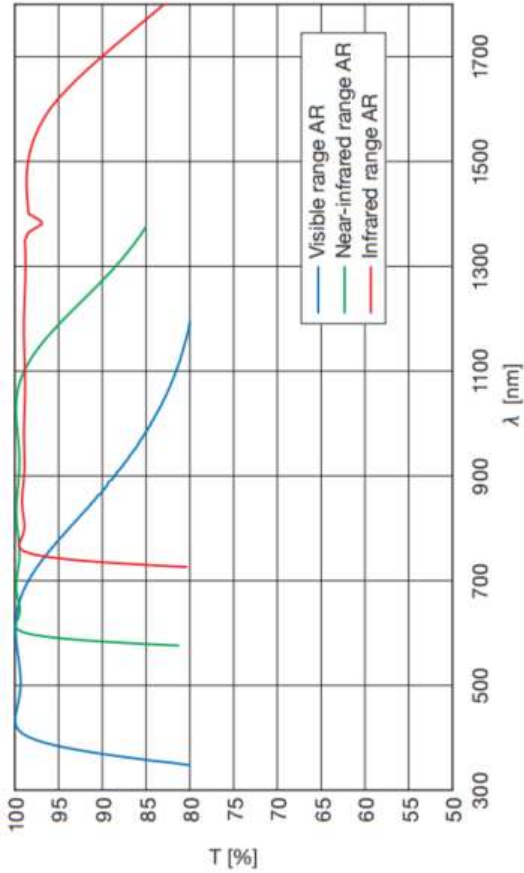
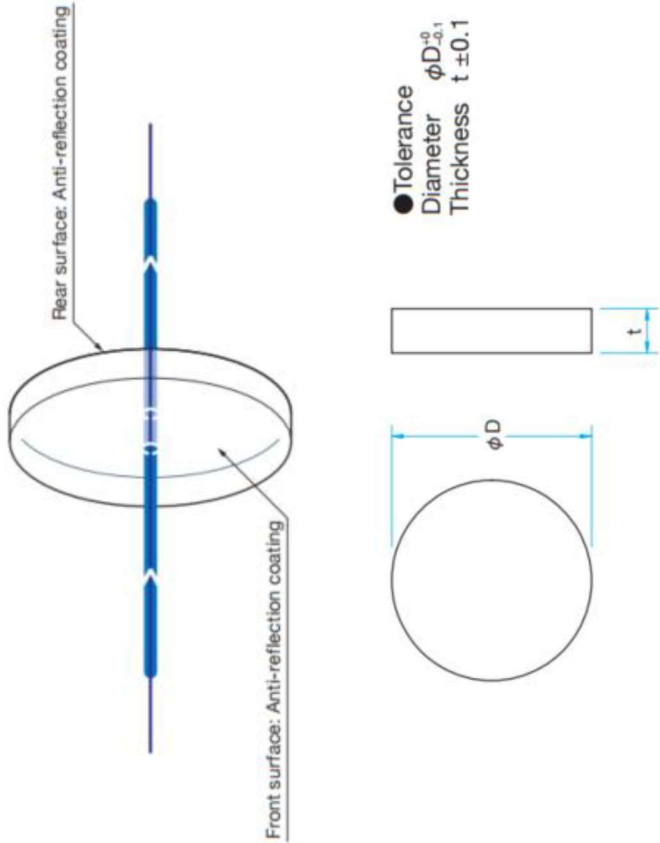


Optical Windows with Anti-Reflection Coating | OP-W-BA



Material	BK7
Surface flatness of substrate	$\lambda/10$
Parallelism	$<5''$
Coating	Multi-layer anti-reflection coating
Incident angle	0°
Laser damage threshold	4J/cm ² (Laser pulse width 10ns, repetition frequency 20Hz)
Surface Quality (Scratch-Dig)	40-20
Clear aperture	90% of actual aperture

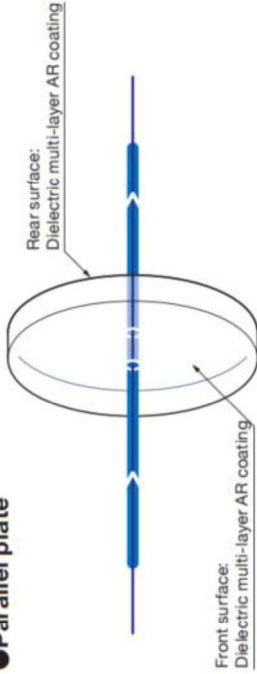


AR Coated Windows for High Power Laser | OP-W-W-HP

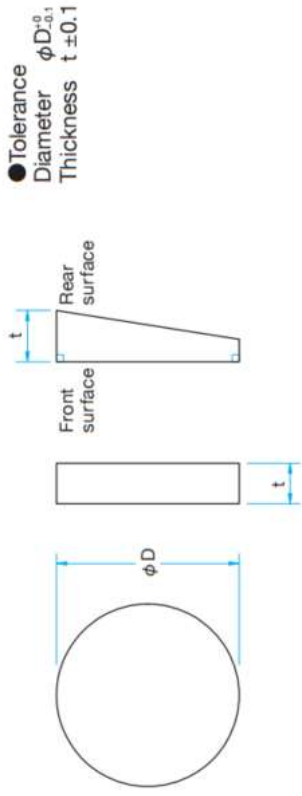
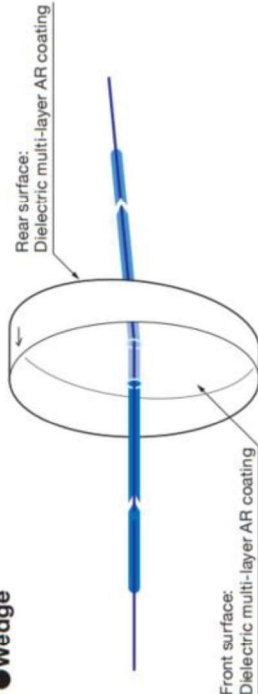


Material	Synthetic fused silica
Surface flatness of substrate	$\lambda/10$
Coating	Multi-layer anti-reflection coating
Transmittance	>99%
Incident angle	0°
Surface Quality (Scratch-Dig)	10-5
Clear aperture	90% of actual aperture

● Parallel plate



● Wedge

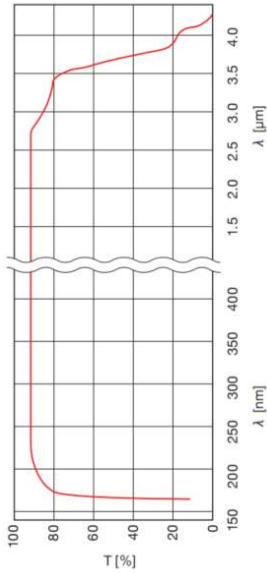
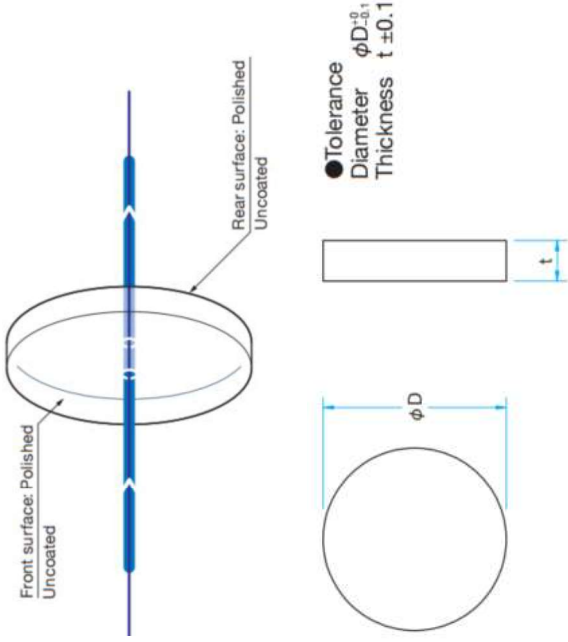


● Tolerance
Diameter $\phi D_{\pm 0.1}$
Thickness $t \pm 0.1$

Fused Silica Windows for Infrared Laser | OP-W-SQIR



Material	Water Free Synthetic Fused Silica
Parallelism	<3'
Surface Quality (Scratch-Dig)	20-10
Clear aperture	90% of real diameter



Wavelength [nm]	Refractive Index
193.5	1.561
200	1.548
250	1.509
300	1.486
350	1.476
400	1.470
500	1.462
600	1.458
700	1.455
800	1.453
1000	1.451
1500	1.445
2000	1.438
2500	1.430
3000	1.419
3500	1.407
Density	2.20g/cm³
Thermal Conductivity	1.38W · m·°K-1
Thermal Expansion Coefficient	0.55×10-6/°C

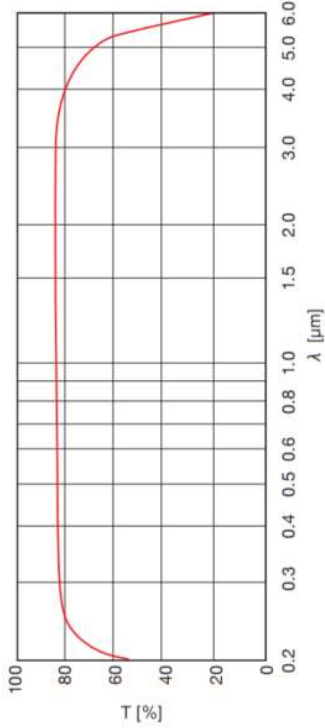
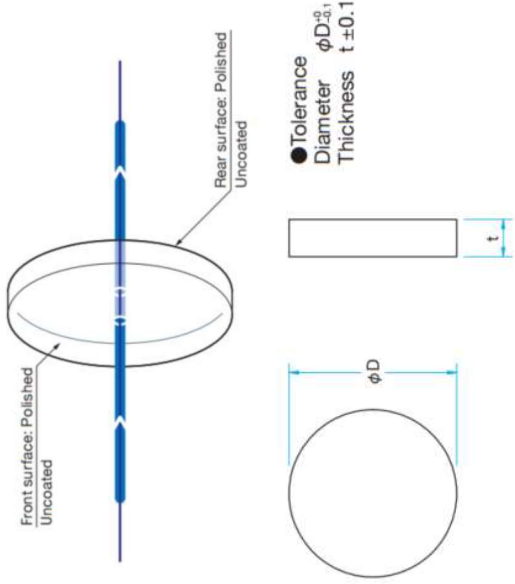
Part Number	Diameter φD [mm]	Thickness t [mm]
OP-W-SQIR-30C03-P	φ30	3
OP-W-SQIR-30C05-P	φ30	5
OP-W-SQIR-50C03-P	φ50	3
OP-W-SQIR-50C05-P	φ50	5

Sapphire Windows for Infrared Laser

OP-W-SHIR



Material	Optical Sapphire Crystal (Uniaxial crystal)
Crystal axis direction	Not define the direction of the crystal axis
Parallelism	<3'
Wavelength Range	400-5000nm
Surface Quality (Scratch-Dig)	40-20
Clear aperture	90%of real diameter



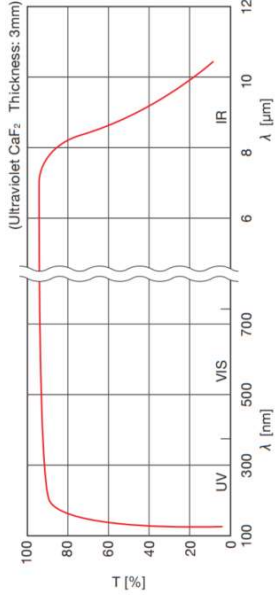
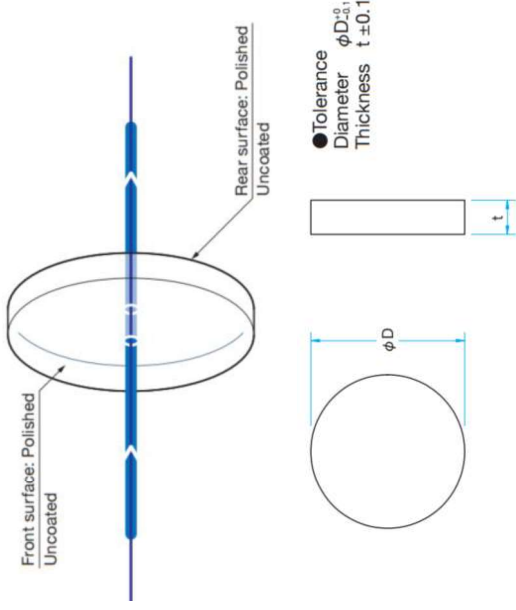
Wavelength [nm]	Refractive Index
248.4	1.834
325.0	1.804
365.0	1.794
404.7	1.786
587.6	1.769
694.3	1.764
1014	1.756
1800	1.742
2200	1.733
3400	1.699
4500	1.650
Density	3.98g/cm³
Thermal Conductivity	42W ·m·K⁻¹(25°C)
Thermal Expansion Coefficient	6.9×10-6/°C (Perpendicular to the C axis 200°C) 7.6×10-6/°C (Parallel to the C axis 200°C)

Part Number	Diameter ϕD [mm]	Thickness t [mm]
OP-W-SHIR-20C02-P	$\phi 20$	2
OP-W-SHIR-25C02-P	$\phi 25$	2
OP-W-SHIR-30C02-P	$\phi 30$	2
OP-W-SHIR-40C02-P	$\phi 40$	2
OP-W-SHIR-50C02-P	$\phi 50$	2

CaF₂ Windows for Ultraviolet and Infrared Laser | OP-W-CFUR/ OP-W-CFVR



Material	Calcium Fluoride
Parallelism	<3'
Surface Quality (Scratch-Dig)	60-40
Clear aperture	90% of real diameter



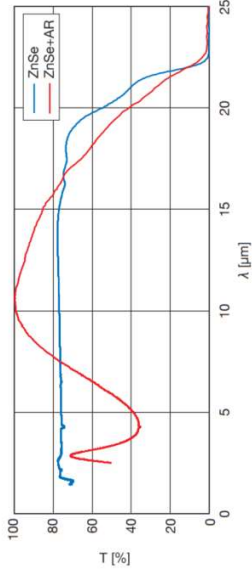
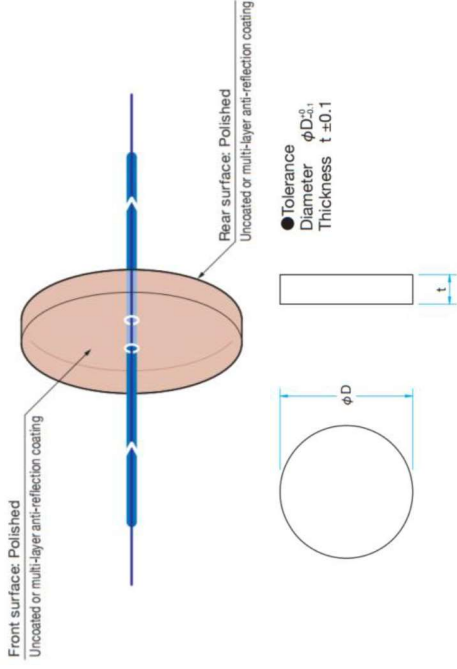
Wavelength [nm]	Refractive Index
193.5	1.502
200.0	1.496
248.4	1.467
308.0	1.453
355.0	1.446
404.7	1.442
488.0	1.437
632.8	1.433
694.3	1.432
780.0	1.430
1064	1.429
2000	1.424
3000	1.418
4000	1.410
5000	1.399
6000	1.386
7000	1.369
8000	1.350
9000	1.327
Density	3.18g/cm ³
Thermal Conductivity	9.71W ·m·K ⁻¹
Thermal Expansion Coefficient	24×10 ⁻⁶ /°C(20-60°C)

Part Number	Diameter ϕD [mm]	Thickness t [mm]	Wavelength Range [nm]	Part Number	Diameter ϕD [mm]	Thickness t [mm]	Wavelength Range [nm]
OP-W-CFUR-20C01-P	$\phi 20$	1	130-8000	OP-W-CFVR-20C01-P	$\phi 20$	1	300-8000
OP-W-CFUR-20C02-P	$\phi 20$	2	130-8000	OP-W-CFVR-20C02-P	$\phi 20$	2	300-8000
OP-W-CFUR-25C02-P	$\phi 25$	2	130-8000	OP-W-CFVR-25C02-P	$\phi 25$	2	300-8000
OP-W-CFUR-25C03-P	$\phi 25$	3	130-8000	OP-W-CFVR-25C03-P	$\phi 25$	3	300-8000
OP-W-CFUR-30C02-P	$\phi 30$	2	130-8000	OP-W-CFVR-30C02-P	$\phi 30$	2	300-8000
OP-W-CFUR-30C03-P	$\phi 30$	3	130-8000	OP-W-CFVR-30C03-P	$\phi 30$	3	300-8000
OP-W-CFUR-40C03-P	$\phi 40$	3	130-8000	OP-W-CFVR-40C03-P	$\phi 40$	3	300-8000
OP-W-CFUR-40C04-P	$\phi 40$	4	130-8000	OP-W-CFVR-40C04-P	$\phi 40$	4	300-8000
OP-W-CFUR-50C03-P	$\phi 50$	3	130-8000	OP-W-CFVR-50C03-P	$\phi 50$	3	300-8000
OP-W-CFUR-50C05-P	$\phi 50$	5	130-8000	OP-W-CFVR-50C05-P	$\phi 50$	5	300-8000

ZnSe Windows for Infrared Laser | OP-W-ZS/ OP-W-SA



Material	Zinc Selenide Crystal	
Coating	ZS:Uncoated SA:Anti-reflection coating (at Wavelength 10.6μm)	
Incident angle	0° (WZSA only)	
Surface Quality (Scratch-Dig)	40-20	
Clear aperture	90% of actual aperture	



Wavelength [μm]	Refractive Index
0.59	2.625
0.63	2.594
1.0	2.489
2.2	2.444
4.0	2.433
6.0	2.426
8.0	2.417
10.6	2.403
16.0	2.356
Density	5.27g/cm ³ (25°C)
Thermal Conductivity	18W ·m ⁻¹ K ⁻¹ (23°C)
Thermal Expansion Coefficient	7.1×10 ⁻⁶ /°C(0°C)

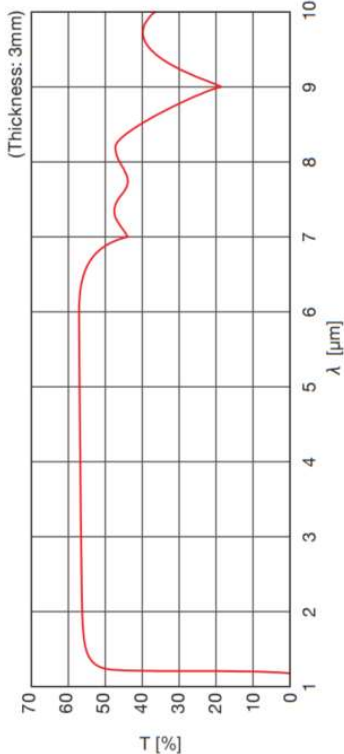
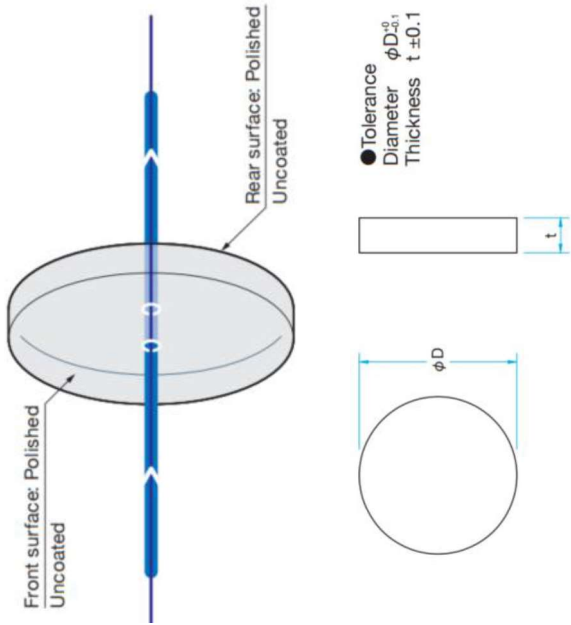
Part Number	Diameter φD [mm]	Thickness t [mm]	Parallelism	Transmission (Wavelength 10.6μm) [%]
OP-W-ZS-30C03-10-3	φ30	3	<3'	65
OP-W-ZS-40C04-10-3	φ40	4	<3'	65
OP-W-SA-19C2.5-10600	φ19	2.5	<5"	>99
OP-W-SA-20C2.5-10600	φ20	2.5	<5"	>99
OP-W-SA-25.4C03-10600	φ25.4	3	<5"	>99
OP-W-SA-30C03-10-10600	φ30	3	<3'	>99
OP-W-SA-38.1C03-10600	φ38.1	3	<5"	>99
OP-W-SA-40C04-10-10600	φ40	4	<3'	>99
OP-W-SA-50.8C03-10600	φ50.8	3	<5"	>99

Silicon Windows for Infrared Laser

OP-W-SI



Material	Silicon Single Crystal
Parallelism	<3'
Surface Quality (Scratch-Dig)	40-20
Clear aperture	90% of real diameter



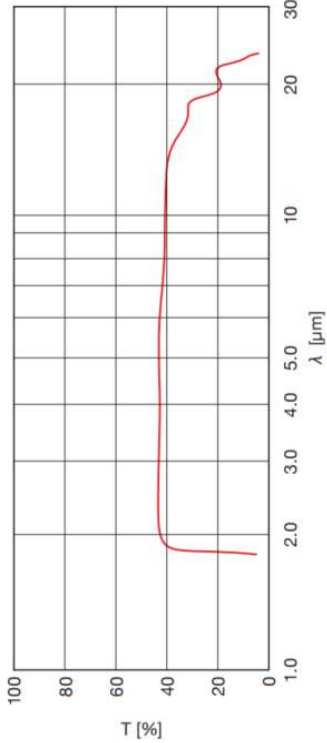
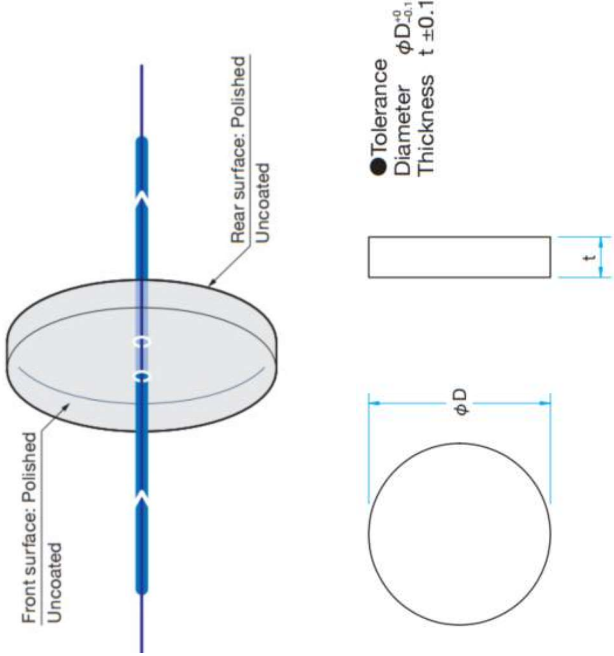
Wavelength [μm]	Refractive Index
1.2	3.519
1.3	3.503
1.4	3.494
1.5	3.483
1.6	3.473
1.8	3.462
2.0	3.454
2.2	3.449
2.4	3.445
2.6	3.441
2.8	3.437
3.0	3.435
3.4	3.433
3.6	3.431
3.8	3.431
4.0	3.430
4.5	3.428
5.0	3.426
5.5	3.425
6.0	3.424
Density	2.33g/cm³
Thermal Conductivity	129W · m · K ⁻¹ (40°C)
Thermal Expansion Coefficient	4.2×10 ⁻⁶ /°C(25°C)

Part Number	Diameter φD [mm]	Thickness t [mm]
OP-W-SI-30C03-2-3	φ30	3
OP-W-SI-40C04-2-3	φ40	4
OP-W-SI-50C05-2-3	φ50	5

Germanium Windows for Infrared Laser | OP-W-GE

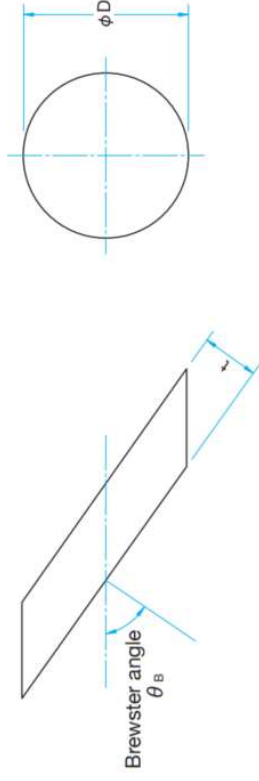
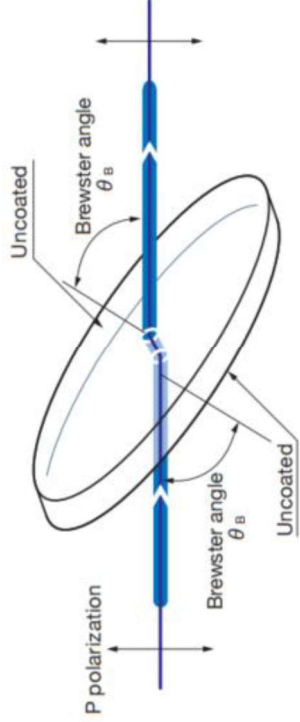


Material	Germanium Single Crystal
Parallelism	<3'
Surface Quality (Scratch-Dig)	40-20
Clear aperture	90% of real diameter



Wavelength [μm]	Refractive Index
2	4.120
3	4.044
4	4.025
5	4.016
6	4.012
7	4.009
8	4.007
9	4.006
10	4.004
10.6	4.004
11	4.004
12	4.003
13	4.002
14	4.002
Density	5.33g/cm³
Thermal Conductivity	58.6W ·m·K ⁻¹ (20°C)
Thermal Expansion Coefficient	5.5×10 ⁻⁶ /°C(25°C)

Part Number	DiameterφD [mm]	Thickness t [mm]
OP-W-GE-30C03-P	φ30	3
OP-W-GE-50C05-P	φ50	5



Wavelength [nm]	BK7		Synthetic fused silica	
	Refractive Index	Brewster angle θ_B [°]	Refractive Index	Brewster angle θ_B [°]
266	—	—	1.499	56.3
355	1.539	57.0	1.476	55.9
488	1.522	56.7	1.463	55.6
532	1.519	56.6	1.461	55.6
632.8	1.515	56.6	1.457	55.5
1064	1.507	56.4	1.449	55.4
1550	1.501	56.3	1.444	55.3