

LP171 FUSED SILICA MULTI-LAYER VIS A/R COATED PROTECTIVE WINDOW

MidOpt Protective Filters

MidOpt specializes in manufacturing custom made Protective Windows, which can be designed for nearly any type or size application at any wavelength range requirement. MidOpt custom windows can be manufactured from different substrates and include various coatings depending on the application requirements.

- Glass, acrylic, polycarbonate, sapphire and other substrates
- Oleophobic, anti-reflection, anti-smudge, anti-fog and hydrophobic coatings available
- Chemically strengthened glass options, including Gorilla Glass®
- Wavelength and polarization filtering
- Adhesive backing for easy fastening
- Custom silk screening service for borders, masking, fiducial marks, logos or patterns
- Available with various mounting configurations based on need



Protective Filter Applications

MidOpt Protective Filters are used to protect expensive or fragile optical elements from environmental hazards such as liquids, dust, dirt, and other debris.

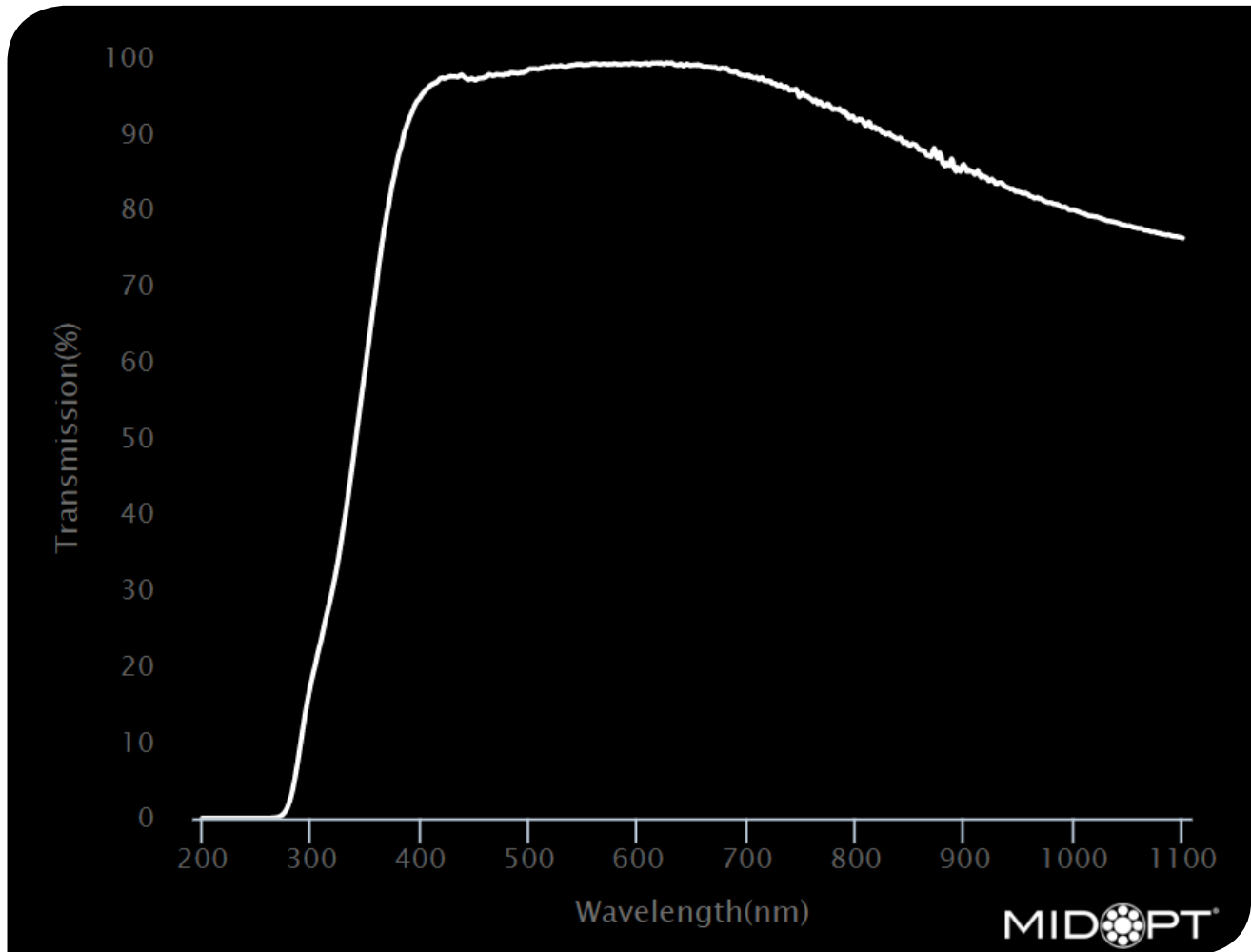
LP Series - Protective Filters

- Variety of materials available with different physical properties
- Sapphire option for weld resistance
- Fused Silica option for low thermal expansion and high shock resistance
- Borofloat option for excellent strength, thermal, mechanical and solar properties (similar to that of Pyrex)
- Glass options for low-cost protection where dust covers are required
- Anti-Reflective coated glass offers low cost dust protection with improved optical properties
- UV Absorptive and Blocking Options to protect UV sensitive imagers from damaging Ultra-Violet light
- Germanium option for thermal imaging and LWIR (long-wave infrared)

APPLICATIONS: Protective filters are useful in nearly all imaging and sensing applications where optical protection is necessary from environmental contaminants

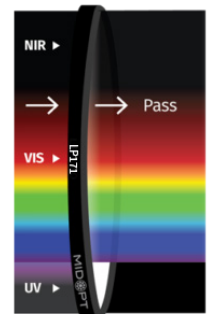
LP171

Protective Filters



Tolerance:	+/- 10nm
STABLEEDGE:	Yes

LP171 fused silica protective windows are made from an ultra-pure, synthetic optical material similar to fused quartz. They offer extremely low thermal expansion, high-resistance to shock, superior scratch resistance and excellent optical properties. They perform well in high-temperature applications, having the ability to withstand temperatures of up to 1100° C. They are also chemical resistant and have superior transmission in the UV through near infrared spectral ranges. LP171 includes a durable broadband multi-layer anti-reflection coating to limit reflection losses in the visible and near-infrared spectrums.



LP171 TRANSMISSION DATA (TYPICAL)

Wavelength (nm)	Transmission (%)
900	85.75
899	85.97
898	85.83
897	85.28
896	85.06
895	85.19
894	85.33
893	85.60
892	85.06
891	85.25
890	85.55
889	86.47
888	86.71
887	86.39
886	85.84
885	85.92
884	85.89
883	86.16
882	85.76
881	86.03
880	86.09
879	86.50
878	87.27
877	87.50
876	87.32
875	86.81
874	87.14
873	87.76
872	88.10
871	87.84
870	87.42

Wavelength (nm)	Transmission (%)
869	87.00
868	87.07
867	87.13
866	87.13
865	87.22
864	87.46
863	87.73
862	87.80
861	87.80
860	87.88
859	87.95
858	87.92
857	88.17
856	88.35
855	88.55
854	88.61
853	88.64
852	88.71
851	88.56
850	88.49
849	88.51
848	88.58
847	88.86
846	88.87
845	88.94
844	88.78
843	88.96
842	89.21
841	89.48
840	89.46
839	89.39

Wavelength (nm)	Transmission (%)
838	89.33
837	89.39
836	89.52
835	89.57
834	89.69
833	89.72
832	89.84
831	90.07
830	90.06
829	90.00
828	89.92
827	90.00
826	90.14
825	90.12
824	90.21
823	90.39
822	90.60
821	90.67
820	90.68
819	90.60
818	90.86
817	90.92
816	90.84
815	90.77
814	90.95
813	91.46
812	91.56
811	91.42
810	91.15



LP171 TRANSMISSION DATA (TYPICAL)

Wavelength (nm)	Transmission (%)
809	91.09
808	91.25
807	91.54
806	91.78
805	91.90
804	91.87
803	91.94
802	91.87
801	91.75
800	91.74
799	91.82
798	92.18
797	92.32
796	92.28
795	92.26
794	92.07
793	92.49
792	92.38
791	92.78
790	92.71
789	93.01
788	92.83
787	92.98
786	93.05
785	93.32
784	93.18
783	93.22
782	93.26
781	93.25
780	93.32
779	93.20

Wavelength (nm)	Transmission (%)
778	93.30
777	93.45
776	93.69
775	93.89
774	93.93
773	93.75
772	93.78
771	93.64
770	93.73
769	93.86
768	94.15
767	94.23
766	94.03
765	93.97
764	94.32
763	94.48
762	94.43
761	94.25
760	94.39
759	94.54
758	94.67
757	94.75
756	94.91
755	94.96
754	94.98
753	95.03
752	95.25
751	95.33
750	95.22
749	94.96
748	94.88

Wavelength (nm)	Transmission (%)
747	95.26
746	95.64
745	95.91
744	95.76
743	95.77
742	95.77
741	95.81
740	95.75
739	95.73
738	95.86
737	96.12
736	96.23
735	96.18
734	96.01
733	96.23
732	96.26
731	96.48
730	96.32
729	96.37
728	96.34
727	96.47
726	96.62
725	96.61
724	96.67
723	96.64
722	96.91
721	96.90
720	96.97
719	97.00



LP171 TRANSMISSION DATA (TYPICAL)

Wavelength (nm)	Transmission (%)
718	96.94
717	97.00
716	96.98
715	97.20
714	97.39
713	97.36
712	97.24
711	97.14
710	97.27
709	97.45
708	97.40
707	97.37
706	97.37
705	97.42
704	97.55
703	97.48
702	97.70
701	97.66
700	97.72
699	97.64
698	97.64
697	97.70
696	97.72
695	97.71
694	97.83
693	97.82
692	97.96
691	98.07
690	98.22
689	98.23
688	98.11

Wavelength (nm)	Transmission (%)
687	98.17
686	98.15
685	98.23
684	98.23
683	98.47
682	98.56
681	98.64
680	98.53
679	98.60
678	98.64
677	98.62
676	98.63
675	98.51
674	98.57
673	98.56
672	98.66
671	98.77
670	98.69
669	98.76
668	98.70
667	98.81
666	98.78
665	98.80
664	98.84
663	98.84
662	98.84
661	98.77
660	98.83
659	98.93
658	98.96
657	99.02

Wavelength (nm)	Transmission (%)
656	99.01
655	99.13
654	99.04
653	99.07
652	99.03
651	99.07
650	99.03
649	99.03
648	98.98
647	99.07
646	99.11
645	99.21
644	99.10
643	99.05
642	98.91
641	98.99
640	99.13
639	99.19
638	99.14
637	99.00
636	99.04
635	99.06
634	99.08
633	99.16
632	99.23
631	99.35
630	99.31
629	99.31
628	99.29



LP171 TRANSMISSION DATA (TYPICAL)

Wavelength (nm)	Transmission (%)
627	99.35
626	99.35
625	99.28
624	99.15
623	99.21
622	99.27
621	99.35
620	99.28
619	99.27
618	99.33
617	99.33
616	99.32
615	99.29
614	99.32
613	99.33
612	99.25
611	99.15
610	99.12
609	99.17
608	99.32
607	99.27
606	99.26
605	99.22
604	99.22
603	99.19
602	99.09
601	99.22
600	99.23
599	99.24
598	99.20
597	99.22

Wavelength (nm)	Transmission (%)
596	99.28
595	99.29
594	99.26
593	99.21
592	99.14
591	99.17
590	99.22
589	99.22
588	99.21
587	99.20
586	99.17
585	99.14
584	99.12
583	99.15
582	99.14
581	99.13
580	99.20
579	99.23
578	99.25
577	99.17
576	99.17
575	99.15
574	99.19
573	99.12
572	99.14
571	99.13
570	99.19
569	99.19
568	99.20
567	99.18
566	99.15

Wavelength (nm)	Transmission (%)
565	99.12
564	99.14
563	99.17
562	99.21
561	99.25
560	99.21
559	99.25
558	99.20
557	99.21
556	99.14
555	99.09
554	99.08
553	99.13
552	99.08
551	99.07
550	99.04
549	99.08
548	99.17
547	99.13
546	99.18
545	99.11
544	99.16
543	99.14
542	99.06
541	99.05
540	99.01
539	99.05
538	98.97
537	98.99



LP171 TRANSMISSION DATA (TYPICAL)

Wavelength (nm)	Transmission (%)
536	98.92
535	98.83
534	98.77
533	98.78
532	98.84
531	98.86
530	98.94
529	98.98
528	98.93
527	98.89
526	98.85
525	98.85
524	98.89
523	98.90
522	98.94
521	98.85
520	98.79
519	98.70
518	98.75
517	98.78
516	98.81
515	98.78
514	98.69
513	98.67
512	98.59
511	98.65
510	98.57
509	98.52
508	98.50
507	98.53
506	98.58

Wavelength (nm)	Transmission (%)
505	98.56
504	98.54
503	98.54
502	98.53
501	98.56
500	98.53
499	98.40
498	98.29
497	98.20
496	98.14
495	98.06
494	98.03
493	98.06
492	98.06
491	97.99
490	97.97
489	97.96
488	98.03
487	98.00
486	98.00
485	98.06
484	98.07
483	98.04
482	97.91
481	97.81
480	97.84
479	97.86
478	97.88
477	97.77
476	97.70
475	97.75

Wavelength (nm)	Transmission (%)
474	97.77
473	97.79
472	97.75
471	97.82
470	97.82
469	97.75
468	97.67
467	97.65
466	97.67
465	97.74
464	97.80
463	97.81
462	97.63
461	97.53
460	97.44
459	97.45
458	97.35
457	97.35
456	97.33
455	97.31
454	97.31
453	97.27
452	97.18
451	97.06
450	97.08
449	97.19
448	97.26
447	97.30
446	97.21



LP171 TRANSMISSION DATA (TYPICAL)

Wavelength (nm)	Transmission (%)
445	97.15
444	97.11
443	97.21
442	97.33
441	97.39
440	97.53
439	97.65
438	97.78
437	97.73
436	97.61
435	97.50
434	97.46
433	97.52
432	97.55
431	97.52
430	97.53
429	97.52
428	97.58
427	97.52
426	97.48
425	97.46
424	97.35
423	97.36
422	97.28
421	97.38
420	97.36
419	97.32
418	97.24
417	97.05
416	96.92
415	96.77

Wavelength (nm)	Transmission (%)
414	96.67
413	96.69
412	96.56
411	96.54
410	96.41
409	96.37
408	96.11
407	96.04
406	95.84
405	95.80
404	95.54
403	95.42
402	95.22
401	95.04
400	94.75
399	94.63
398	94.41
397	94.31
396	93.98
395	93.77
394	93.34
393	93.05
392	92.67
391	92.38
390	92.03
389	91.61
388	91.23
387	90.79
386	90.40
385	89.89
384	89.21

Wavelength (nm)	Transmission (%)
383	88.57
382	88.04
381	87.61
380	87.11
379	86.49
378	85.78
377	85.04
376	84.31
375	83.72
374	83.14
373	82.28
372	81.45
371	80.53
370	79.84
369	79.06
368	78.25
367	77.49
366	76.53
365	75.66
364	74.61
363	73.67
362	72.63
361	71.52
360	70.33
359	69.16
358	68.19
357	67.16
356	66.16
355	65.03



LP171 TRANSMISSION DATA (TYPICAL)

Wavelength (nm)	Transmission (%)
354	63.97
353	62.81
352	61.75
351	60.67
350	59.57
349	58.50
348	57.42
347	56.45
346	55.39
345	54.31
344	53.20
343	52.12
342	51.11
341	49.95
340	48.90
339	47.70
338	46.66
337	45.58
336	44.59
335	43.61
334	42.50
333	41.48
332	40.44
331	39.59
330	38.66
329	37.84
328	36.88
327	35.95
326	35.07
325	34.18
324	33.38

Wavelength (nm)	Transmission (%)
323	32.59
322	31.84
321	31.14
320	30.39
319	29.73
318	29.07
317	28.44
316	27.83
315	27.23
314	26.65
313	26.05
312	25.40
311	24.71
310	24.06
309	23.39
308	22.84
307	22.27
306	21.70
305	20.99
304	20.32
303	19.71
302	19.18
301	18.54
300	17.94
299	17.18
298	16.50
297	15.73
296	15.01
295	14.19
294	13.33
293	12.41

Wavelength (nm)	Transmission (%)
292	11.50
291	10.58
290	9.67
289	8.71
288	7.79
287	6.89
286	6.05
285	5.24
284	4.48
283	3.78
282	3.14
281	2.61
280	2.14
279	1.73
278	1.38
277	1.08
276	0.85
275	0.66
274	0.51
273	0.39
272	0.30
271	0.23
270	0.17
269	0.13
268	0.10
267	0.07
266	0.06
265	0.04
264	0.03

LP171 TRANSMISSION DATA (TYPICAL)

Wavelength (nm)	Transmission (%)
263	0.02
262	0.02
261	0.01
260	0.01
259	0.01
258	0.01
257	0.01
256	0.01
255	0.01
254	0.01
253	0.01
252	0.00
251	0.00
250	0.00
249	0.00
248	0.00
247	0.00
246	0.00
245	0.00
244	0.00
243	0.00
242	0.00
241	0.00
240	0.00
239	0.00
238	0.00
237	0.00
236	0.00
235	0.00
234	0.00
233	0.00

Wavelength (nm)	Transmission (%)
232	0.00
231	-0.00
230	0.01
229	0.01
228	0.00
227	0.00
226	0.00
225	0.01
224	0.01
223	0.01
222	0.00
221	0.01
220	0.01
219	0.00
218	0.00
217	0.00
216	0.00
215	0.01
214	0.00
213	-0.00
212	0.00
211	0.01
210	0.01
209	0.00
208	0.01
207	0.00
206	-0.00
205	-0.01
204	-0.01
203	0.01
202	0.00

Wavelength (nm)	Transmission (%)
201	0.01
200	-0.00

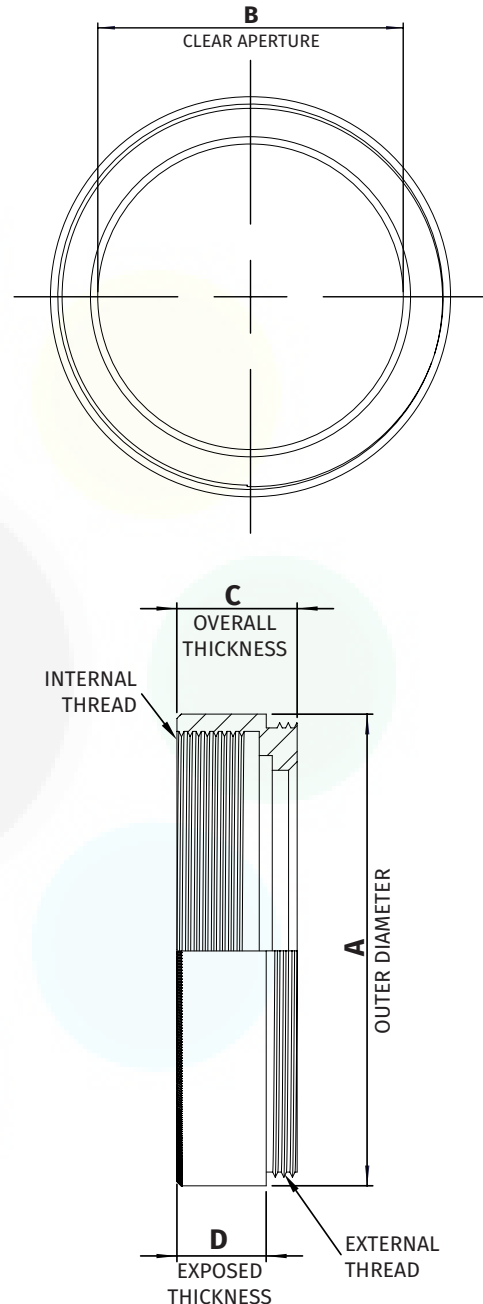


STANDARD THREADED MOUNT DIMENSIONS

NOTES:

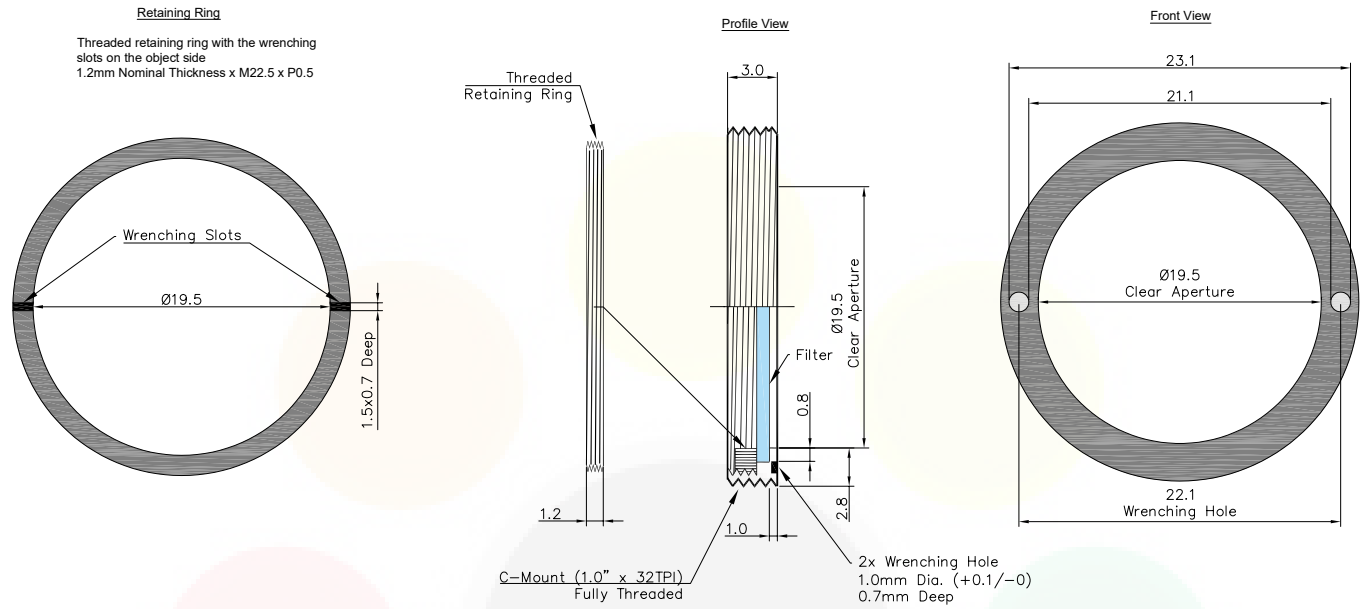
1. Inner and outer threads are of the same size and pitch.
2. Filter mount and retaining ring are black anodized aluminum.
3. All dimensions indicated in mm.
4. Tolerance: +/-0.3mm.

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



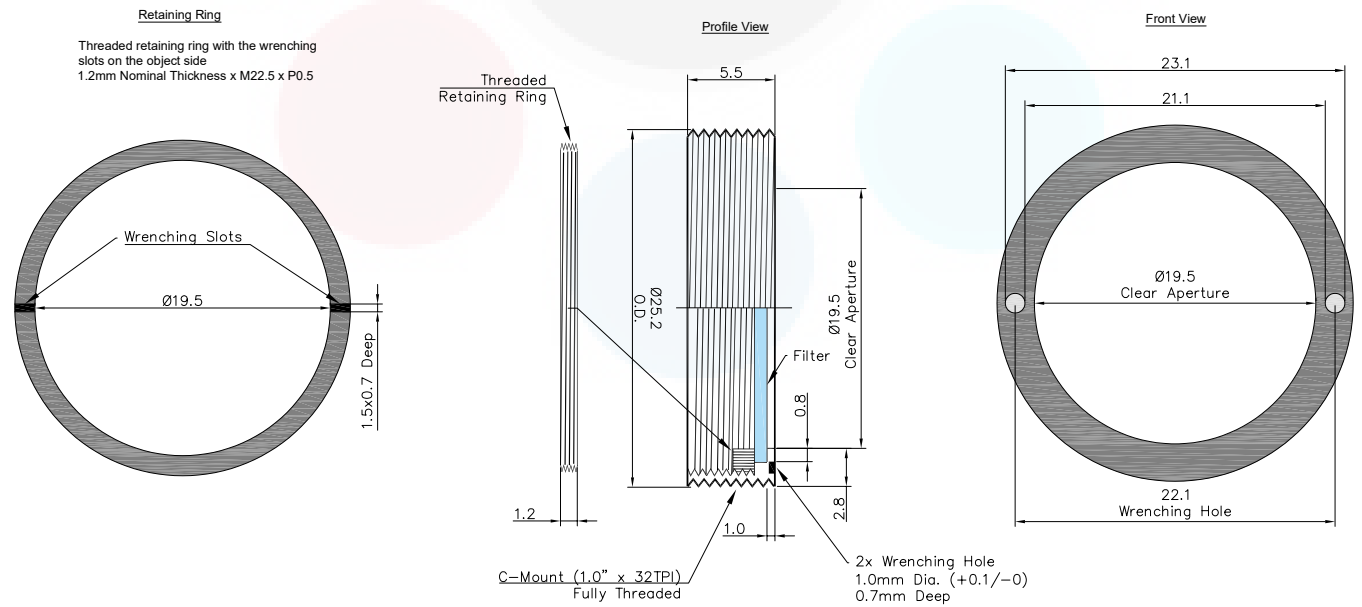
C-MOUNT DIMENSIONS (-25.4)

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).

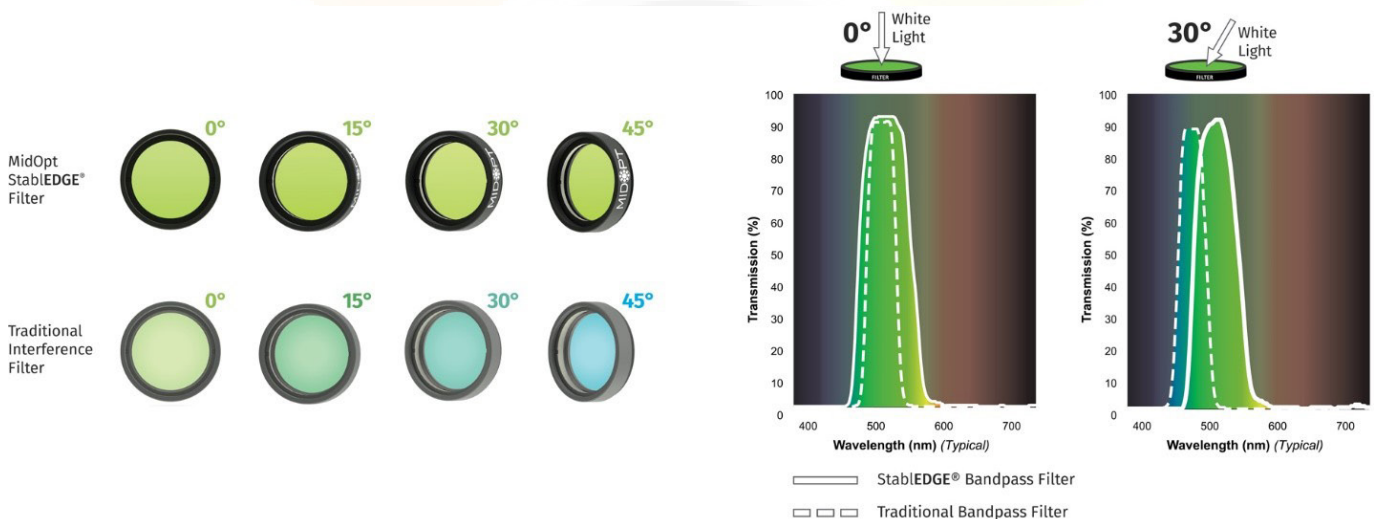


MIDOPT STABLEDGE®

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.

