

ND090 NEUTRAL DENSITY FILTER ABSORPTIVE 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.

ND Series – Visible (VIS) Spectrum Filters

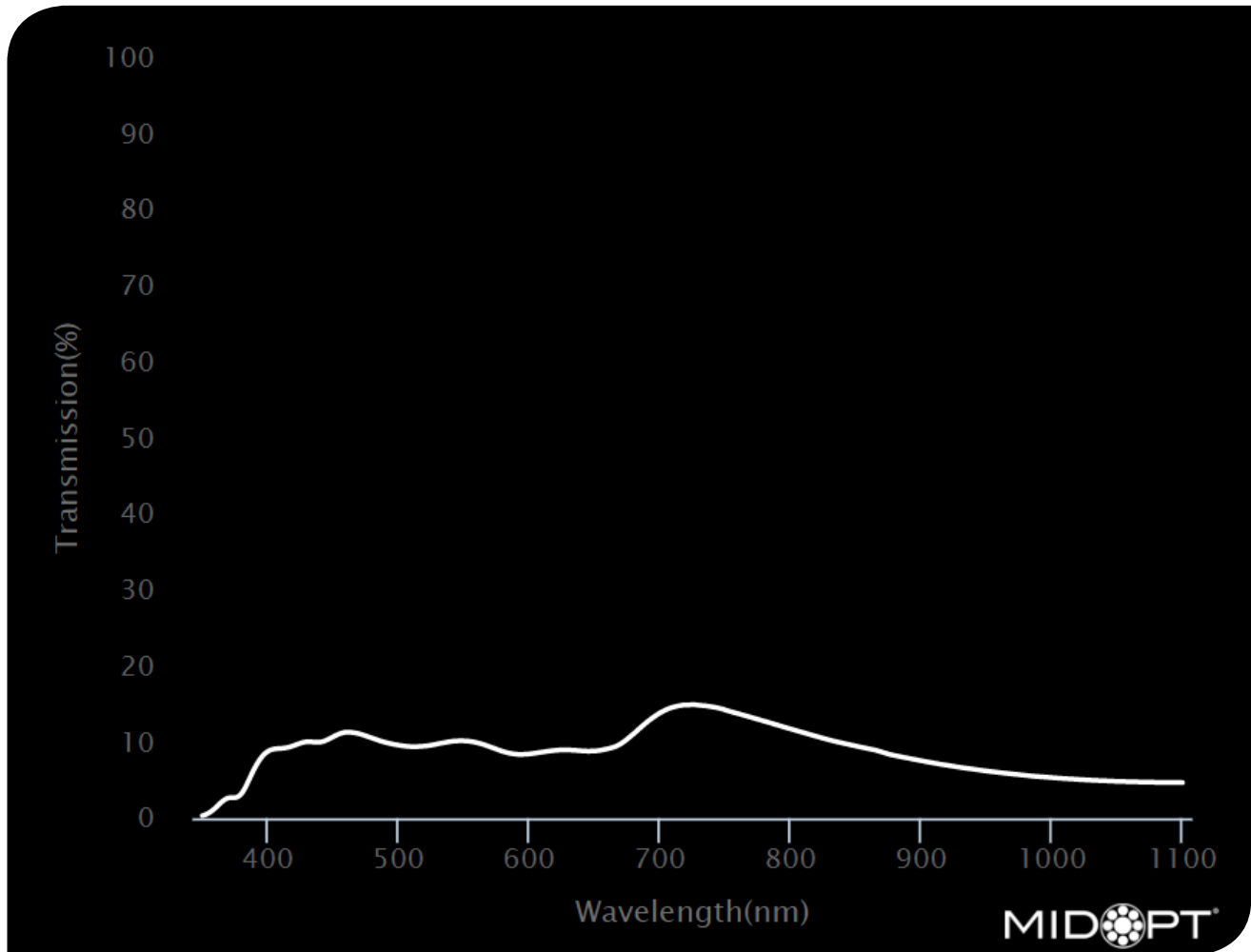
- Absorptive filter effective from 425-675nm
- Available in optical densities ranging from 0.10-6.0

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,



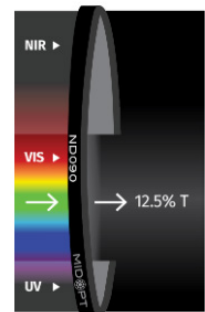
ND090

Neutral Density Filter



| | |
|------------------------------|-----------|
| Useful Range: | 425-675nm |
| Optical Density: | 0.9 |
| Average Transmission: | 12.50% |
| Tolerance: | +/- 1.50% |
| Surface Quality: | 40/20 |

ND090 absorptive neutral density filters have an optical density of 0.9, or average 12.5% transmission across the visible spectrum. 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. For example, the result from stacking two ND090 filters together would be almost identical to one (ND180) filter – transmitting approximately 1.6% of visible light.



ND090 TRANSMISSION DATA (TYPICAL)

| Wavelength (nm) | Transmission (%) |
|-----------------|------------------|
| 1100 | 4.68 |
| 1090 | 4.70 |
| 1080 | 4.72 |
| 1070 | 4.75 |
| 1060 | 4.80 |
| 1050 | 4.85 |
| 1040 | 4.92 |
| 1030 | 5.00 |
| 1020 | 5.10 |
| 1010 | 5.21 |
| 1000 | 5.34 |
| 990 | 5.47 |
| 980 | 5.63 |
| 970 | 5.81 |
| 960 | 6.00 |
| 950 | 6.21 |
| 940 | 6.44 |
| 930 | 6.68 |
| 920 | 6.96 |
| 910 | 7.24 |
| 900 | 7.56 |
| 890 | 7.90 |
| 880 | 8.23 |
| 870 | 8.70 |
| 860 | 9.13 |
| 850 | 9.49 |
| 840 | 9.87 |
| 830 | 10.28 |
| 820 | 10.76 |
| 810 | 11.25 |
| 800 | 11.75 |

| Wavelength (nm) | Transmission (%) |
|-----------------|------------------|
| 790 | 12.25 |
| 780 | 12.76 |
| 770 | 13.26 |
| 760 | 13.75 |
| 750 | 14.24 |
| 740 | 14.65 |
| 730 | 14.86 |
| 720 | 14.91 |
| 710 | 14.59 |
| 700 | 13.83 |
| 690 | 12.61 |
| 680 | 11.10 |
| 670 | 9.77 |
| 660 | 9.12 |
| 650 | 8.84 |
| 640 | 8.86 |
| 630 | 8.97 |
| 620 | 8.92 |
| 610 | 8.69 |
| 600 | 8.45 |
| 590 | 8.42 |
| 580 | 8.78 |
| 570 | 9.39 |
| 560 | 9.93 |
| 550 | 10.17 |
| 540 | 10.08 |
| 530 | 9.77 |
| 520 | 9.48 |
| 510 | 9.42 |
| 500 | 9.61 |
| 490 | 9.97 |

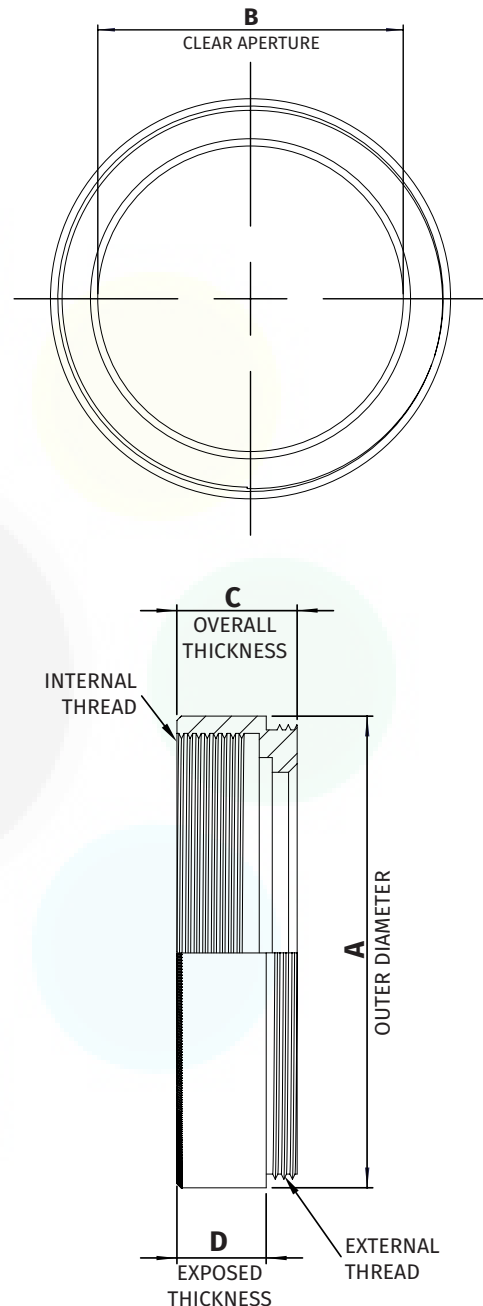
| Wavelength (nm) | Transmission (%) |
|-----------------|------------------|
| 480 | 10.54 |
| 470 | 11.10 |
| 460 | 11.31 |
| 450 | 10.69 |
| 440 | 10.01 |
| 430 | 10.04 |
| 420 | 9.55 |
| 410 | 9.17 |
| 400 | 8.77 |
| 390 | 6.57 |
| 380 | 3.24 |
| 370 | 2.66 |
| 360 | 1.36 |
| 350 | 0.33 |

STANDARD THREADED MOUNT DIMENSIONS

NOTES:

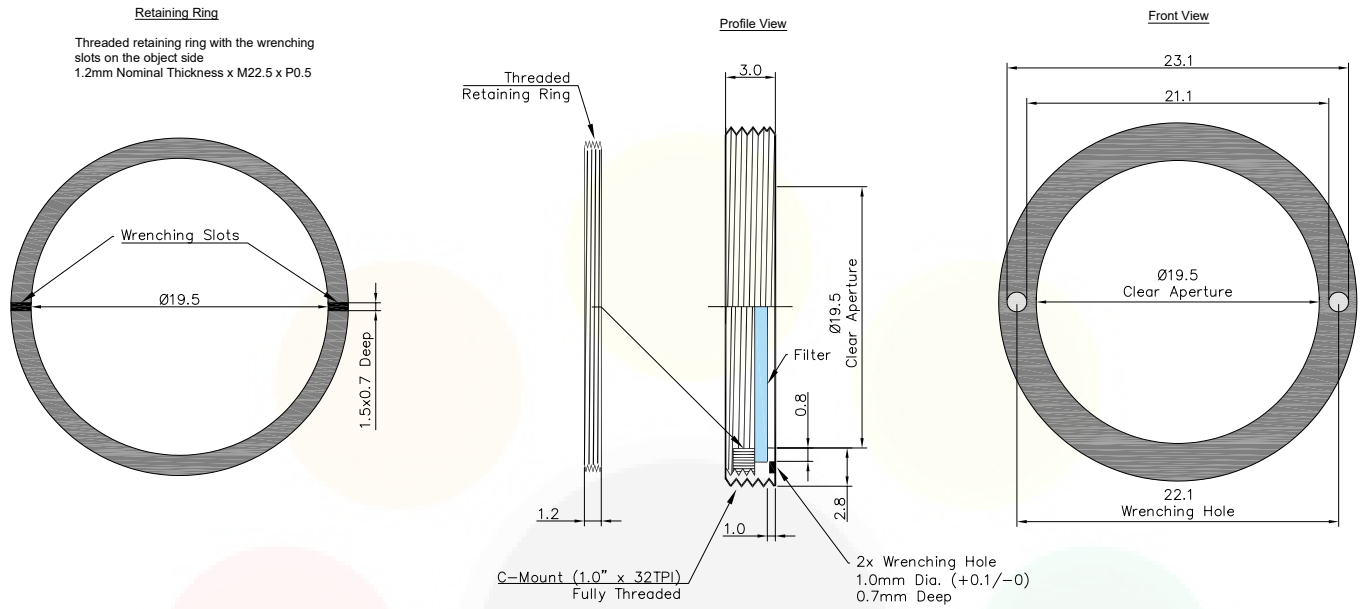
1. Inner and outer threads are of the same size and pitch.
2. Filter mount and retaining ring are black anodized aluminum.
3. All dimensions indicated in mm.
4. Tolerance: +/-0.3mm.

| 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 |



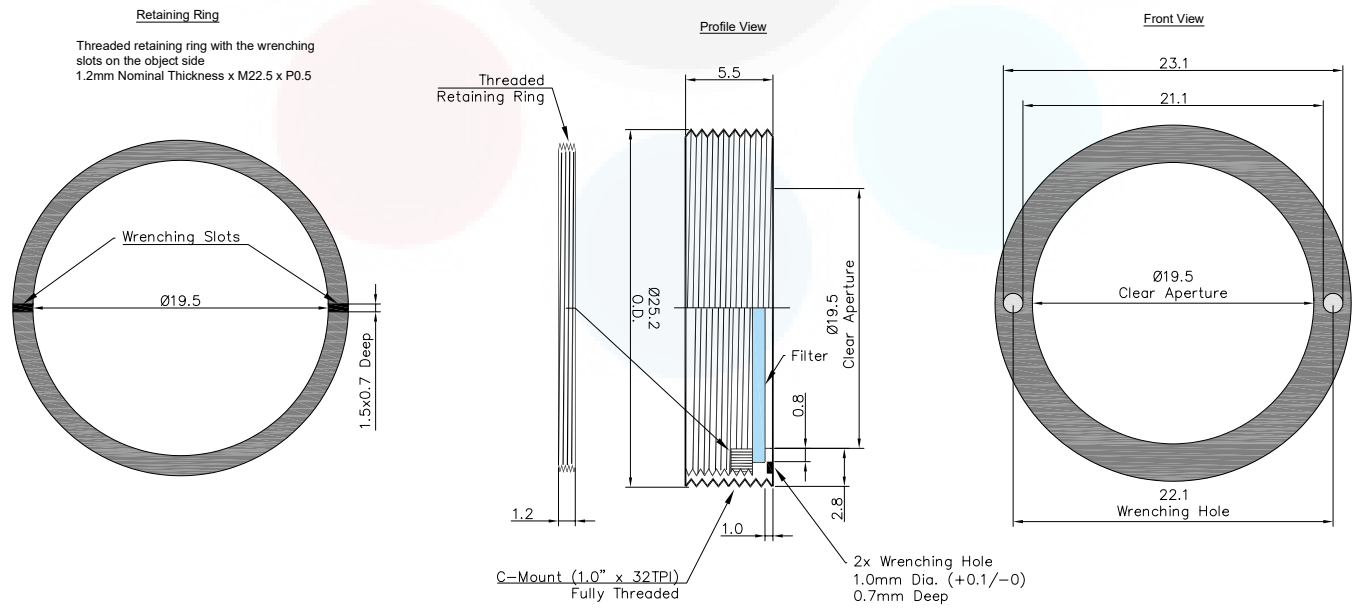
C-MOUNT DIMENSIONS (-25.4)

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.

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 |



› **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



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).

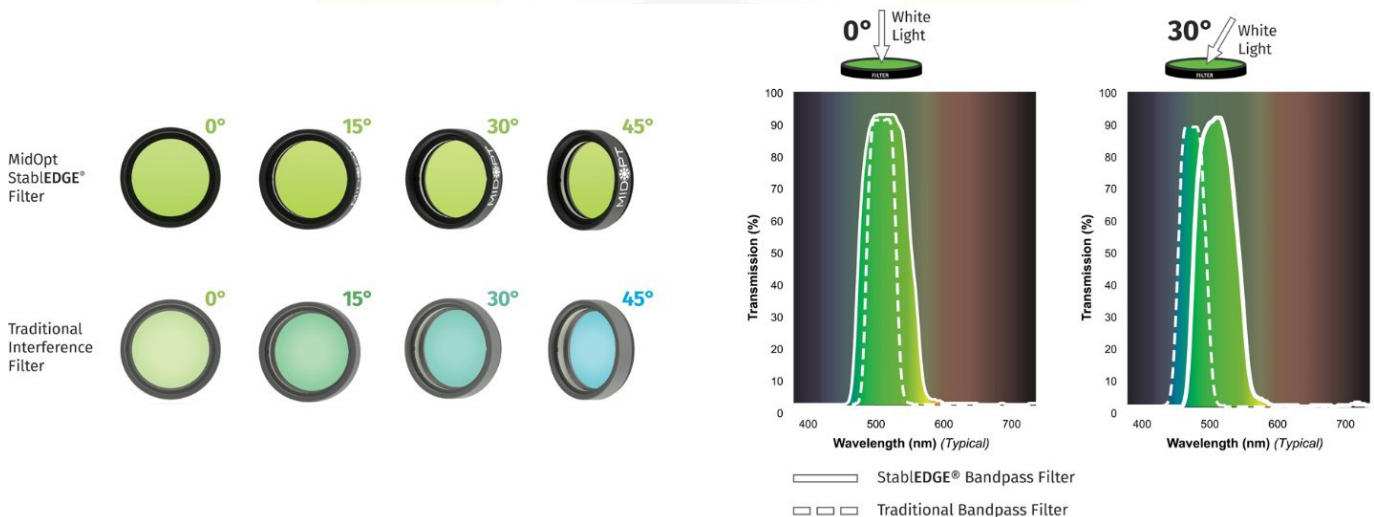


MIDOPT STABLEEDGE®

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.

