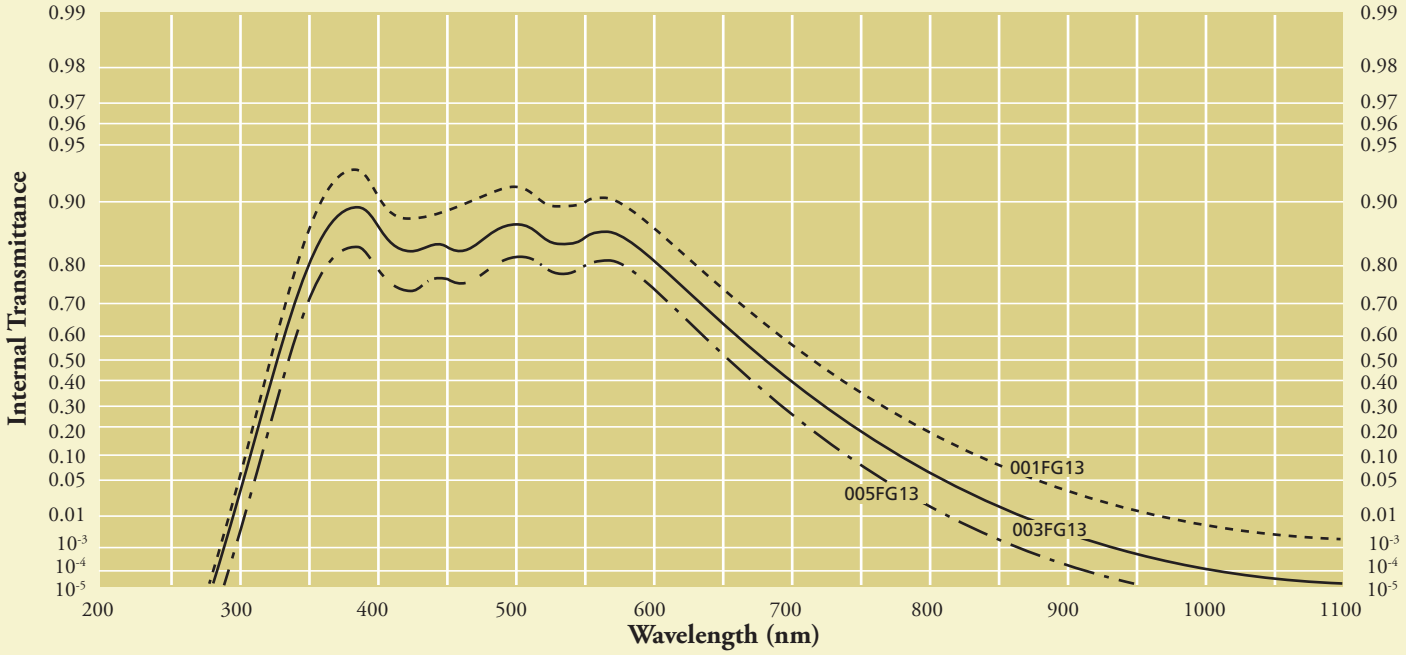


Glass Type	Size, Shape & Part Number			
	25mm Ø ○	50mm Ø ◯	50mm SQ □	165mm SQ ▢
UV Transmitting	001FG09-25	001FG09-50	001FG09-50S	001FG09-165S
UV Transmitting	005FG09-25	005FG09-50	005FG09-50S	005FG09-165S
UV Transmitting	011FG09-25	011FG09-50	011FG09-50S	011FG09-165S
Blue glass	023FG11-25	023FG11-50	023FG11-50S	023FG11-165S
Blue glass	025FG11-25	025FG11-50	025FG11-50S	025FG11-165S
Blue glass	038FG11-25	038FG11-50	038FG11-50S	038FG11-165S
Blue glass	S86FG11-25	S86FG11-50	S86FG11-50S	S86FG11-165S

BANDPASS TYPE

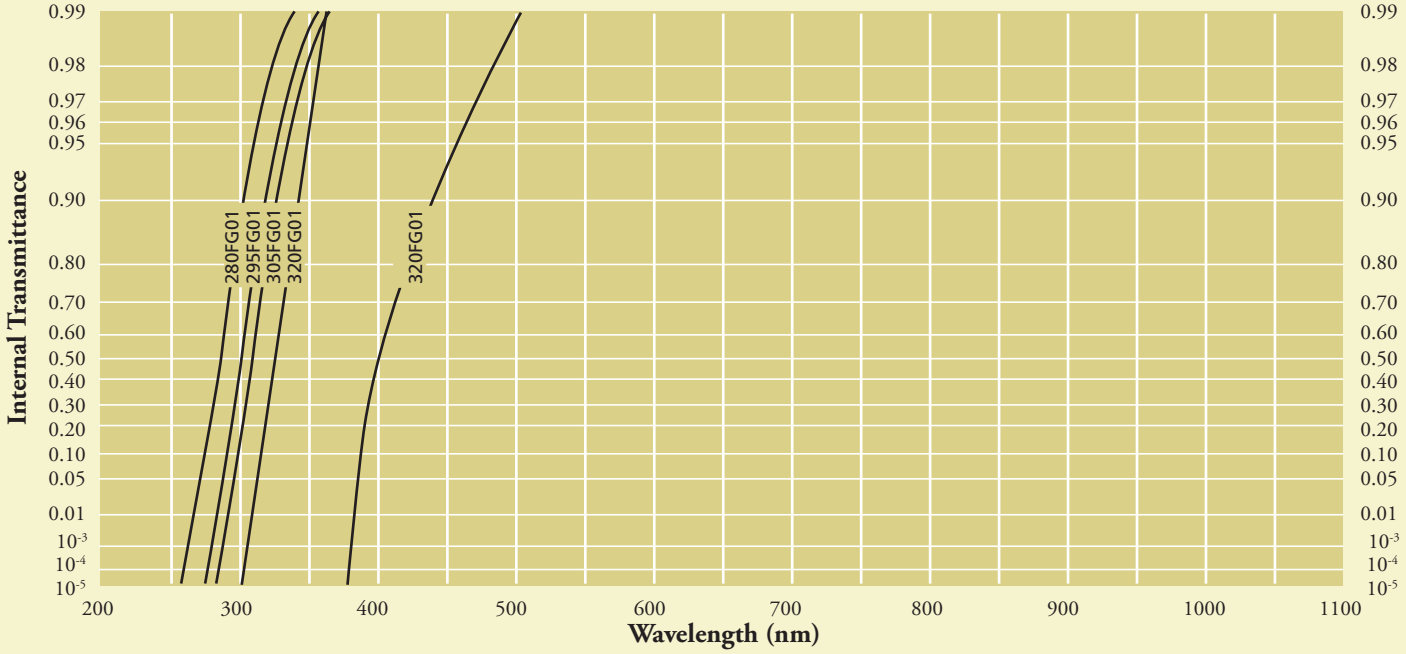


HEAT ABSORBING TYPE

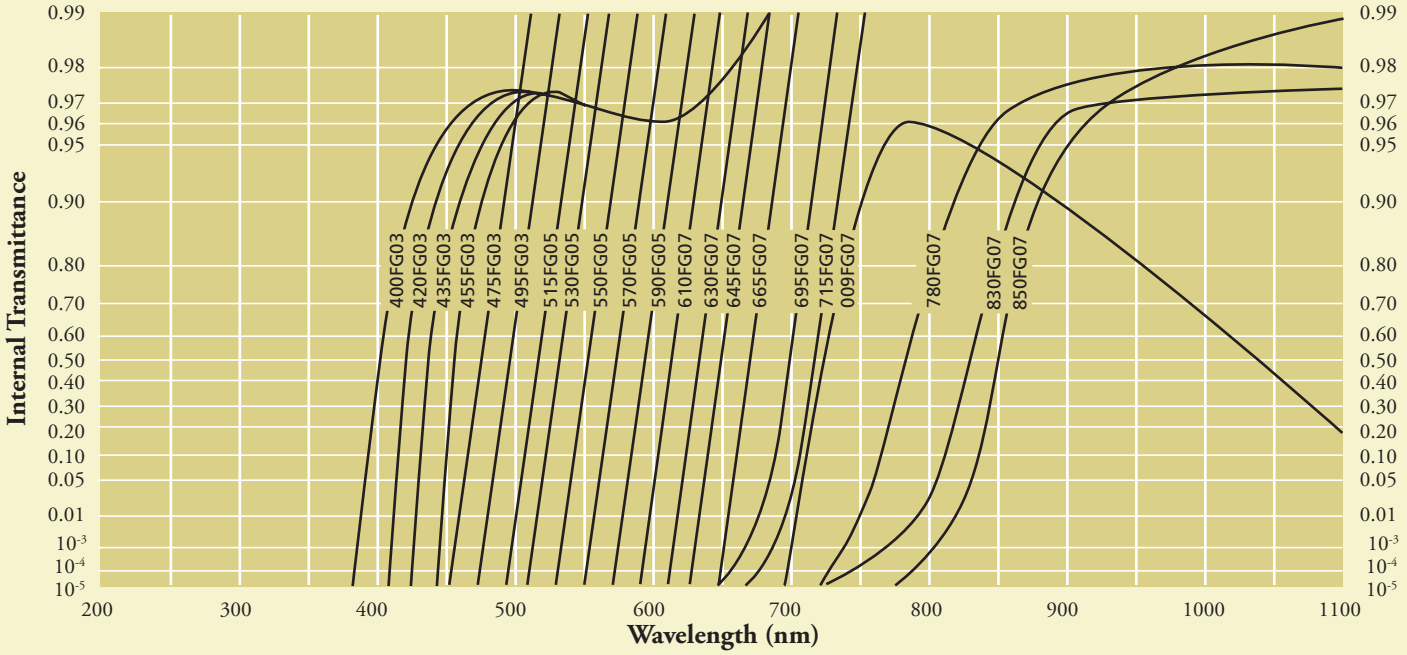


Glass Type	Size, Shape & Part Number			
	25mm Ø ○	50mm Ø ○	50mm SQ □	165mm SQ ⬡
Heat absorbing	001FG13-25	001FG13-50	001FG13-50S	001FG13-165S
Heat absorbing	003FG13-25	003FG13-50	003FG13-50S	003FG13-165S
Heat absorbing	005FG13-25	005FG13-50	005FG13-50S	005FG13-165S
White glass	280FG01-25	280FG01-50	280FG01-50S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

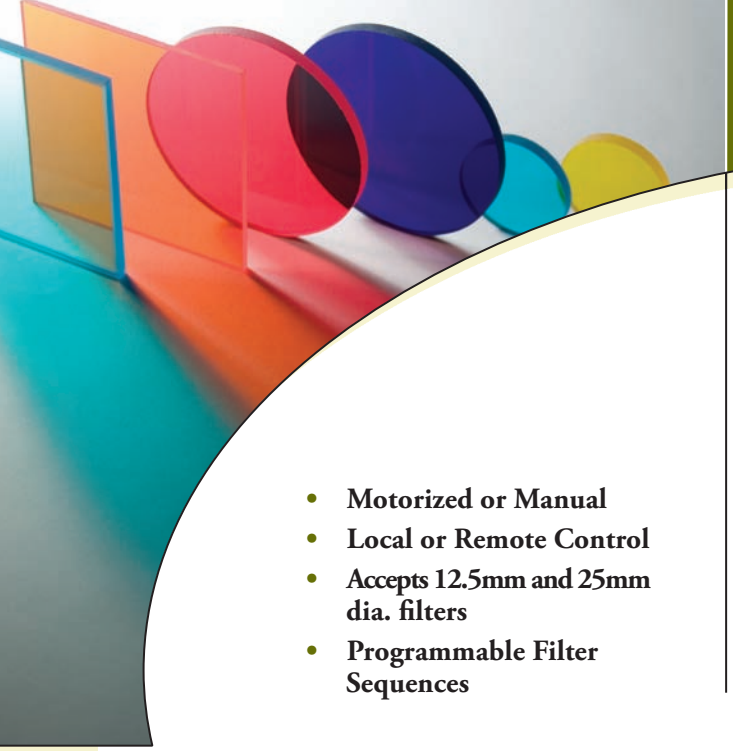
LONG WAVE PASS TYPE



LONG WAVE PASS TYPE



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



- **Motorized or Manual**
- **Local or Remote Control**
- **Accepts 12.5mm and 25mm dia. filters**
- **Programmable Filter Sequences**

Motorized Filter Wheel

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

Remote or Manual Operation

Filter selection can be made manually from push buttons on the unit, or remotely from either a USB 2.0 interface, or a BNC input. The BNC input accepts a TTL level signal to trigger the rotation of the filter wheel.

Interchangeable filter wheels

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

Programming and Remote Control

Automation of filter sequences is available through the USB 2.0 interface. A simple command language facilitates retrieving filter status and making filter selections. The unit comes with the controller, filter housing, filter wheel, and a 5 VDC power supply, and threaded rings to hold the optics in place.

Applications

Color CCD photography
Fluorescence microscopy
Photometry

GENERAL SPECIFICATIONS

Access time between filters	<0.4 seconds to adjacent location
Accuracy/repeatability	±2°
Interface:	
BNC	TTL (max indexing rate 0.5Hz)
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" (5.43" with BNC)

- **Accepts 12.5mm or 25mm dia. filters**
- **Motorized and manual versions available**
- **Labeled filter positions**
- **Base and post mountable**

Filter Wheel Ordering Info

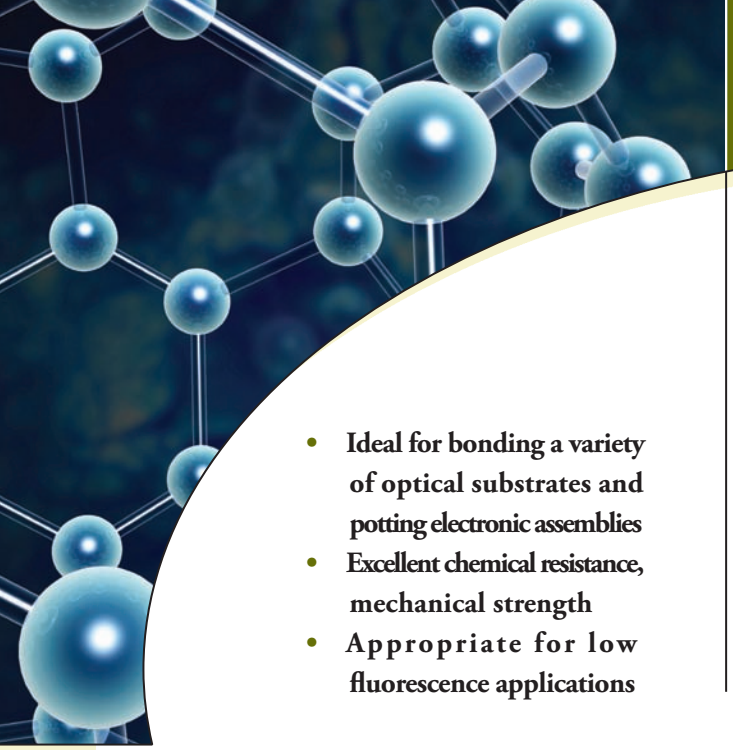
Description	Size & Part Number	
	12-position, 12.5mm Ø ○	6-position, 25mm Ø ◯
Motorized filter wheel	FW-MOT-12.5	FW-MOT-25
Manual filter wheel	FW-MAN-12.5	FW-MAN-25
Extra wheel only	FW-12.5	FW-25

User-Defined Filter Sets

Andover Corporation offers customers the opportunity to build their own filter sets from across our product listings–whether bandpass, neutral density, dichroic, edge, or other filter category.

The only restriction is that the filters must be the same size. Take your choice of six, eight and twelve-piece sets in one of two standard sizes. All filter sets include complete spectral curve data and are shipped with a hardwood storage case.

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



EPOLITE FH-5313 EPOXY

- **Ideal for bonding a variety of optical substrates and potting electronic assemblies**
- **Excellent chemical resistance, mechanical strength**
- **Appropriate for low fluorescence applications**

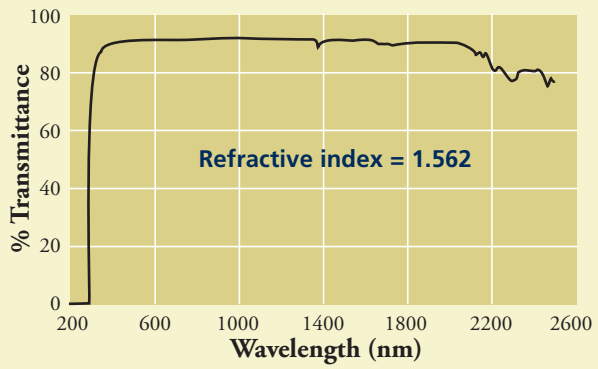
Fuller Epolite FH-5313 is a 100% solid, room-temperature curing, optically clear, electrical grade epoxy. Proven to be a superior bonding agent for ferrite pot cures, this system is designed for continuous operation at temperatures up to 200°F. Resin and hardener sold individually or in kits and in premeasured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

Type	Weight and Content	Part Number
Premeasured 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

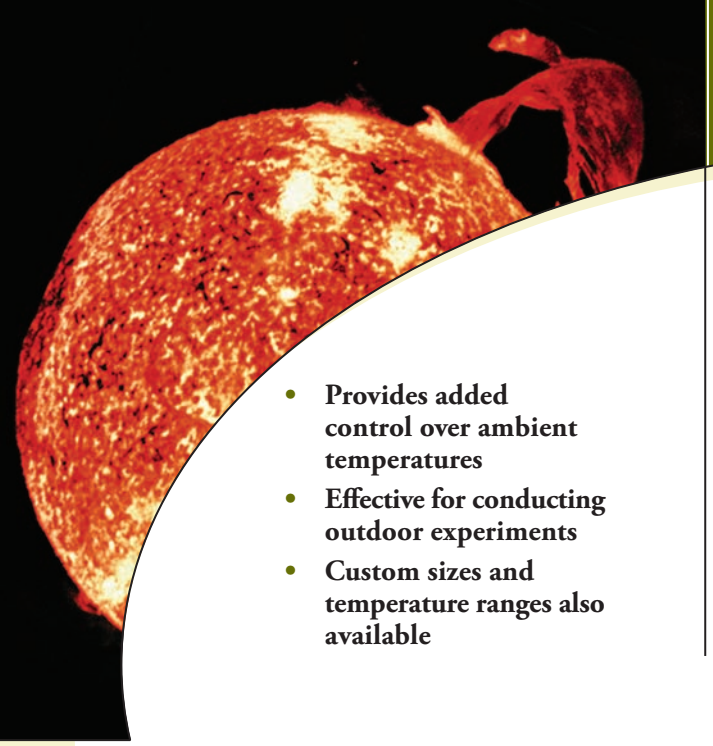
Certified results from an independent testing lab.

GENERAL PROPERTIES	VALUE	TEST METHOD
Specific Gravity	1.17	ASTM-D-792-00
Hardness, Shore D	81	ASTM-D-2240-04e1
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	8.4×10^{14}	ASTM-D-257-99
CHEMICAL RESISTANCE		
Isopropyl Alcohol		
Weight Change	0.15%	ASTM-D-543-95
Thickness Change	0.902%	ATSM-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

OPTICAL TRANSMISSION



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



TEMPERATURE CONTROLLERS

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

Controlling the ambient temperature when using a narrow bandpass filter is critical for top performance. For installations that are subject to large temperature fluctuations, Andover has developed a filter oven to maintain a constant temperature above ambient temperature. This precise control also provides an effective means of tuning the center wavelength to an exact value.

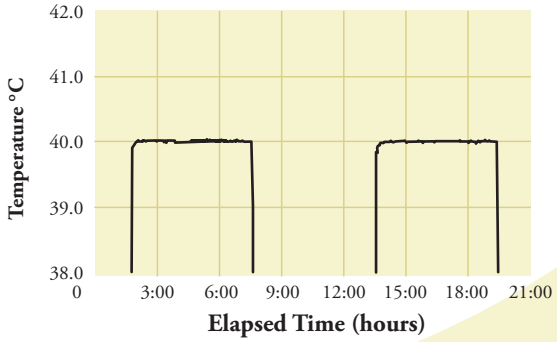
All of our filter ovens come with a universal oven controller, which will operate from 110 to 220 volts, 50–60 Hz, and include plugs for US, UK, Australia, and Europe.

Shipped in a sturdy, reusable weatherproof case.

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'

STABILITY TEST (2 cycles shown)



Filter Ovens

Filter oven windows have broadband antireflective coating for a maximum average reflectance of less than or equal to 0.5% per surface over their specified wavelength range. The substrate material is either Schott BK-7 or fused silica, as appropriate. All substrates are flat to λ/4 minimum and parallel to 30 arc seconds or better.

A/R Coating W/L Range	Part Number
300nm to 450nm	101FRDC01-50
450nm to 700nm	101FRDC02-50
700nm to 1100nm	101FRDC03-50

Filter Oven Controllers

Filter Oven Controller	Part Number
Oven Controller	101FRDC00-CTRL

HARDWOOD STORAGE CASES

- Hardwood construction
- Plated metal hardware
- Custom engraving available

These cases are a great way to store and organize your filters and optics. All cases are made from hardwood, and utilize sturdy plated hinges and clasps. Choose from a variety of case sizes and foam configuations. Custom laser engraving is also available.

CASES WITH PRE-CUT FOAM INSERTS

Outside dimensions L x W x H (approx.)	Foam configuration accomodates:	Part Numbers
3.75" x 3.75" x 2.75"	Six filters up to 25mm dia.	CASE-6-25
4.75" x 4.75" x 2.75"	Eight filters up to 25mm dia.	CASE-8-25
4.75" x 4.75" x 2.75"	Twelve filters up to 25mm dia.	CASE-12-25
3.75" x 3.75" x 3.5"	Six filters up to 50mm sq.	CASE-6-50
6.75" x 3.75" x 3.5"	Eight filters up to 50mm sq.	CASE-8-50
6.75" x 3.75" x 3.5"	Twelve filters up to 50mm sq.	CASE-12-50

CASES WITH FOAM BLANKS

Outside dimensions L x W x H (approx.)	Inside dimensions of base L x W x H (approx.)	Part Numbers
3.5" x 3.5" x 1.5"	2.75" x 2.75" x .5"	CASE-2x2
4.75" x 4.75" x 2.5"	4" x 4" x 1.5"	CASE-4x4
6.75" x 6.75" x 2.5"	6" x 6" x 1.5"	CASE-6x6
9.75" x 9.75" x 2.5"	9" x 9" x 1.5"	CASE-9x9

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GLOSSARY

A

AR Coating	Antireflective coating that reduces the surface reflection of an optic
Absorptance	The ratio of absorbed to incident radiation

B

B/W	Bandwidth
Bandpass Filter	A filter that transmits a specific band of energy and rejects all other energy at higher and lower wavelengths
Bandwidth	The spectral width of a filter measured at half of the peak transmission; also referred to as full width at half maximum (FWHM)
Blocking Range	The spectral range of unwanted radiation

C

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
Center Wavelength	The wavelength coinciding with the midpoint of the passband
Cold Mirror	A filter which reflects the visible energy and transmits the near infrared energy
Commercial Quality	A filter designed for use in non-imaging instrumentation applications
CW/L	Center wavelength

F

Fabry-Perot Filter	Dielectric filter construction based on the Fabry-Perot interferometer. Consists of two reflective stacks separated by an even-ordered spacer
FIR	Far Infrared (wavelengths from 30μm to 1000μm)
FWHM	Full width at half maximum or the bandwidth of the filter

H

Hot Mirror	A filter that reflects the near infrared energy (heat) and transmits the visible energy

I

Image Quality	A filter designed for use in imaging applications
Index of Refraction	The ratio of the velocity of light in a vacuum to the velocity of light in a refractive material
Interferometer	An instrument that measures the accuracy of an optical element utilizing interference phenomena based on the wave characteristics of light
IR	Infrared Spectrum (wavelengths from 3μm to 30μm)

L

Long Pass Filter	A filter which transmits the longer wavelengths and rejects the shorter wavelengths

M

MDM	Metal-Dielectric-Metal

N

N*	The effective refractive index of the filter
ND Filter	A neutral density filter that transmits a specific amount of energy equally over all wavelengths
NIR	Near Infrared Spectrum (wavelengths from 750nm to 3μm)

P

Passband	The band of energy that is transmitted (passed) by the filter
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

T

T or Tx	Transmittance
Transmittance	The ratio of the radiant energy transmitted to the total radiant energy incident on the filter

U

UV	Ultraviolet spectrum (wavelengths below 400nm)

V

VIS	Visible spectrum (wavelengths from 400nm to 750nm)

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