Ni090 NEUTRAL DENSITY FILTER
LOW REFLECTIVITY 12.5% TRANSMISSION

MidOpt Neutral Density Filters

- Available in a variety of optical densities
- Reduce light intensity while maintaining a wide aperture and shallow depth of field. Every 0.3 density increment equals one f-stop
- Minimize pixel saturation
- Can be stacked with other Neutral Density Filters to test various optical densities
- Exceptional surface quality; 40/20 scratch/dig

Neutral Density Filter Information

MidOpt Neutral Density Filters serves as “sunglasses” for your system and can be used with monochrome or color cameras.

Ni Series - VIS/SWIR Filters

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

APPLICATIONS: MidOpt Neutral Density filters are used to reduce light intensity neutrally over a specific wavelength range without affecting image color or contrast. Typical applications include welding,

MIDOPT
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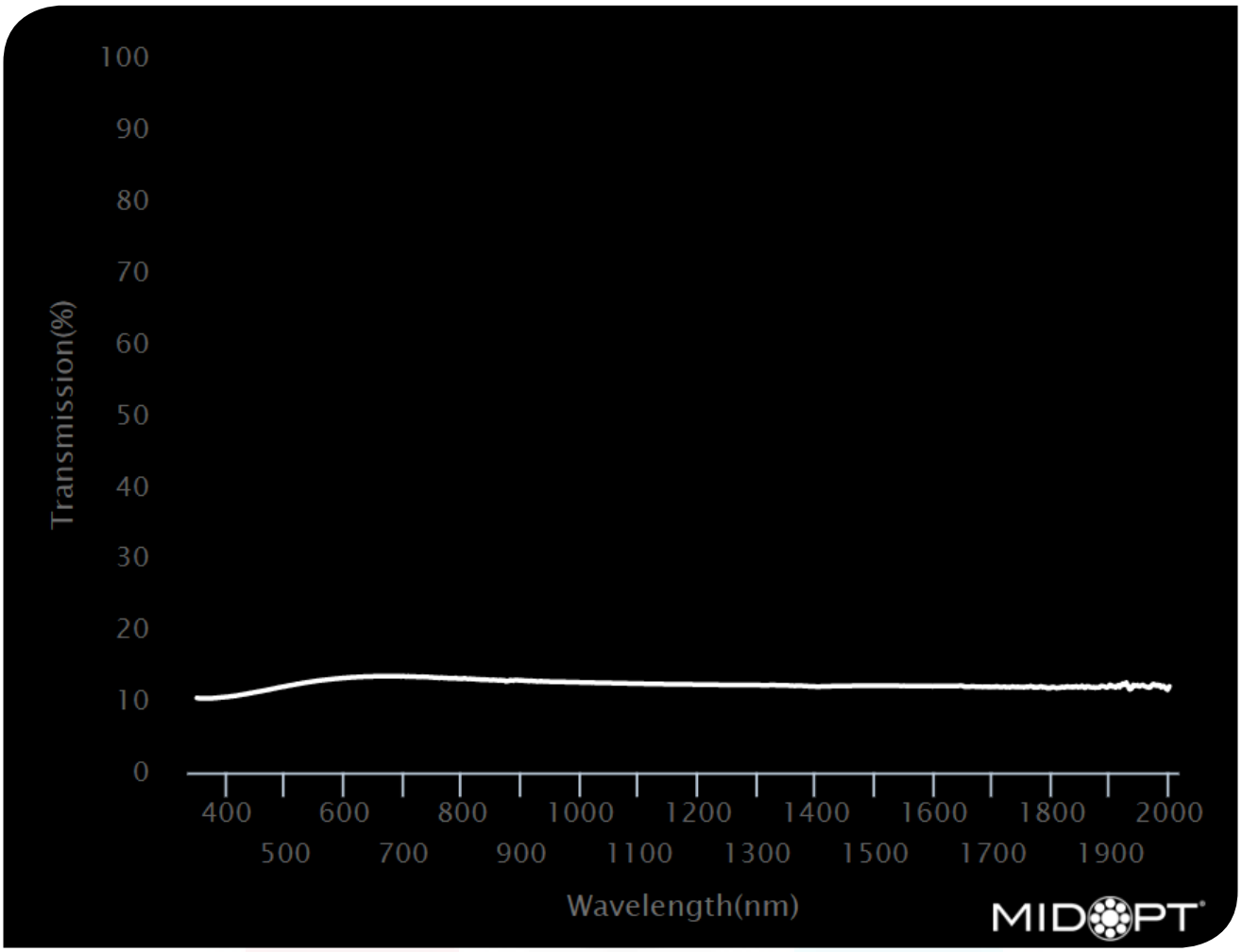
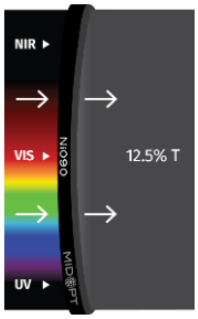
Ni090

Neutral Density Filter



Useful Range:	400-2000nm
Optical Density:	0.9
Average Transmission:	12.50%
Tolerance:	+/- 1.50%
Surface Quality:	40/20



Ni090 filters exhibit uniform attenuation over the entire visible and near-IR range that most industrial CCD/CMOS cameras are sensitive within. The actual percent transmission averages a nearly constant 12.5%, while reflectivity in the visible portion of the spectrum averages 30%. These filters include identical male and female threads on either end so that they can be stacked with other ND filters to achieve various optical densities.

MIDWEST OPTICAL SYSTEM, INC.

MachineVisionDirect.com support@machinevisiondirect.com 1 (800) 834-5588

Ni090 TRANSMISSION DATA (TYPICAL)

Wavelength (nm)	Transmission (%)
2000	12.02
1990	12.08
1980	12.23
1970	12.18
1960	12.01
1950	12.04
1940	12.11
1930	12.07
1920	12.35
1910	11.92
1900	12.22
1890	11.99
1880	11.87
1870	11.89
1860	12.05
1850	12.03
1840	11.96
1830	11.92
1820	11.92
1810	11.82
1800	11.88
1790	11.90
1780	11.99
1770	11.90
1760	11.94
1750	11.92
1740	11.94
1730	11.92
1720	11.98
1710	11.99
1700	11.95

Wavelength (nm)	Transmission (%)
1690	11.99
1680	11.96
1670	12.00
1660	11.96
1650	12.06
1640	12.09
1630	12.07
1620	12.07
1610	12.08
1600	12.06
1590	12.07
1580	12.07
1570	12.08
1560	12.09
1550	12.10
1540	12.11
1530	12.13
1520	12.13
1510	12.12
1500	12.13
1490	12.12
1480	12.11
1470	12.12
1460	12.10
1450	12.08
1440	12.08
1430	12.07
1420	12.04
1410	12.02
1400	12.00
1390	12.04

Wavelength (nm)	Transmission (%)
1380	12.10
1370	12.11
1360	12.12
1350	12.16
1340	12.18
1330	12.20
1320	12.19
1310	12.19
1300	12.20
1290	12.22
1280	12.23
1270	12.22
1260	12.22
1250	12.23
1240	12.24
1230	12.25
1220	12.26
1210	12.27
1200	12.28
1190	12.30
1180	12.30
1170	12.32
1160	12.32
1150	12.33
1140	12.35
1130	12.36
1120	12.37
1110	12.39
1100	12.41

MIDWEST OPTICAL SYSTEM, INC.

Ni090 TRANSMISSION DATA (TYPICAL)

Wavelength (nm)	Transmission (%)
1090	12.44
1080	12.45
1070	12.46
1060	12.47
1050	12.50
1040	12.51
1030	12.52
1020	12.55
1010	12.57
1000	12.59
990	12.61
980	12.61
970	12.65
960	12.67
950	12.68
940	12.71
930	12.73
920	12.78
910	12.79
900	12.86
890	12.90
880	12.85
870	12.84
860	12.87
850	12.93
840	12.96
830	12.98
820	13.06
810	13.07
800	13.08
790	13.18

Wavelength (nm)	Transmission (%)
780	13.16
770	13.21
760	13.23
750	13.29
740	13.33
730	13.35
720	13.38
710	13.41
700	13.44
690	13.45
680	13.43
670	13.43
660	13.43
650	13.43
640	13.42
630	13.36
620	13.32
610	13.27
600	13.21
590	13.13
580	13.05
570	12.96
560	12.87
550	12.75
540	12.62
530	12.50
520	12.36
510	12.19
500	12.04
490	11.89
480	11.71

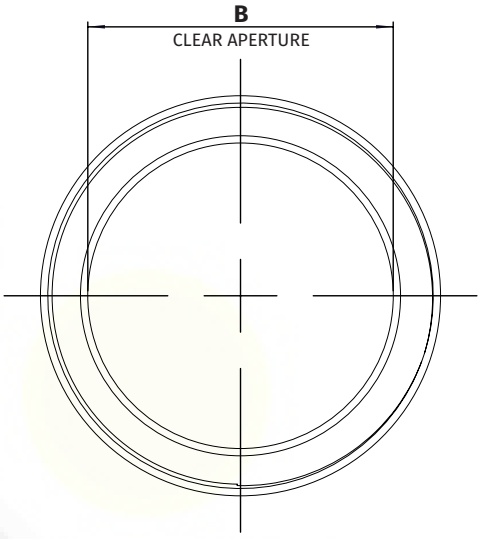
Wavelength (nm)	Transmission (%)
470	11.54
460	11.38
450	11.23
440	11.08
430	10.92
420	10.78
410	10.65
400	10.55
390	10.48
380	10.40
370	10.36
360	10.36
350	10.40

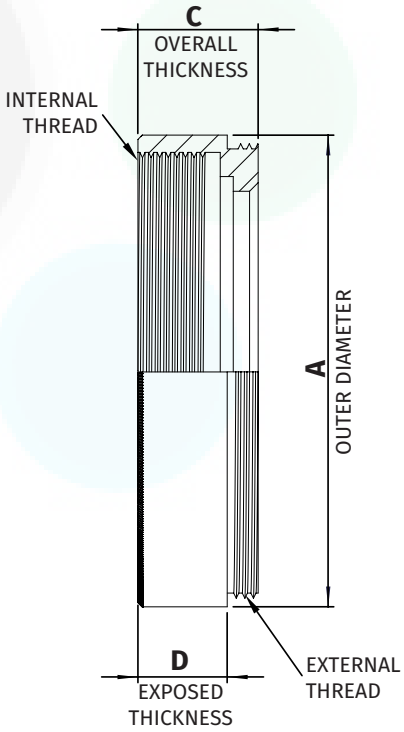
STANDARD THREADED MOUNT DIMENSIONS

NOTES:

1. Inner and outer threads are of the same size and pitch.
2. Filter mount and retaining ring are black anodized aluminum.
3. All dimensions indicated in mm.
4. Tolerance: +/-0.3mm.

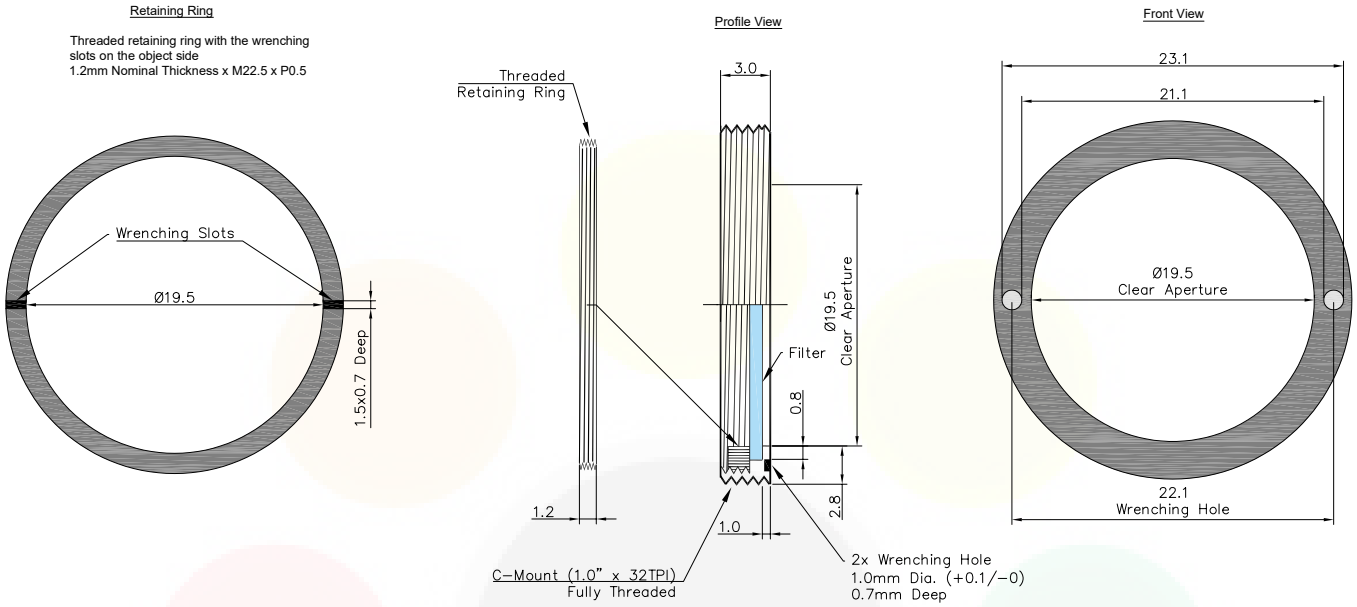
Mount Size	A	B	C	D
M13.25 x P0.5	14.3	10.6	7.5	5.7
M22.5 x P0.5	24	18.5	7	5.2
M25.5 x P0.5	27.5	21	7	5.2
M27 x P0.5	29	22.5	7	5.2
M30.5 x P0.5	32.5	25.5	7	5.2
M34 x P0.5	36	29	7	5.2
M35.5 x P0.5	37.5	30.5	7	5.2
M37 x P0.75	39	31.9	6.5	4.5
M37.5 x P0.5	39.5	32.5	7.2	5.2
M39 x P0.5	41	34	7	5.2
M40.5 x P0.5	42.5	35.5	7	5.2
M43 x P0.75	45	38	7	5.2
M46 x P0.75	48	41	7	5.2
M48 x P0.75	50	43	7	5.1
M49 x P0.75	51	44	7	5.2
M52 x P0.75	54	47	7	5.2
M55 x P0.75	57	50	7	5.2
M58 x P0.75	60	52.9	6.5	4.5
M62 x P0.75	64	57.1	7	5.2
M67 x P0.75	70	61.8	6.5	4.5
M72 x P0.75	75	66.9	6.5	4.5
M77 x P0.75	80	71.9	6.5	4.5
M82 x P0.75	85	76.8	6.5	4.5
M86 x P1.0	89	80.8	6.5	4.5
M95 x P1.0	98.2	89.9	10	7.1
M105 x P1.0	109.8	100	11	8





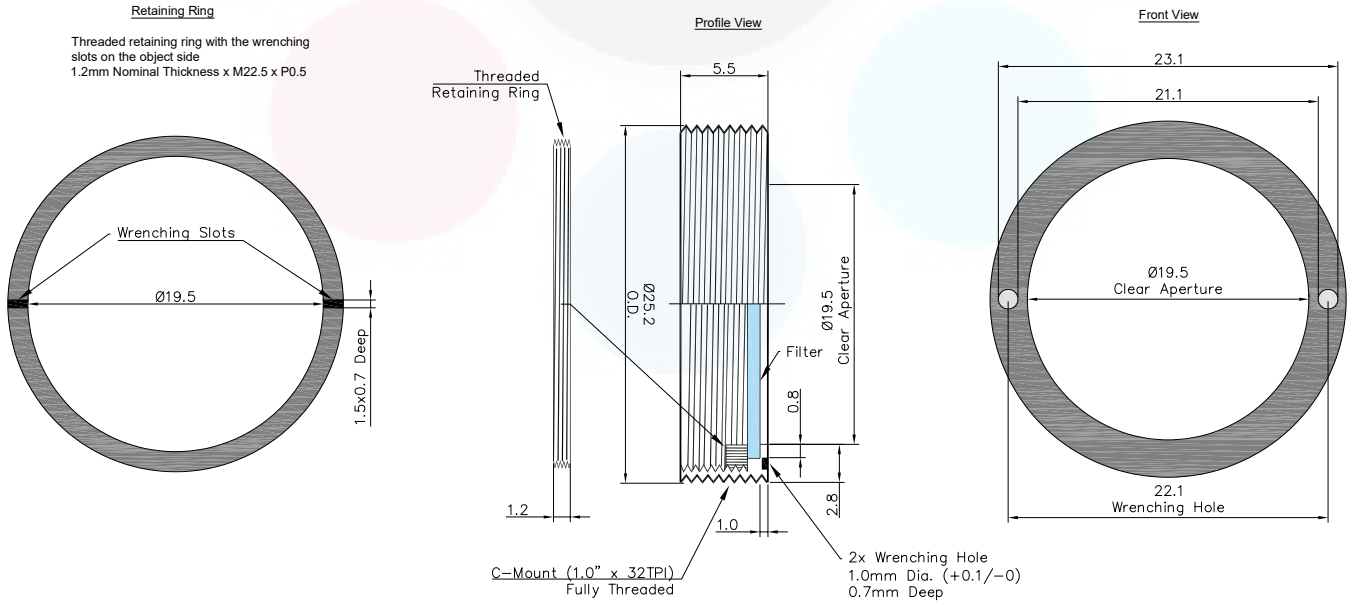
C-MOUNT DIMENSIONS (-25.4)

C-Mount is available on filters with a substrate thickness of 1mm or less



C-MOUNT SIS DIMENSIONS (-25.4-SIS)

C-Mount SIS is available on filters with a substrate thickness greater than 1mm and less than or equal to 3.5mm



MOUNTS FOR ANY SYSTEM

Midwest Optical Systems is the world's leading resource in machine vision filters and optical solutions. MidOpt's innovative filter designs ensure flawless control, dependable results and unmatched image quality. Mounting solutions are available for any system for lenses with and without filter threads, the exclusively designed 25.4™ C-Mount, and custom fabrication of unmounted shapes and sizes.

› THREADED MOUNT *Designed for Lenses with Filter Threads*

- MidOpt offers the largest variety of filters in-stock and ready to ship
- Sizes available: M13.25-M105
- Black anodized aluminum
- Custom thread sizes are available upon request

CREATE PART #: *Select a filter and add a mount size (e.g. M27) Example: BP470-27*

› 25.4™ C-MOUNT *Threads into all C-Mount Cameras*

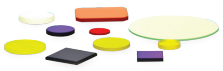
- 25.4™ C-Mount Camera Filter exclusively designed by MidOpt to thread directly into any C-Mount Camera between the lens and sensor
- Recommended for use with wide angle lenses to prevent vignetting and angle shift
- Helpful in applications with space constraints and lenses without filter threads
- Custom installation wrench included

CREATE PART #: *Select a filter and add "-25.4" Example: BP470-25.4*

› SLIP MOUNT *Designed for Wide Angle Lenses Without Filter Threads*

- Accommodates standard threaded mounts
- Low profile and oversize diameter design prevents wide angle lens vignetting
- Includes black Delrin® Slip Mount adapter plus Threaded Mount Filter

CREATE PART #: *Select a filter, use "S" for slip and add the outside diameter of lens in mm (e.g. 43mm) Example: BP470-S43*



› UNMOUNTED

- Any MidOpt filter type can be provided as an Unmounted Filter
- Custom shapes and sizes are typically available within a two week lead time with many shipped same day

CREATE PART #
CIRCLE: *Use "D" and add diameter in mm (e.g. 19mm) Example: BP470-D19*
SQUARE: *Use "R" and add side measurement in mm (e.g. 15mm) Example: BP470-R15*
RECTANGLE: *Use "R" and add length in mm (e.g. 30mm) x width in mm (e.g. 15mm) Example: BP470-R30x15*

› CUSTOM SOLUTIONS FOR M12 MOUNT LENSES

- Offered in aluminum slip mount over the lens
- Can be optically cemented behind the lens

Mount Sizes

› THREADED

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

› C-MOUNT
M25.4™

› SLIP MOUNT

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

› UNMOUNTED
Custom Shapes & Sizes Available

› M12 MOUNT

Outside Diameter Range	Part #
13.2-14.2	S14A
14.3-15.0	S15A

HOW TO ORDER

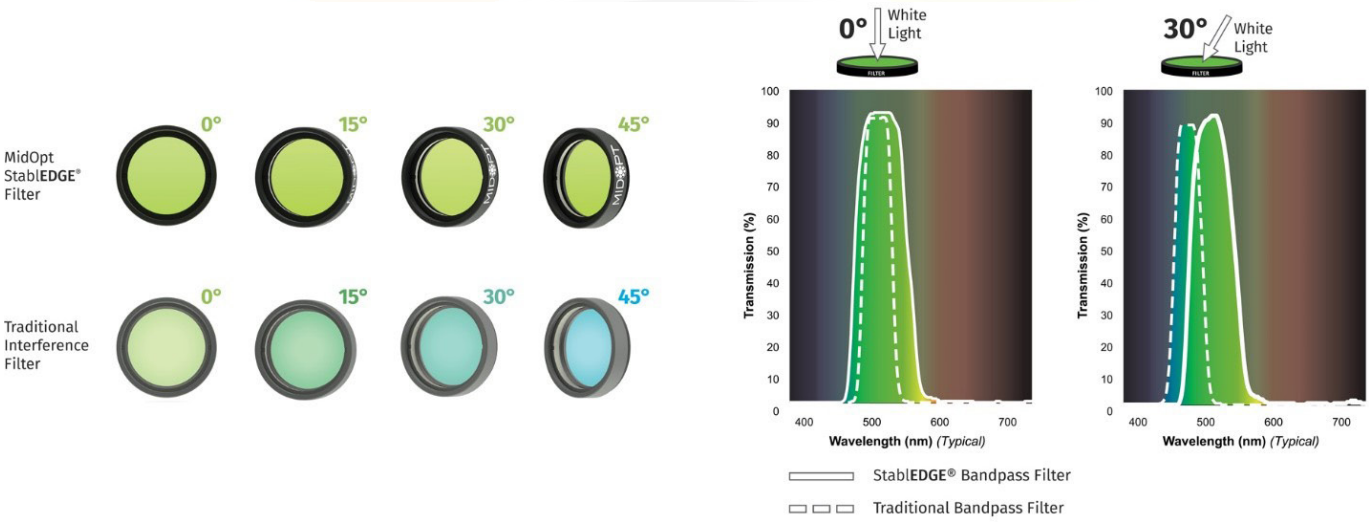
To order a filter with a threaded mount, first select a filter (e.g. BP470) and add the mount size (e.g. M27) to build your part number (e.g. BP470-27).

MIDOPT STABLEDGE®

Minimize the Effects of Short Shifting

MidOpt StablEDGE® optical filters are specifically designed to be less susceptible to effects from angular shifting seen when optical filters are placed in front of short focal length (<12mm) camera lenses. This feature is becoming increasingly important as today's trend in machine vision imaging progresses towards more compact inspection layouts, which utilize less space – forcing the camera and lens closer to the subject. As a result, short focal length lenses are now more widely used than ever before.

Using a traditional coated interference filter in these more compressed configurations results in contrast loss toward the edges of the image. Because of the angle imposed by the field of view (FOV) of the lens, the passband shifts and allows short wavelength ambient light to overwhelm the subject. Light from LED or laser diode lighting is also cut off. In contrast, peak transmission of MidOpt's StablEDGE® filters is not significantly altered, and effects due to short shifting are minimized.



StablEDGE® filters take advantage of absorptive filter glass to form the leading edge of the filter passband. This assures no shifting in this region, even when the lens FOV exceeds 100°. Filter glasses also offer far superior lower wavelength blocking of ambient light, sharp transition slopes and unmatched durability. MidOpt's StablEDGE® Filter cut-off slopes utilize interference filter coatings, however the cut-off slope is positioned to be sufficiently broad, and the Gaussian passband profile ensures that excessive ambient light is not allowed to degrade image contrast. Thus, shifting will not significantly encroach into peak transmission, assuring angular insensitivity over the desired range.

Among all machine vision filter manufacturers, MidOpt is unique in incorporating StablEDGE® technology across a full range of products. StablEDGE® designs are less angle-of-incidence sensitive, inherently more rugged, and are environmentally stable.