

Bi940 NEAR-IR INTERFERENCE BANDPASS FILTER

MidOpt Bandpass Filters are specifically designed for industrial imaging

- Available in UV, VIS and NIR passbands
- Achieve optimal contrast
- Improve system control, repeatability and stability
- Block interfering wavelengths, eliminating the need for shrouds
- Increase resolution by reducing chromatic aberration
- Anti-reflection coated for maximum transmission
- Hard coated, single substrate fabrication
- Exceptional surface quality; 40/20 scratch/dig



Bandpass Filter Applications

Bandpass Filters are used in a variety of industries, including machine vision, factory automation, security and surveillance, license plate recognition, medical and life science, agricultural inspection, aerial imaging, motion analysis, photography and cinematography.

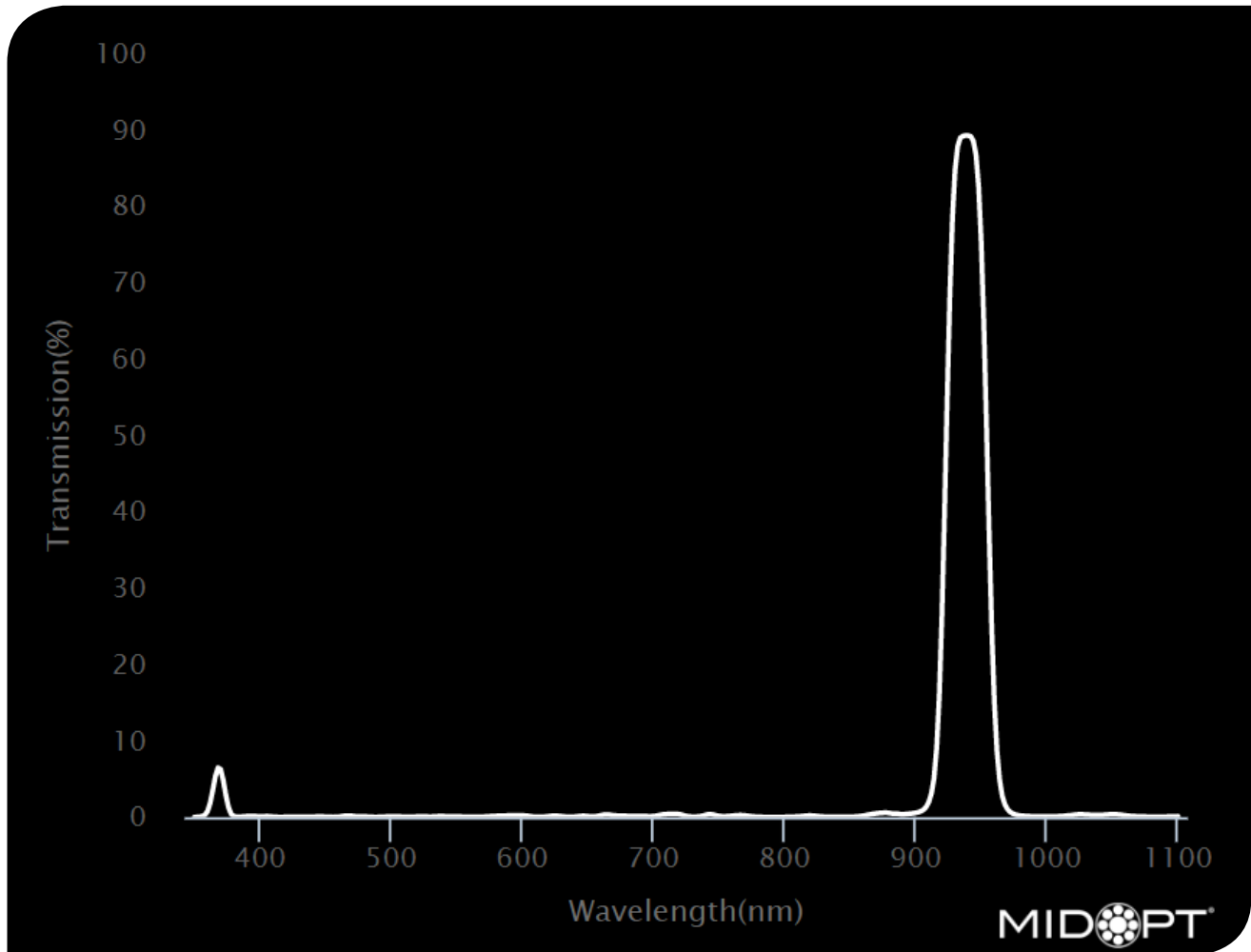
Bi Series Narrow Interference Bandwidth

- 20-35nm FWHM; Narrow bandwidth
- High transmission $\geq 85\%$
- Designed for use with laser diodes
- Ideal wavelength separation when multiple light sources of similar wavelengths are present
- Reflective, mirror-type surface that helps minimize thermal effects
- Available in sizes up to 79.5mm sq.

APPLICATIONS: Bi Series are popular for life science and laser analysis applications where only discrete wavelengths need to be passed to maximize system performance.

Bi940

Bandpass Filter



Useful Range:	930-952nm
FWHM:	32nm
Tolerance:	+/- 5nm
Peak Transmission:	≥85%
Surface Quality:	40/20
Compatible LED:	940nm
Thickness:	1mm

Many commonly used IR LED or laser diode illuminators operate at or very close to 940nm. Bi940 filters feature a much narrower band design vs. BN940, which can be beneficial when used in situations where ambient light conditions might otherwise create poor contrast. These are frequently night vision, security, traffic control, LPR and industrial inspection applications.

NIR image sensors used in conjunction with 940nm illumination are also being used to support iris recognition in biometrics. When used as a secondary scanner (simultaneously with a primary, mobile scanning unit), the invisible 940nm band can similarly help improve finger-vein identification protocols. This technology identifies specific individuals using a distinct blood vessel pattern inside one's hand. Use of a narrow band Bi940 filter can provide insurance in the event of unanticipated changes in ambient/background light. One application that is under development is to verify users in payment transactions instead of relying on a credit card.



Bi940 TRANSMISSION DATA (TYPICAL)

Wavelength (nm)	Transmission (%)
1100	0.12
1098	0.10
1096	0.09
1094	0.08
1092	0.07
1090	0.06
1088	0.06
1086	0.06
1084	0.06
1082	0.05
1080	0.06
1078	0.07
1076	0.07
1074	0.07
1072	0.08
1070	0.10
1068	0.11
1066	0.14
1064	0.15
1062	0.19
1060	0.23
1058	0.27
1056	0.32
1054	0.35
1052	0.37
1050	0.37
1048	0.36
1046	0.33
1044	0.31
1042	0.29
1040	0.28

Wavelength (nm)	Transmission (%)
1038	0.27
1036	0.27
1034	0.28
1032	0.31
1030	0.33
1028	0.35
1026	0.36
1024	0.36
1022	0.33
1020	0.28
1018	0.25
1016	0.22
1014	0.18
1012	0.14
1010	0.12
1008	0.11
1006	0.11
1004	0.09
1002	0.09
1000	0.08
998	0.09
996	0.08
994	0.10
992	0.10
990	0.11
988	0.11
986	0.13
984	0.15
982	0.17
980	0.21
978	0.26

Wavelength (nm)	Transmission (%)
976	0.34
974	0.47
972	0.69
970	1.04
968	1.67
966	2.78
964	4.87
962	8.60
960	14.97
958	24.61
956	37.24
954	51.20
952	64.41
950	75.13
948	82.53
946	86.74
944	88.56
942	89.17
940	89.28
938	89.30
936	89.21
934	88.98
932	87.85
930	84.73
928	78.39
926	68.08
924	54.66
922	39.93
920	26.53



Bi940 TRANSMISSION DATA (TYPICAL)

Wavelength (nm)	Transmission (%)
918	16.02
916	9.12
914	5.15
912	3.13
910	1.98
908	1.35
906	0.97
904	0.78
902	0.64
900	0.58
898	0.50
896	0.47
894	0.43
892	0.40
890	0.36
888	0.40
886	0.47
884	0.47
882	0.48
880	0.54
878	0.58
876	0.59
874	0.55
872	0.54
870	0.50
868	0.44
866	0.38
864	0.32
862	0.25
860	0.19
858	0.14

Wavelength (nm)	Transmission (%)
856	0.10
854	0.08
852	0.05
850	0.04
848	0.04
846	0.04
844	0.03
842	0.03
840	0.03
838	0.03
836	0.03
834	0.04
832	0.05
830	0.07
828	0.09
826	0.12
824	0.16
822	0.20
820	0.21
818	0.21
816	0.18
814	0.15
812	0.11
810	0.09
808	0.07
806	0.05
804	0.04
802	0.03
800	0.02
798	0.02
796	0.02

Wavelength (nm)	Transmission (%)
794	0.02
792	0.02
790	0.02
788	0.01
786	0.02
784	0.02
782	0.03
780	0.04
778	0.06
776	0.09
774	0.13
772	0.17
770	0.22
768	0.25
766	0.26
764	0.25
762	0.22
760	0.18
758	0.14
756	0.12
754	0.11
752	0.12
750	0.16
748	0.22
746	0.31
744	0.37
742	0.36
740	0.30
738	0.20



Bi940 TRANSMISSION DATA (TYPICAL)

Wavelength (nm)	Transmission (%)
736	0.13
734	0.08
732	0.06
730	0.06
728	0.08
726	0.12
724	0.20
722	0.29
720	0.38
718	0.42
716	0.43
714	0.42
712	0.40
710	0.39
708	0.37
706	0.32
704	0.24
702	0.18
700	0.13
698	0.11
696	0.11
694	0.13
692	0.15
690	0.16
688	0.16
686	0.15
684	0.14
682	0.14
680	0.16
678	0.18
676	0.20

Wavelength (nm)	Transmission (%)
674	0.21
672	0.21
670	0.23
668	0.28
666	0.32
664	0.34
662	0.31
660	0.24
658	0.17
656	0.10
654	0.08
652	0.09
650	0.12
648	0.16
646	0.17
644	0.15
642	0.10
640	0.06
638	0.04
636	0.03
634	0.05
632	0.08
630	0.12
628	0.15
626	0.18
624	0.18
622	0.16
620	0.12
618	0.08
616	0.04
614	0.03

Wavelength (nm)	Transmission (%)
612	0.03
610	0.04
608	0.07
606	0.12
604	0.17
602	0.21
600	0.23
598	0.23
596	0.23
594	0.23
592	0.23
590	0.22
588	0.21
586	0.20
584	0.19
582	0.17
580	0.16
578	0.14
576	0.12
574	0.10
572	0.08
570	0.06
568	0.04
566	0.03
564	0.03
562	0.03
560	0.03
558	0.03
556	0.05



Bi940 TRANSMISSION DATA (TYPICAL)

Wavelength (nm)	Transmission (%)
554	0.07
552	0.08
550	0.08
548	0.08
546	0.08
544	0.09
542	0.10
540	0.12
538	0.13
536	0.12
534	0.10
532	0.07
530	0.06
528	0.07
526	0.09
524	0.10
522	0.10
520	0.09
518	0.06
516	0.04
514	0.03
512	0.04
510	0.05
508	0.07
506	0.09
504	0.10
502	0.11
500	0.10
498	0.09
496	0.07
494	0.05

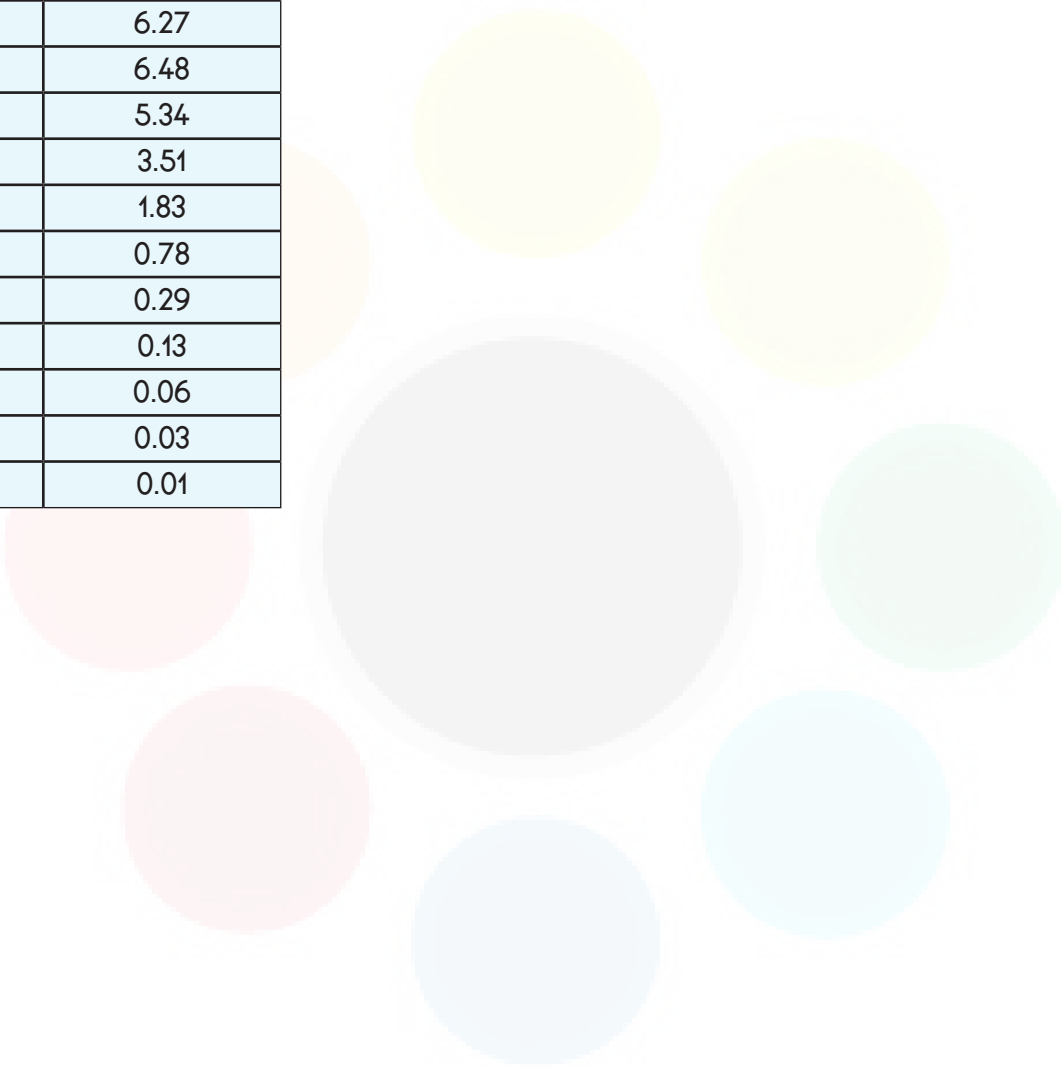
Wavelength (nm)	Transmission (%)
492	0.04
490	0.02
488	0.02
486	0.03
484	0.04
482	0.07
480	0.09
478	0.10
476	0.09
474	0.09
472	0.13
470	0.17
468	0.21
466	0.21
464	0.17
462	0.10
460	0.05
458	0.03
456	0.02
454	0.03
452	0.04
450	0.06
448	0.08
446	0.08
444	0.08
442	0.07
440	0.05
438	0.04
436	0.03
434	0.04
432	0.04

Wavelength (nm)	Transmission (%)
430	0.05
428	0.05
426	0.05
424	0.04
422	0.04
420	0.03
418	0.02
416	0.02
414	0.02
412	0.03
410	0.06
408	0.09
406	0.12
404	0.12
402	0.11
400	0.09
398	0.11
396	0.14
394	0.16
392	0.15
390	0.13
388	0.09
386	0.06
384	0.05
382	0.06
380	0.11
378	0.42
376	1.30
374	2.88



Bi940 TRANSMISSION DATA (TYPICAL)

Wavelength (nm)	Transmission (%)
372	4.82
370	6.27
368	6.48
366	5.34
364	3.51
362	1.83
360	0.78
358	0.29
356	0.13
354	0.06
352	0.03
350	0.01

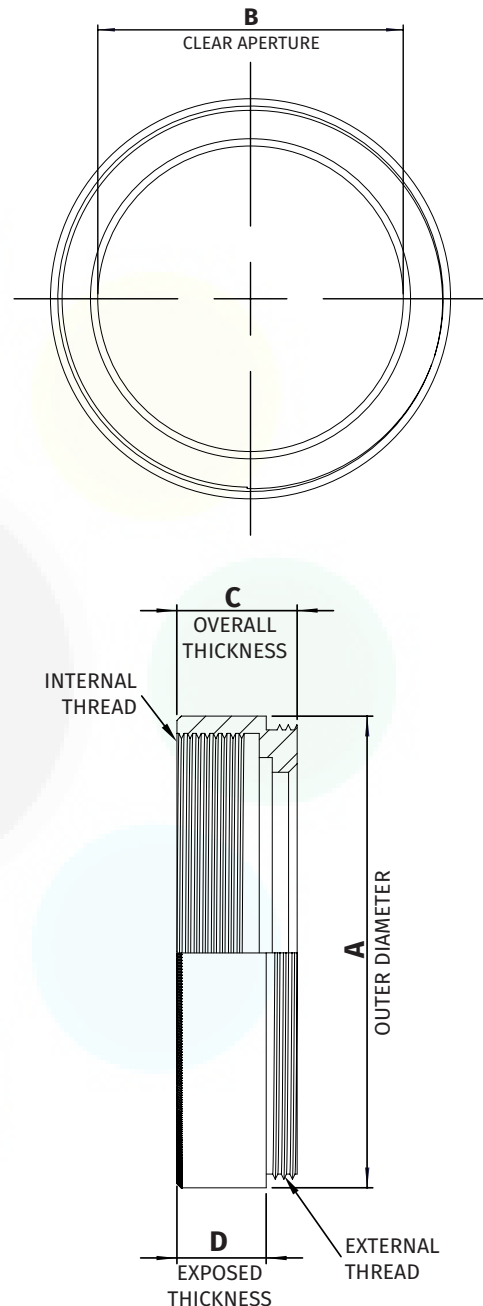


STANDARD THREADED MOUNT DIMENSIONS

NOTES:

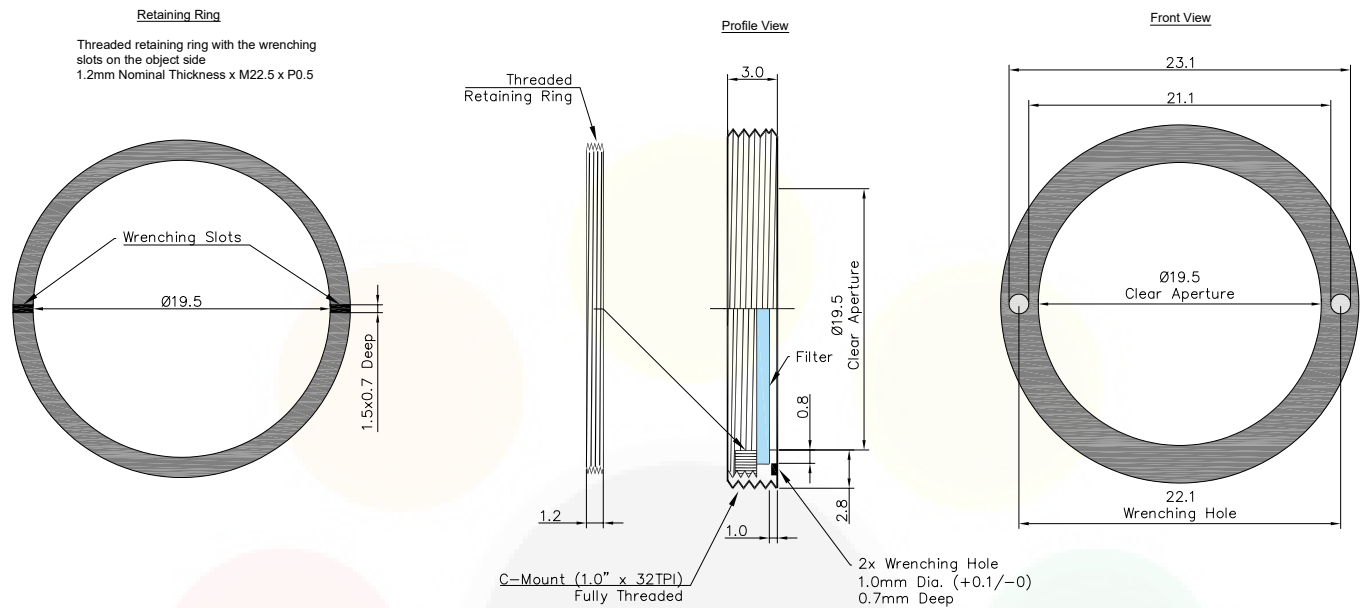
1. Inner and outer threads are of the same size and pitch.
2. Filter mount and retaining ring are black anodized aluminum.
3. All dimensions indicated in mm.
4. Tolerance: +/-0.3mm.

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



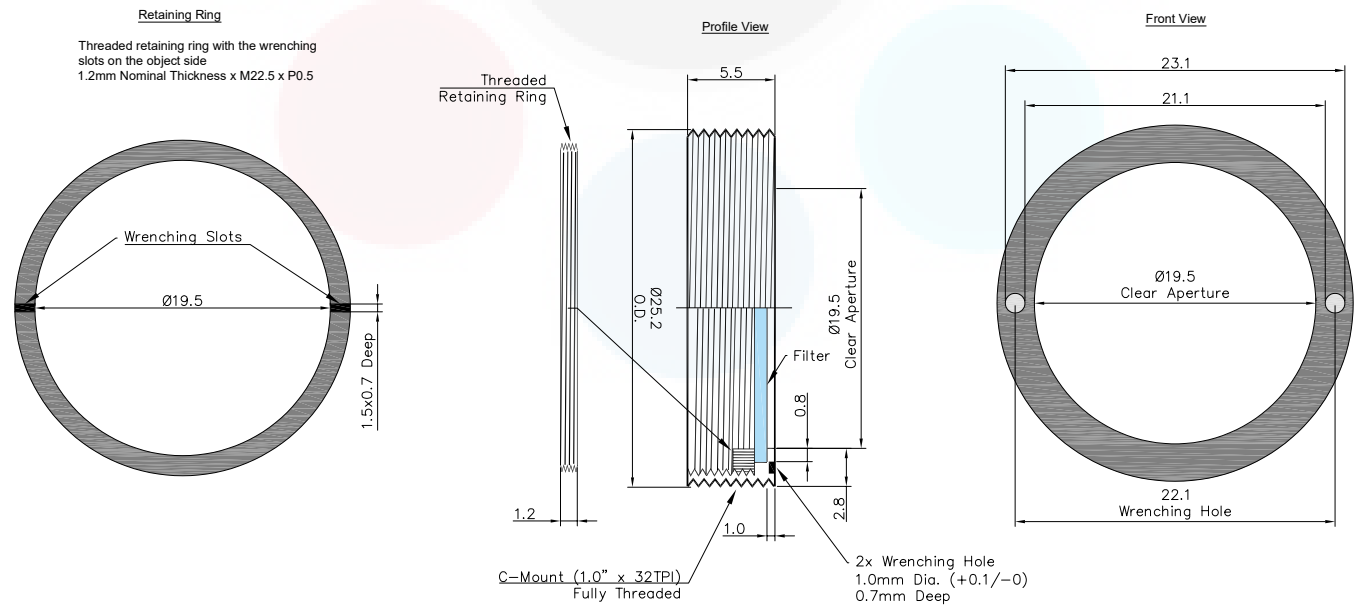
C-MOUNT DIMENSIONS (-25.4)

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).

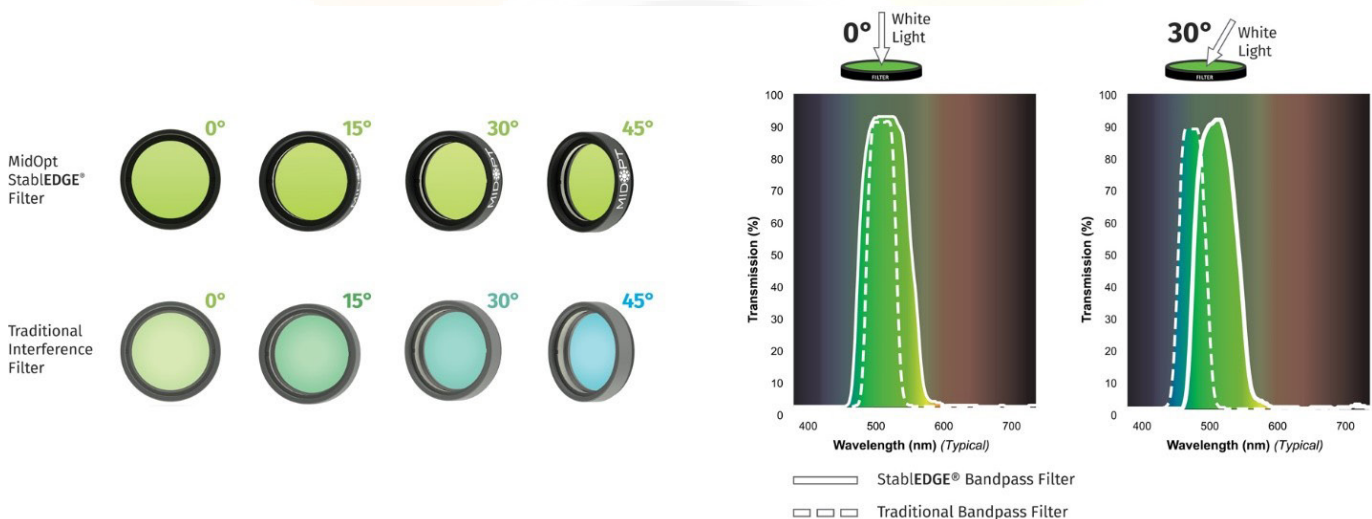


MIDOPT STABLEDGE®

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.

