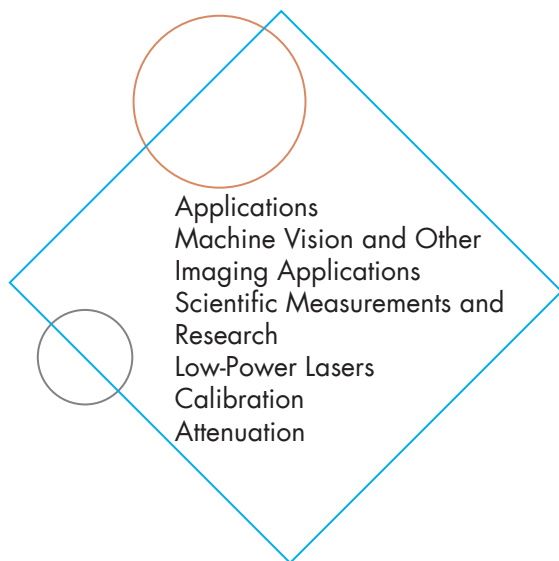
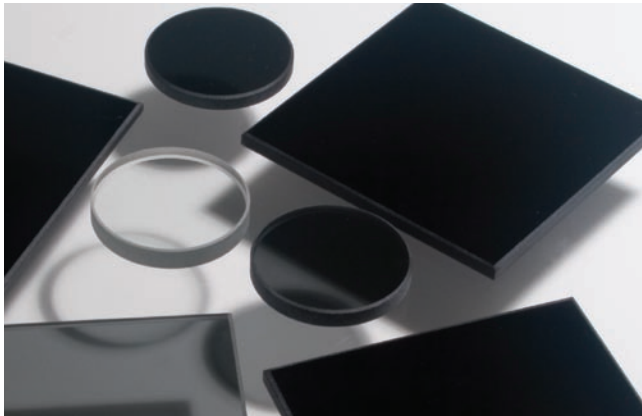




Neutral Density Filters



General Specifications	
Thickness	1.5mm
Dimensional Tolerances	±0.5mm
Clear Aperture	90% of outside dimension
Surface Quality	60/40 per MIL-0-13830B
Coating Quality	40/20 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 $\lambda/4$ per inch and parallelism of 30 arc seconds or better

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.)

- 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 Neutral Density Specifications				
Optical Density	Nominal Transmittance (%)	Transmission Deviation from Nominal (%)		
		250 - 350nm	350 - 800nm	800 - 2000nm
0.10	79.43	±8.0	±2.0	±8.0
0.15	70.79	±7.0	±2.0	±7.0
0.20	63.10	±6.0	±2.0	±6.0
0.30	50.12	±5.0	±2.0	±5.0
0.40	39.81	±4.0	±1.5	±4.0
0.50	31.62	±4.0	±1.5	±4.0
0.60	25.12	±4.0	±1.5	±4.0
0.70	19.95	±4.0	±1.5	±4.0
0.80	15.85	±4.0	±1.5	±4.0
0.90	12.59	±3.5	±1.0	±3.5
1.00	10.00	±3.5	±1.0	±3.5
1.30	5.01	±3.0	±1.0	±3.0
1.50	3.16	±1.5	±0.5	±1.5
2.00	1.00	±0.5	±0.2	±0.5
2.50	0.32	±0.15	±0.07	±0.15
3.00	0.10	±0.06	±0.04	0.01 (nominal)
4.00	0.01	±0.008	±0.1/-0.008	0.01 (nominal)

Neutral Density Filters

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

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

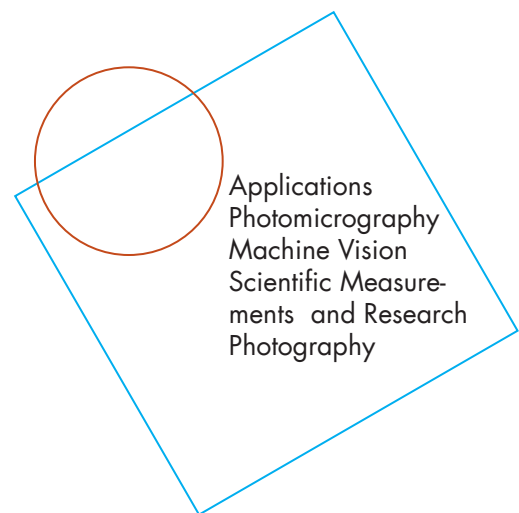
Neutral Density Filters

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.

- Optical density tolerance $\leq 0.5\%$ from 400nm to 700nm
- Sets provide a uniform series of filters for adjusting illumination
- Custom substrate materials and dimensions available

General Specifications	
Thickness	5.0mm (maximum)
Dimensional Tolerances	± 0.5 mm
Clear Aperture	90% of outside dimension
Surface Quality	60/40 per MIL-0-13830B
Max. Operating Temperature	+100°C
Substrate Materials	Schott absorption glass
Spectral Range	400–700nm
Optical Quality	Flatness of $\lambda/4$ per inch and parallelism of 30 arc seconds or better
Coating	none*
*AR coating on request	



Optical Density	Density Tolerance @ 550 nm (%)	Nominal Transmission (%)	Nominal Transmittance (%)	Size, Shape & Part Number	
				12.5mm \varnothing ○	50mm SQ □
0.10	± 10.00	79.43	3.73	010ABND-25	010ABND-50S
0.20	± 10.00	63.10	1.53	020ABND-25	020ABND-50S
0.30	± 10.00	50.12	2.46	030ABND-25	030ABND-50S
0.40	± 10.00	39.81	3.39	040ABND-25	040ABND-50S
0.50	± 10.00	31.62	1.91	050ABND-25	050ABND-50S
0.60	± 10.00	25.12	2.32	060ABND-25	060ABND-50S
0.70	± 10.00	19.95	2.73	070ABND-25	070ABND-50S
0.80	± 10.00	15.85	3.13	080ABND-25	080ABND-50S
0.90	± 10.00	12.59	1.75	090ABND-25	090ABND-50S
1.00	± 10.00	10.00	1.95	100ABND-25	100ABND-50S
1.50	± 10.00	3.16	2.96	150ABND-25	150ABND-50S
2.00	± 10.00	1.00	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.

Order a Filter Set and save up to 10%!

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	12.5mm Ø ○	25mm Ø ○	50mm Ø ○	50mm SQ □
Glass	128FA52-12.5	128FA52-25	128FA52-50	128FA52-50S
Fused Silica	130FA46-12.5	130FA46-25	130FA46-50	130FA46-50S

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

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	12.5mm Ø ○	25mm Ø ○	50mm Ø ○	50mm SQ □
Glass	132FA52-12.5	132FA52-25	132FA52-50	132FA52-50S
Fused Silica	134FA46-12.5	134FA46-25	134FA46-50	134FA46-50S

Absorptive Sets

Andover's absorptive neutral density filter sets provide a choice of either round 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	0.80
0.20	0.90
0.30	1.00
0.40	1.50
0.50	2.00
0.60	3.00
0.70	4.00

Includes 14 filters with optical densities ranging 0.10 to 4.00.

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