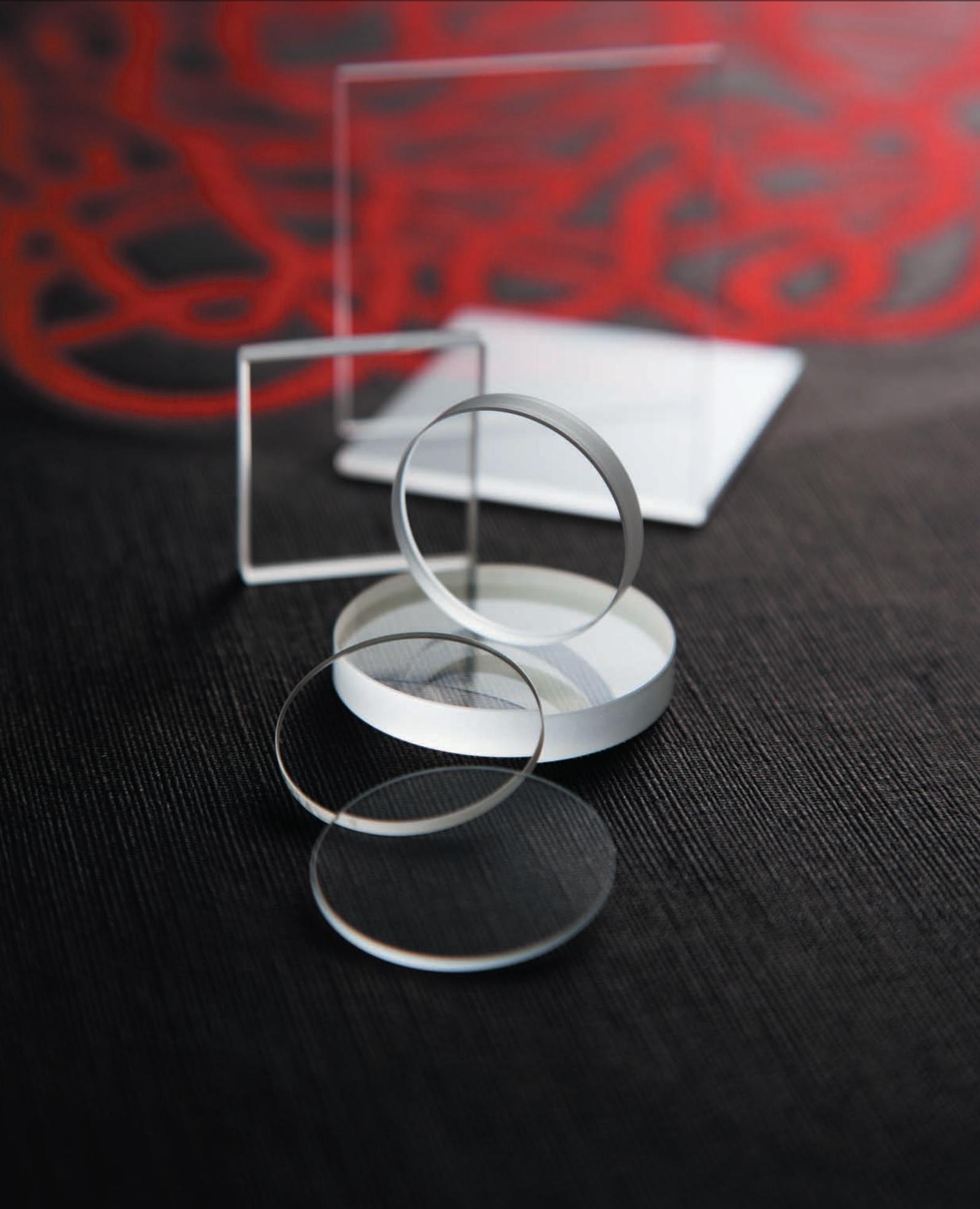


Substrates & Windows



Substrates & Windows Selection Guide **B285**

Low Scattering
 Low Scattering Substrate **B286**
 OPSQSP/OPCFSP/OPMFSP/
 WSSQSP/WSCFSP/WSMFSP

Optical Flats
 Optical Flats **B287**
 OFB/OFBP/OFBQ/OFBXP/OFBQP

 Reasonable Optical Flat **B290**
 S-OFB/S-OFBP/S-OPB/S-WSB

 Float Glass **B291**
 OPFL

Optical Parallels
 Optical Parallels **B292**
 OPB/OPSQ/OPSQK

 Optical Flats with Hole **B299**
 Custom-made

Wedged Substrates
 Wedged Substrates **B300**
 WSB/WSSQ/WSSQK

Contact sheet for Custom Optical Parallels and Optical Flats — **B302**

Contact sheet for Custom Wedged Substrates — **B303**

Concave Mirror Substrates
 Concave Mirror Substrates **B304**
 Aluminum Concave Mirror Substrates
 TCBS/TCA/TCAN

 Concave Mirror Substrate for Laser **B308**
 LCBS

 Custom Curved Mirror **B310**
 Custom-made

Contact sheet for Special Order for Custom Curved Mirror — **B311**

Master Optics
 Optical Flats **B312**
 HMPQP/HMPZP

 Master Optics **B314**
 Custom-made

Contact sheet for Special Order for Master Optics — **B315**

Windows
 Optical Windows with Anti-Reflection Coating **B316**
 WBMA

 AR Coated Windows for High Power Laser **B317**
 WSQNAHP

 Water Free Synthetic Fused Silica Windows for Infrared Laser **B318**
 OPNQ

 Sapphire Windows for Infrared Laser **B319**
 OPSH

 CaF₂ Windows for Ultraviolet and Infrared Laser **B320**
 OPCFU/OPCF

 ZnSe Windows for Infrared Laser **B321**
 OPZS/WZSA

 Silicon Windows for Infrared Laser **B323**
 OPSI

 Germanium Windows for Infrared Laser **B324**
 OPGE

 Brewster Windows **B325**
 Custom-made

Contact sheet for Special Order for Windows — **B326**

Substrates & Windows Selection Guide

Substrates

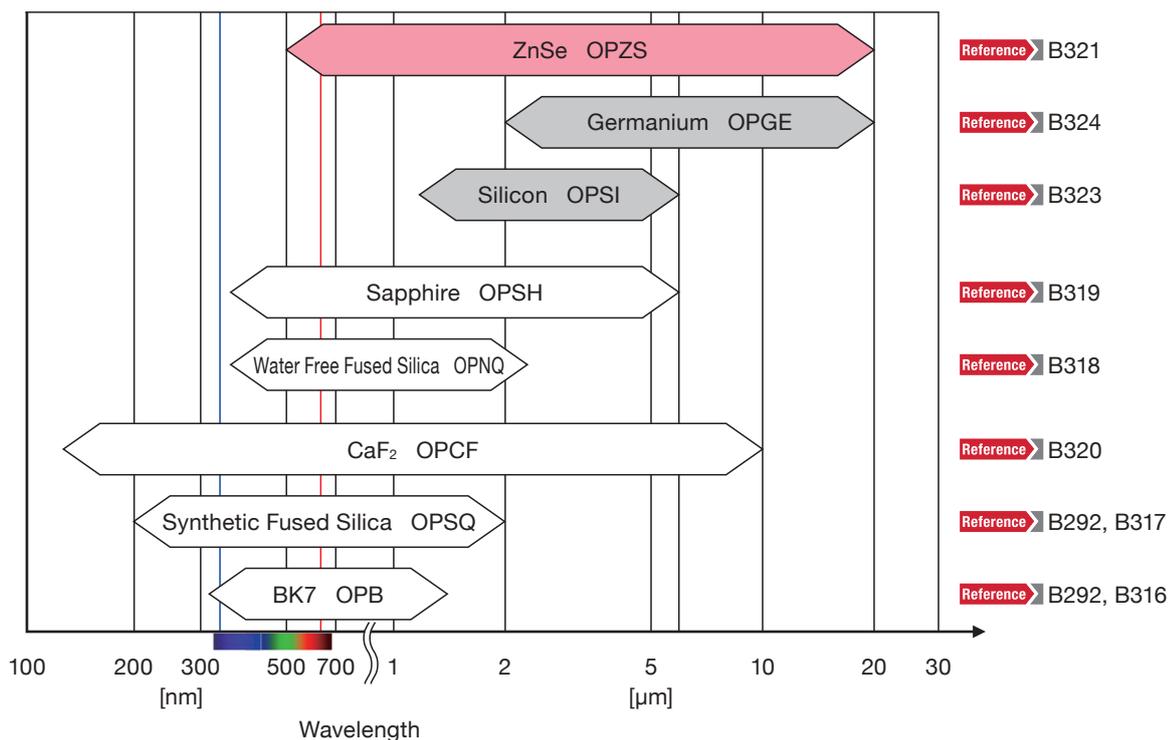
Uncoated optical glasses (substrates) used for mirrors or beamsplitters. If you want to construct mirrors or beamsplitters with custom specification, you will be able to apply custom coating to the standard substrates.

Applications	Substrate to adapt
Mirrors	Optical Flats (OFB/OFSQ/Others) Reference B287
	Optical Parallels (OPB/OPSQ/OPSQK) Reference B292
Half mirrors Beamsplitters	Optical Parallels (OPB/OPSQ/OPSQK) Reference B292
	Wedged Substrates (WSB/WSSQ/WSSQK) Reference B300
Windows	Optical Parallels (OPB/OPSQ/OPSQK) Reference B292
	Wedged Substrates (WSB/WSSQ/WSSQK) Reference B300
Concave mirrors (Laser cavity mirrors)	Concave Mirror Substrates (TCBS/LCBS) Reference B304, B308
Test plates Interferometer reference mirrors	Optical Flats (HMPQP/HMPZP) Reference B312
	Master Optics Reference B314
High power laser mirrors X-ray mirrors	Low scattering substrate (OPSQSP/WSSQSP) Reference B286

Windows

Windows for the optical instrument to be used when light is passed through the opposite side of the partition or inside of the vacuum chamber.

Materials used to window changes depending on the wavelength used. Since there are advantages and disadvantages depending on the material, please check the properties.



Low Scattering Substrate

OPSQSP/OPCFSP/OPMFSP/
WSSQSP/WSCFSP/WSMFSP

RoHS

Catalog
Code

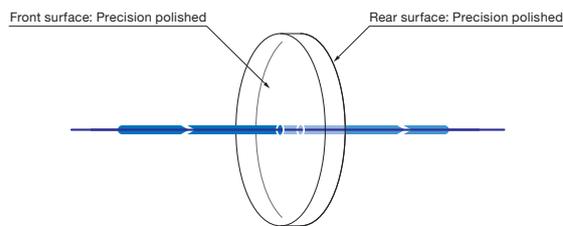
W3140

We can provide special optical polishing service for optics or wedge substrate that achieve surface roughness of $<0.2\text{nm}$ (Ra). These low scattering substrates are in high demand for high power laser and X-ray applications.

- Use a wedged substrate for a beamsplitter to prevent effects of back reflection.
- CaF_2 (calcium fluoride) and MgF_2 (magnesium fluoride) are mainly used in UV and IR for its high transmittance.
- Our highly technical processing yields low surface roughness (microscopic irregularities) and precision surface accuracy (flatness of whole surface).

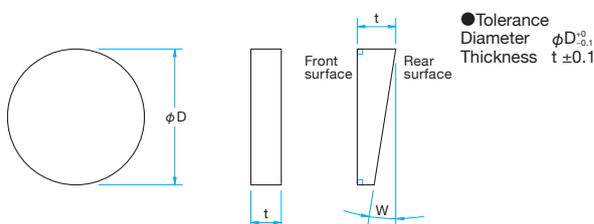


Schematic



Outline Drawing

(in mm)



Specifications

Material	Synthetic fused silica, UV Grade CaF_2 , MgF_2
Surface roughness	$<0.2\text{nm}$ (Ra)
Clear aperture	90% of actual aperture

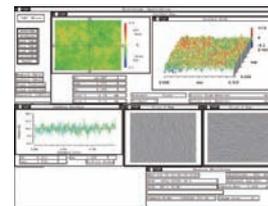
Guide

- ▶ Wedged substrates have marked with an arrow indicating the direction of front surface at the thickest thickness point.

Attention

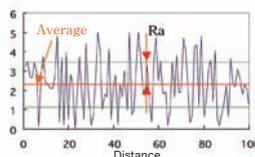
- ▶ The low scattering substrates are uncoated; the reflectance from the surface is 2.5% to 4%.
- ▶ If using wedge substrate for transmission application, the beam will be deviate approximately 0.5 degrees.
- ▶ The CaF_2 substrate surface can be easily scratched. Do not use contact cleaning, please use air-blow for dirt cleaning.
- ▶ The CaF_2 and the MgF_2 substrates get rough under high temperature and high humidity environment. Stock them in dry optical cabinet after use.

Surface roughness tester and measurement data



Surface roughness Ra

The definition of surface roughness is defined according to the JIS B0601 standard. The most commonly used parameter is Ra. The Ra is usually shown on specifications by Å Angstrom unit (0.1nm). The definition of Ra value is the calculation of the measured value and the average value; the absolute value is the subtraction of the measured value to the average value. Similar to Root-Mean-Square value (RMS) but with a little bit bigger number.



Optics

Part Number	Diameter ϕD [mm]	Thickness t [mm]	Material	Surface flatness	Parallelism [$''$]	Surface Quality (Scratch-Dig)
OPSQSP-25.4C05-10-5	$\phi 25.4$	5	Synthetic fused silica	$\lambda/10$	<5	10-5
OPSQSP-30C03-10-5	$\phi 30$	3	Synthetic fused silica	$\lambda/10$	<5	10-5
OPSQSP-30C05-10-5	$\phi 30$	5	Synthetic fused silica	$\lambda/10$	<5	10-5
OPSQSP-50C05-10-5	$\phi 50$	5	Synthetic fused silica	$\lambda/10$	<5	10-5
OPCFSP-25.4C05-10-5	$\phi 25.4$	5	CaF_2	$\lambda/10$	<5	20-10
OPCFSP-30C05-10-5	$\phi 30$	5	CaF_2	$\lambda/10$	<5	20-10
OPMFSP-25.4C05-10-5	$\phi 25.4$	5	MgF_2	$\lambda/10$	<5	20-10
OPMFSP-30C05-10-5	$\phi 30$	5	MgF_2	$\lambda/10$	<5	20-10

Wedge

Part Number	Diameter ϕD [mm]	Thickness t [mm]	Material	Surface flatness	Wedge angle W	Surface Quality (Scratch-Dig)
WSSQSP-30C05-10-1	$\phi 30$	5	Synthetic fused silica	$\lambda/10$	$1^\circ \pm 5'$	10-5
WSSQSP-50C08-10-1	$\phi 50$	8	Synthetic fused silica	$\lambda/10$	$1^\circ \pm 5'$	10-5
WSCFSP-30C05-10-1	$\phi 30$	5	CaF_2	$\lambda/10$	$1^\circ \pm 5'$	20-10
WSMFSP-30C05-10-1	$\phi 30$	5	MgF_2	$\lambda/10$	$1^\circ \pm 5'$	20-10

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Wedged Substrates

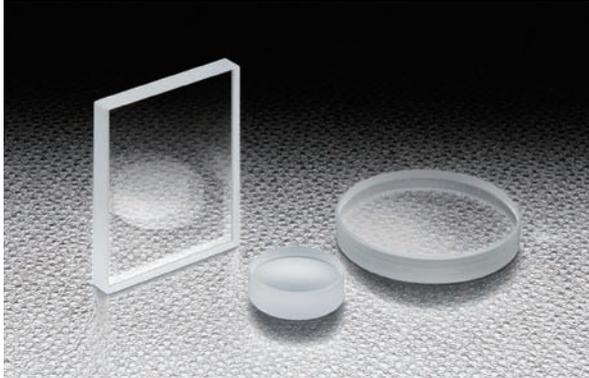
Concave Mirror
Substrates

Master Optics

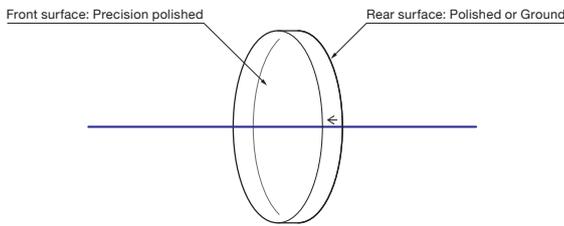
Windows

These Optical Flats are precision polished on one side to a high accuracy and surface quality. They are suitable substrates to be coated with an optical thin film, such as a custom-made mirror.

- We offer these substrates in a wide variety of shapes and sizes, thickness and surface accuracy to allow for selection according to your required specifications.

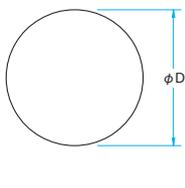


Schematic



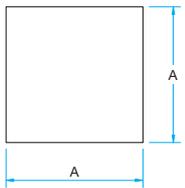
Outline Drawing (in mm)

● Circle



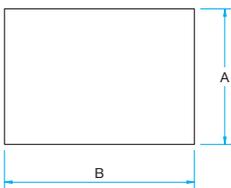
- Tolerance
- $\phi D \leq \phi 50.8$
Diameter $\phi D_{-0.1}^{0.0}$
Thickness $t \pm 0.1$
- $\phi D \geq \phi 60$
Diameter $\phi D_{-0.2}^{0.0}$
Thickness $t \pm 0.2$

● Square



- Tolerance
- $A \leq 50$
Length $A_{-0.1}^{0.0}$
Thickness $t \pm 0.1$
- $A \geq 60$
Length $A_{-0.2}^{0.0}$
Thickness $t \pm 0.2$

● Rectangle



- Tolerance
- $A \times B \leq 40 \times 50$
Length $A_{-0.1}^{0.0}$ $B_{-0.1}^{0.0}$
Thickness $t \pm 0.1$
- $A \times B \geq 50 \times 60$
Length $A_{-0.2}^{0.0}$ $B_{-0.2}^{0.0}$
Thickness $t \pm 0.2$

Specifications

Material	BK7, Synthetic fused silica, Pyrex® or Equivalent (PX)
Parallelism	<3'
Clear aperture	90% of actual aperture, or a circle or ellipse inscribed in the rectangle of 90% Dimensions

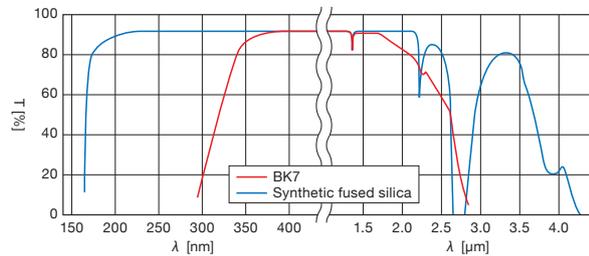
Guide

- ▶ Substrates precision polished on both sides are also available as optical parallels (OPB, OPSQ, OPSQK). [Reference](#) B292
- ▶ Pyrex® is a registered trademark of Corning.

Attention

- ▶ Planar substrate is not coated on both sides and there is a 3.5 to 4% reflection of the surface.
- ▶ When used in transmission (back surface is polished) the planar substrate, there is a possibility that the transmitted beam is slightly deviated. The appropriate substrate for use in transmission is the parallel planar substrate (OPB, OPSQ, OPSQK). [Reference](#) B292
- ▶ No surface accuracy guarantee data is provided with the product. If you need the sheet containing the surface accuracy guarantee data, an additional cost for creating the data is required. Please contact our Sales Division with your request.

Typical Transmittance Data



Surface Accuracy Data (reference data)



- Surface accuracy measurement method: Measured with Zygo laser interferometer
- Surface accuracy measurement wavelength: 632.8nm
- Surface accuracy guaranteed temperature: 23°C±2°C

Compatible Optic Mounts

MLH-10, -15 / MHG-MP12.7-NL / BSHL-15-2 / MHF-20 / MHG-HS25-NL, -HS30-NL / MHAN-40S

Optical Flats | OFB/OFBP/OFSQ/OFPPX/OFSSQ

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Circle						
Part Number	Diameter ϕ D [mm]	Thickness t [mm]	Material	Surface flatness	Surface Quality (Scratch-Dig)	Rear Surface
OFB-10C03-10	ϕ 10	3	BK7	$\lambda/10$	10-5	Ground
OFB-10C05-10	ϕ 10	5	BK7	$\lambda/10$	10-5	Ground
OFB-10C05-20	ϕ 10	5	BK7	$\lambda/20$	10-5	Ground
OFSQ-10C06-20	ϕ 10	6	Synthetic fused silica	$\lambda/20$	20-10	Ground
OFB-12.7C05-10	ϕ 12.7	5	BK7	$\lambda/10$	10-5	Ground
OFB-15C03-10	ϕ 15	3	BK7	$\lambda/10$	10-5	Ground
OFB-15C05-10	ϕ 15	5	BK7	$\lambda/10$	10-5	Ground
OFB-15C05-20	ϕ 15	5	BK7	$\lambda/20$	10-5	Ground
OFSQ-15C06-20	ϕ 15	6	Synthetic fused silica	$\lambda/20$	20-10	Ground
OFB-20C03-10	ϕ 20	3	BK7	$\lambda/10$	10-5	Ground
OFB-20C05-4	ϕ 20	5	BK7	$\lambda/4$	10-5	Ground
OFB-20C05-10	ϕ 20	5	BK7	$\lambda/10$	10-5	Ground
OFB-20C05-20	ϕ 20	5	BK7	$\lambda/20$	10-5	Ground
OFSQ-20C06-20	ϕ 20	6	Synthetic fused silica	$\lambda/20$	20-10	Ground
OFBP-25C05-1	ϕ 25	5	BK7	λ	10-5	Polished
OFBP-25C05-4	ϕ 25	5	BK7	$\lambda/4$	10-5	Polished
OFBP-25C05-10	ϕ 25	5	BK7	$\lambda/10$	10-5	Polished
OFBP-25C05-20	ϕ 25	5	BK7	$\lambda/20$	10-5	Polished
OFSQP-25C06-20	ϕ 25	6	Synthetic fused silica	$\lambda/20$	20-10	Polished
OFBP-25.4C05-10	ϕ 25.4	5	BK7	$\lambda/10$	10-5	Polished
OFBP-30C05-1	ϕ 30	5	BK7	λ	10-5	Polished
OFBP-30C05-4	ϕ 30	5	BK7	$\lambda/4$	10-5	Polished
OFBP-30C05-10	ϕ 30	5	BK7	$\lambda/10$	10-5	Polished
OFBP-30C05-20	ϕ 30	5	BK7	$\lambda/20$	10-5	Polished
OFSQP-30C06-20	ϕ 30	6	Synthetic fused silica	$\lambda/20$	20-10	Polished
OFBP-40C06-1	ϕ 40	6	BK7	λ	10-5	Polished
OFBP-40C06-4	ϕ 40	6	BK7	$\lambda/4$	10-5	Polished
OFBP-40C06-10	ϕ 40	6	BK7	$\lambda/10$	10-5	Polished
OFBP-40C06-20	ϕ 40	6	BK7	$\lambda/20$	10-5	Polished
OFSQP-40C08-20	ϕ 40	8	Synthetic fused silica	$\lambda/20$	20-10	Polished
OFBP-50C08-1	ϕ 50	8	BK7	λ	10-5	Polished
OFBP-50C08-4	ϕ 50	8	BK7	$\lambda/4$	10-5	Polished
OFBP-50C08-10	ϕ 50	8	BK7	$\lambda/10$	10-5	Polished
OFBP-50C08-20	ϕ 50	8	BK7	$\lambda/20$	10-5	Polished
OFSQP-50C10-20	ϕ 50	10	Synthetic fused silica	$\lambda/20$	20-10	Polished
OFBP-50.8C08-10	ϕ 50.8	8	BK7	$\lambda/10$	10-5	Polished
OFPPX-60C10-1	ϕ 60	10	PX	λ	10-5	Polished
OFPPX-60C10-4	ϕ 60	10	PX	$\lambda/4$	10-5	Polished
OFPPX-60C10-10	ϕ 60	10	PX	$\lambda/10$	10-5	Polished
OFPPX-60C10-20	ϕ 60	10	PX	$\lambda/20$	10-5	Polished
OFPPX-80C12-1	ϕ 80	12	PX	λ	10-5	Polished
OFPPX-80C12-4	ϕ 80	12	PX	$\lambda/4$	10-5	Polished
OFPPX-80C12-10	ϕ 80	12	PX	$\lambda/10$	10-5	Polished
OFPPX-80C12-20	ϕ 80	12	PX	$\lambda/20$	10-5	Polished
OFPPX-100C15-1	ϕ 100	15	PX	λ	10-5	Polished
OFPPX-100C15-4	ϕ 100	15	PX	$\lambda/4$	10-5	Polished
OFPPX-100C15-10	ϕ 100	15	PX	$\lambda/10$	10-5	Polished
OFPPX-130C18-1	ϕ 130	18	PX	λ	10-5	Polished
OFPPX-130C18-4	ϕ 130	18	PX	$\lambda/4$	10-5	Polished
OFPPX-130C18-10	ϕ 130	18	PX	$\lambda/10$	10-5	Polished
OFPPX-150C20-1	ϕ 150	20	PX	λ	10-5	Polished
OFPPX-150C20-4	ϕ 150	20	PX	$\lambda/4$	10-5	Polished
OFPPX-150C20-10	ϕ 150	20	PX	$\lambda/10$	10-5	Polished

Square						
Part Number	Length A [mm]	Thickness t [mm]	Material	Surface flatness	Surface Quality (Scratch-Dig)	Rear Surface
OFB-10S03-10	\square 10	3	BK7	$\lambda/10$	10-5	Ground
OFB-10S05-10	\square 10	5	BK7	$\lambda/10$	10-5	Ground
OFB-10S05-20	\square 10	5	BK7	$\lambda/20$	10-5	Ground
OFSQ-10S06-20	\square 10	6	Synthetic fused silica	$\lambda/20$	20-10	Ground
OFB-15S03-4	\square 15	3	BK7	$\lambda/4$	10-5	Ground
OFB-15S03-10	\square 15	3	BK7	$\lambda/10$	10-5	Ground
OFB-15S05-4	\square 15	5	BK7	$\lambda/4$	10-5	Ground
OFB-15S05-10	\square 15	5	BK7	$\lambda/10$	10-5	Ground
OFB-15S05-20	\square 15	5	BK7	$\lambda/20$	10-5	Ground
OFSQ-15S06-20	\square 15	6	Synthetic fused silica	$\lambda/20$	20-10	Ground
OFB-20S03-4	\square 20	3	BK7	$\lambda/4$	10-5	Ground
OFB-20S03-10	\square 20	3	BK7	$\lambda/10$	10-5	Ground
OFB-20S05-4	\square 20	5	BK7	$\lambda/4$	10-5	Ground
OFB-20S05-10	\square 20	5	BK7	$\lambda/10$	10-5	Ground
OFB-20S05-20	\square 20	5	BK7	$\lambda/20$	10-5	Ground
OFSQ-20S06-20	\square 20	6	Synthetic fused silica	$\lambda/20$	20-10	Ground
OFB-25S05-1	\square 25	5	BK7	λ	10-5	Ground
OFB-25S05-4	\square 25	5	BK7	$\lambda/4$	10-5	Ground
OFB-25S05-10	\square 25	5	BK7	$\lambda/10$	10-5	Ground
OFB-25S05-20	\square 25	5	BK7	$\lambda/20$	10-5	Ground
OFSQ-25S06-20	\square 25	6	Synthetic fused silica	$\lambda/20$	20-10	Ground
OFB-30S05-1	\square 30	5	BK7	λ	10-5	Ground
OFB-30S05-4	\square 30	5	BK7	$\lambda/4$	10-5	Ground
OFB-30S05-10	\square 30	5	BK7	$\lambda/10$	10-5	Ground
OFB-30S05-20	\square 30	5	BK7	$\lambda/20$	10-5	Ground
OFSQ-30S06-20	\square 30	6	Synthetic fused silica	$\lambda/20$	20-10	Ground
OFPPX-40S06-1	\square 40	6	PX	λ	10-5	Polished
OFPPX-40S06-4	\square 40	6	PX	$\lambda/4$	10-5	Polished
OFPPX-40S06-10	\square 40	6	PX	$\lambda/10$	10-5	Polished
OFPPX-40S06-20	\square 40	6	PX	$\lambda/20$	10-5	Polished
OFPPX-50S08-1	\square 50	8	PX	λ	10-5	Polished
OFPPX-50S08-4	\square 50	8	PX	$\lambda/4$	10-5	Polished
OFPPX-50S08-10	\square 50	8	PX	$\lambda/10$	10-5	Polished
OFPPX-50S08-20	\square 50	8	PX	$\lambda/20$	10-5	Polished
OFPPX-60S10-1	\square 60	10	PX	λ	10-5	Polished
OFPPX-60S10-4	\square 60	10	PX	$\lambda/4$	10-5	Polished
OFPPX-60S10-10	\square 60	10	PX	$\lambda/10$	10-5	Polished
OFPPX-60S10-20	\square 60	10	PX	$\lambda/20$	10-5	Polished
OFPPX-80S12-1	\square 80	12	PX	λ	10-5	Polished
OFPPX-80S12-4	\square 80	12	PX	$\lambda/4$	10-5	Polished
OFPPX-80S12-10	\square 80	12	PX	$\lambda/10$	10-5	Polished
OFPPX-80S12-20	\square 80	12	PX	$\lambda/20$	10-5	Polished
OFPPX-100S15-1	\square 100	15	PX	λ	10-5	Polished
OFPPX-100S15-4	\square 100	15	PX	$\lambda/4$	10-5	Polished
OFPPX-100S15-10	\square 100	15	PX	$\lambda/10$	10-5	Polished
OFPPX-130S18-1	\square 130	18	PX	λ	10-5	Polished
OFPPX-130S18-4	\square 130	18	PX	$\lambda/4$	10-5	Polished
OFPPX-130S18-10	\square 130	18	PX	$\lambda/10$	10-5	Polished
OFPPX-150S20-1	\square 150	20	PX	λ	10-5	Polished
OFPPX-150S20-4	\square 150	20	PX	$\lambda/4$	10-5	Polished
OFPPX-150S20-10	\square 150	20	PX	$\lambda/10$	10-5	Polished

Compatible Optic Mounts

MHG-MP50-NL, MP50.8-NL / MHG-60MAD + MHG-MP80-NL / MHG-MP80-NL, -MP100-NL / MHA-130AS / MHA-150S



Rectangle						
Part Number	AxB [mm]	Thickness t [mm]	Material	Surface flatness	Surface Quality (Scratch-Dig)	Rear Surface
OFB-1015R03-4	10x15	3	BK7	$\lambda/4$	10-5	Ground
OFB-1015R03-10	10x15	3	BK7	$\lambda/10$	10-5	Ground
OFB-1015R05-4	10x15	5	BK7	$\lambda/4$	10-5	Ground
OFB-1015R05-10	10x15	5	BK7	$\lambda/10$	10-5	Ground
OFB-1015R05-20	10x15	5	BK7	$\lambda/20$	10-5	Ground
OFSQ-1015R06-20	10x15	6	Synthetic fused silica	$\lambda/20$	20-10	Ground
OFB-1525R03-4	15x25	3	BK7	$\lambda/4$	10-5	Ground
OFB-1525R03-10	15x25	3	BK7	$\lambda/10$	10-5	Ground
OFB-1525R05-4	15x25	5	BK7	$\lambda/4$	10-5	Ground
OFB-1525R05-10	15x25	5	BK7	$\lambda/10$	10-5	Ground
OFB-1525R05-20	15x25	5	BK7	$\lambda/20$	10-5	Ground
OFSQ-1525R06-20	15x25	6	Synthetic fused silica	$\lambda/20$	20-10	Ground
OFB-2030R05-1	20x30	5	BK7	λ	10-5	Ground
OFB-2030R05-4	20x30	5	BK7	$\lambda/4$	10-5	Ground
OFB-2030R05-10	20x30	5	BK7	$\lambda/10$	10-5	Ground
OFB-2030R05-20	20x30	5	BK7	$\lambda/20$	10-5	Ground
OFSQ-2030R06-20	20x30	6	Synthetic fused silica	$\lambda/20$	20-10	Ground
OFB-2535R05-1	25x35	5	BK7	λ	10-5	Ground
OFB-2535R05-4	25x35	5	BK7	$\lambda/4$	10-5	Ground
OFB-2535R05-10	25x35	5	BK7	$\lambda/10$	10-5	Ground
OFB-2535R05-20	25x35	5	BK7	$\lambda/20$	10-5	Ground
OFSQ-2535R06-20	25x35	6	Synthetic fused silica	$\lambda/20$	20-10	Ground
OFPXP-3040R06-1	30x40	6	PX	λ	10-5	Polished
OFPXP-3040R06-4	30x40	6	PX	$\lambda/4$	10-5	Polished
OFPXP-3040R06-10	30x40	6	PX	$\lambda/10$	10-5	Polished
OFPXP-3040R06-20	30x40	6	PX	$\lambda/20$	10-5	Polished
OFSQP-3040R08-20	30x40	8	Synthetic fused silica	$\lambda/20$	20-10	Polished
OFPXP-4050R08-1	40x50	8	PX	λ	10-5	Polished
OFPXP-4050R08-4	40x50	8	PX	$\lambda/4$	10-5	Polished
OFPXP-4050R08-10	40x50	8	PX	$\lambda/10$	10-5	Polished
OFPXP-4050R08-20	40x50	8	PX	$\lambda/20$	10-5	Polished
OFPXP-5060R10-1	50x60	10	PX	λ	10-5	Polished
OFPXP-5060R10-4	50x60	10	PX	$\lambda/4$	10-5	Polished
OFPXP-5060R10-10	50x60	10	PX	$\lambda/10$	10-5	Polished
OFPXP-5060R10-20	50x60	10	PX	$\lambda/20$	10-5	Polished
OFPXP-6080R12-1	60x80	12	PX	λ	10-5	Polished
OFPXP-6080R12-4	60x80	12	PX	$\lambda/4$	10-5	Polished
OFPXP-6080R12-10	60x80	12	PX	$\lambda/10$	10-5	Polished
OFPXP-6080R12-20	60x80	12	PX	$\lambda/20$	10-5	Polished
OFPXP-80100R15-1	80x100	15	PX	λ	10-5	Polished
OFPXP-80100R15-4	80x100	15	PX	$\lambda/4$	10-5	Polished
OFPXP-80100R15-10	80x100	15	PX	$\lambda/10$	10-5	Polished

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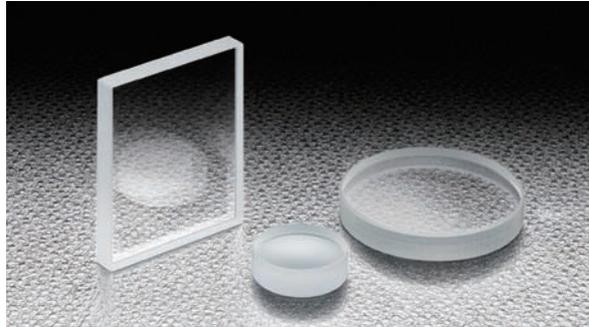
Reasonable Optical Flat

S-OFB/S-OFBP/S-OPB/S-WSB

RoHS

Catalog Code W3215

This lower cost product offering of Plano Glass Substrates has only minimal reduction in surface quality and is perfect for most applications. The surface accuracy and parallelism (tolerance of wedged) is the same as our optical flats used for high quality laser applications.



- We also offer the fabrication of the substrates with coating per your specific specifications, contact our Sales Division with your request.
- In addition to the circle, square, rectangular substrates, wedged substrates and high surface accuracy on both sides are available.

Specifications

Material	BK7
Surface flatness	$\lambda/10$
Clear aperture	90% of actual aperture, or a circle or ellipse inscribed in the rectangle of 90% Dimensions
Surface Quality (Scratch-Dig)	60-40

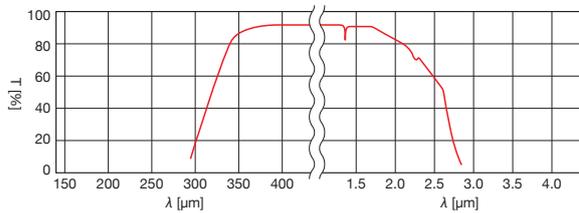
Guide

- ▶ A planar substrate OFB and OFBP are also available with better surface quality which minimizes laser light scattering. [Reference](#) B287

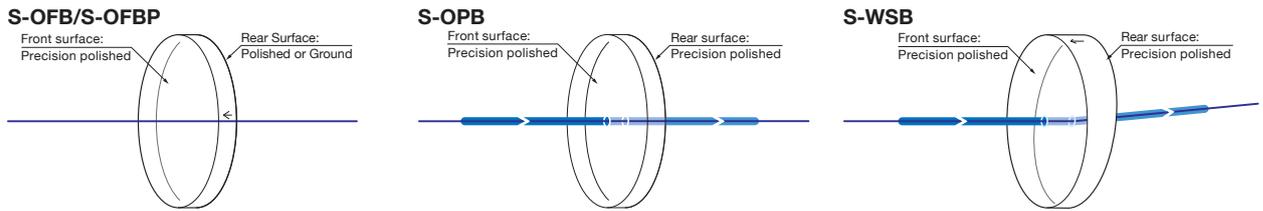
Attention

- ▶ Transmissions losses due to reflection off the front and rear surfaces of the Parallel flat substrate can be minimized by coating the surfaces. Consult our Sales Division for anti-reflection coatings suitable for your application.
- ▶ A data sheet for accuracy guarantee of the surface flatness is not included with the product. If you need a guarantee sheet of the flatness data, Please contact our Sales Division for a quotation.

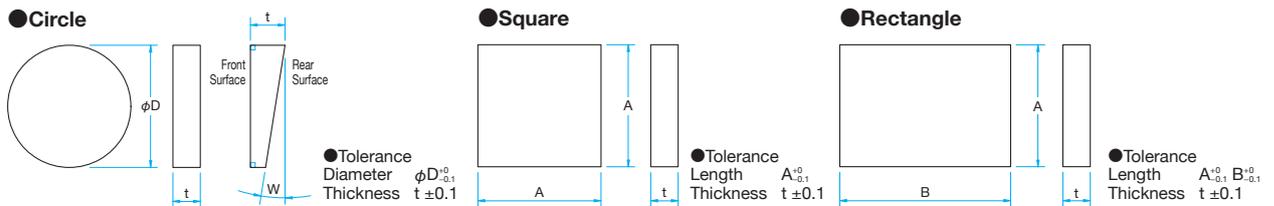
Typical Transmittance Data T: Transmission



Schematic



Outline Drawing



Circle

Part Number	Diameter φD [mm]	Thickness t [mm]	Parallelism	Rear Surface
S-OFB-10C03-10	φ10	3	<3'	Ground
S-OFB-10C05-10	φ10	5	<3'	Ground
S-OFB-15C03-10	φ15	3	<3'	Ground
S-OFB-20C03-10	φ20	3	<3'	Ground
S-OFB-20C05-10	φ20	5	<3'	Ground
S-OFBP-25C05-10	φ25	5	<3'	Polished
S-OFBP-25.4C05-10	φ25.4	5	<3'	Polished
S-OFBP-30C05-10	φ30	5	<3'	Polished
S-OFBP-40C06-10	φ40	6	<3'	Polished
S-OFBP-50C08-10	φ50	8	<3'	Polished

Square/Rectangle

Part Number	Length AxB [mm]	Thickness t [mm]	Parallelism	Rear Surface
S-OFB-10S03-10	10x10	3	<3'	Ground
S-OFB-15S03-10	15x15	3	<3'	Ground
S-OFB-15S05-10	15x15	5	<3'	Ground
S-OFB-20S03-10	20x20	3	<3'	Ground
S-OFB-25S05-10	25x25	5	<3'	Ground
S-OFB-30S05-10	30x30	5	<3'	Ground
S-OFB-1015R03-10	10x15	3	<3'	Ground
S-OFB-2535R05-10	25x35	5	<3'	Ground

Optical parallel

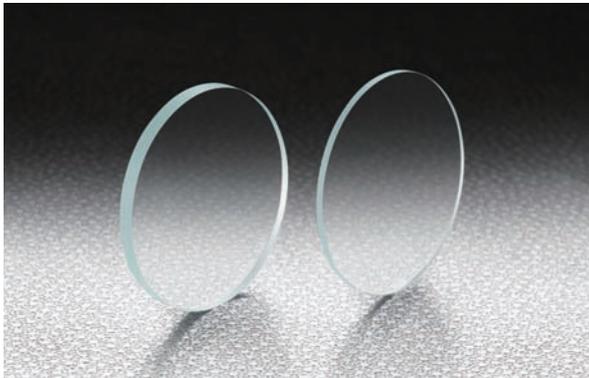
Part Number	Diameter φD [mm]	Thickness t [mm]	Parallelism	Rear Surface Surface flatness
S-OPB-25.4C03-10-5	φ25.4	3	<5"	$\lambda/10$
S-OPB-25.4C05-10-5	φ25.4	5	<5"	$\lambda/10$
S-OPB-30C03-10-5	φ30	3	<5"	$\lambda/10$
S-OPB-30C05-10-5	φ30	5	<5"	$\lambda/10$
S-OPB-40C04-10-5	φ40	4	<5"	$\lambda/10$
S-OPB-40C06-10-5	φ40	6	<5"	$\lambda/10$
S-OPB-50C05-10-5	φ50	5	<5"	$\lambda/10$
S-OPB-50C08-10-5	φ50	8	<5"	$\lambda/10$

Wedge

Part Number	Diameter φD [mm]	Thickness t [mm]	Wedge Angle W	Rear Surface Surface flatness
S-WSB-30C05-10-1	φ30	5	1°±5'	$\lambda/10$
S-WSB-50C08-10-1	φ50	8	1°±5'	$\lambda/10$

Float glass is a glass substrate made by the float process used in the production of window glass. This fabrication process does not require surface polishing or molding and produces large plate sheets in large volumes resulting in lower cost substrates.

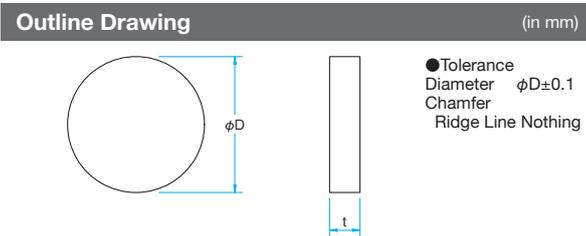
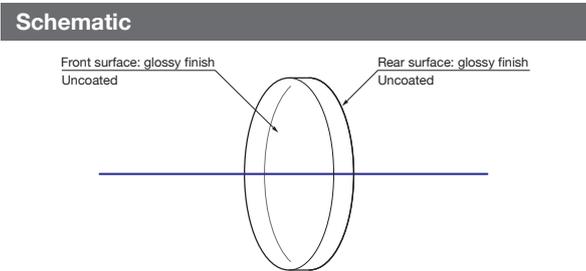
- Float Glass is also available in large lots with coating contact our Sales Division with you requirement specifications.
- Because the edges are not chamfered, there will be some cases that small chipping occur.



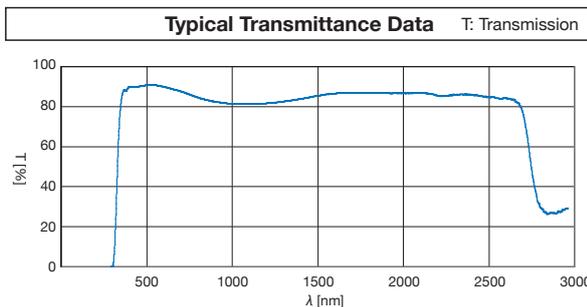
Specifications	
Material	Float glass (blue sheet)
Surface flatness	4 – 6λ
Clear aperture	90% of actual aperture
Surface Quality (Scratch-Dig)	60–40

Attention

► Transmissions losses due to reflection off the front and rear surfaces of the Parallel flat substrate can be minimized by coating the surfaces. Consult our Sales Division for anti-reflection coatings suitable for your application.



Specifications		
Part Number	Diameter ϕD [mm]	Thickness t [mm]
OPFL-15C01-P	$\phi 15$	1±0.3
OPFL-15C02-P	$\phi 15$	2±0.4
OPFL-15C03-P	$\phi 15$	3±0.4
OPFL-25.4C01-P	$\phi 25.4$	1±0.3
OPFL-25.4C02-P	$\phi 25.4$	2±0.4
OPFL-25.4C03-P	$\phi 25.4$	3±0.4
OPFL-30C01-P	$\phi 30$	1±0.3
OPFL-30C02-P	$\phi 30$	2±0.4
OPFL-30C03-P	$\phi 30$	3±0.4



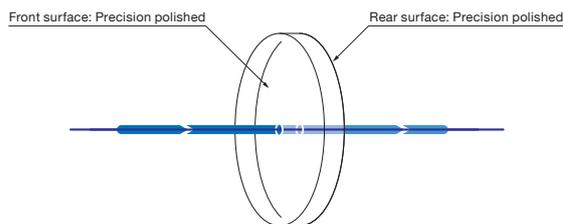
Optical Parallels are precision substrates polished on both sides with excellent surface quality and surface flatness.

These substrates can be used with thin film coatings to make custom windows and beamsplitters.

- The Optical Parallels are available in BK7 for visible and infrared wavelength range, synthetic fused silica for high ultra-violet transmission, and a synthetic fused silica for excimer laser that can be used for KrF excimer laser (248nm).
- The high accuracy of the substrate parallels does not change the angle of the transmitted beam when you insert it parallel to the substrate perpendicular to the optical path of the laser.
- The high surface precision substrate can also be used instead of a Newton test plate.



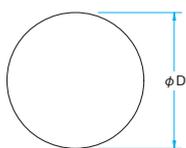
Schematic



Outline Drawing

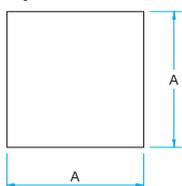
(in mm)

● Circle



- Tolerance
- $\phi D \leq \phi 50.8$
- Diameter $\phi D_{-0.1}^{\pm 0.1}$
- Thickness $t \pm 0.1$
- $\phi D \geq \phi 60$
- Diameter $\phi D_{-0.2}^{\pm 0.1}$
- Thickness $t \pm 0.2$

● Square



- Tolerance
- $A \leq 50$
- Length $A_{-0.1}^{\pm 0.1}$
- Thickness $t \pm 0.1$
- $A \geq 60$
- Length $A_{-0.2}^{\pm 0.1}$
- Thickness $t \pm 0.2$

Specifications

Material	BK7, Synthetic fused silica, Synthetic fused silica for excimer laser
Clear aperture	90% of actual aperture, or a circle or ellipse inscribed in the rectangle of 90% Dimensions
Surface Quality (Scratch-Dig)	BK7: 10-5 Synthetic fused silica, Synthetic fused silica for Excimer Laser: 20-10

Guide

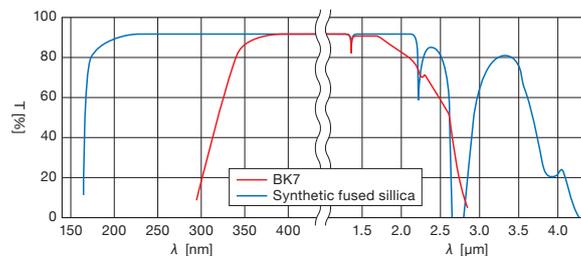
- ▶ There are also wedge substrate (WSB/WSSQ/WSSQK) available which can prevent the influence of back reflection. [Reference](#) B300
- ▶ We also offer the fabrication of the substrates with coating per your specific specifications, contact our Sales Division with your request.

Attention

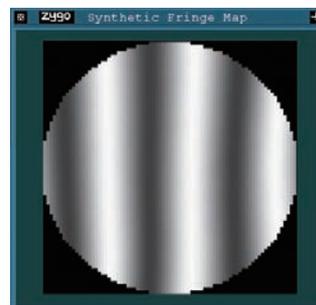
- ▶ Transmissions losses due to reflection off the front and rear surfaces of the Parallel flat substrate can be minimized by coating the surfaces. Consult our Sales Division for anti-reflection coatings suitable for your application.
- ▶ A data sheet for accuracy guarantee of the surface flatness is not included with the product. If you need a guarantee sheet of the flatness data, Please contact our Sales Division for a quotation.

Typical Transmittance Data

T: Transmission



Surface Accuracy Data (reference data)



- Surface accuracy measurement method: Measured with Zygo laser interferometer
- Surface accuracy measurement wavelength 632.8nm
- Surface accuracy guaranteed temperature 23°C±2°C

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BK7/Circle $\phi 10 - \phi 20$				
Part Number	Diameter ϕD [mm]	Thickness t [mm]	Surface flatness	Parallelism
OPB-10C01-10-5	$\phi 10$	1	$\lambda/10$	$<00'05''$
OPB-10C01-4-5	$\phi 10$	1	$\lambda/4$	$<00'05''$
OPB-10C01-1-5	$\phi 10$	1	λ	$<00'05''$
OPB-10C01-P	$\phi 10$	1	$4\lambda^*$	$<03'00''$
OPB-10C02-20-2	$\phi 10$	2	$\lambda/20$	$<00'02''$
OPB-10C02-10-5	$\phi 10$	2	$\lambda/10$	$<00'05''$
OPB-10C02-4-5	$\phi 10$	2	$\lambda/4$	$<00'05''$
OPB-10C02-1-5	$\phi 10$	2	λ	$<00'05''$
OPB-10C02-P	$\phi 10$	2	$4\lambda^*$	$<03'00''$
OPB-10C03-20-2	$\phi 10$	3	$\lambda/20$	$<00'02''$
OPB-10C03-10-5	$\phi 10$	3	$\lambda/10$	$<00'05''$
OPB-10C03-4-5	$\phi 10$	3	$\lambda/4$	$<00'05''$
OPB-10C03-1-5	$\phi 10$	3	λ	$<00'05''$
OPB-10C03-P	$\phi 10$	3	$4\lambda^*$	$<03'00''$
OPB-10C05-20-2	$\phi 10$	5	$\lambda/20$	$<00'02''$
OPB-10C05-10-5	$\phi 10$	5	$\lambda/10$	$<00'05''$
OPB-10C05-4-5	$\phi 10$	5	$\lambda/4$	$<00'05''$
OPB-10C05-1-5	$\phi 10$	5	λ	$<00'05''$
OPB-10C05-P	$\phi 10$	5	$4\lambda^*$	$<03'00''$
OPB-12.7C03-10-5	$\phi 12.7$	3	$\lambda/10$	$<00'05''$
OPB-12.7C03-4-5	$\phi 12.7$	3	$\lambda/4$	$<00'05''$
OPB-12.7C05-10-5	$\phi 12.7$	5	$\lambda/10$	$<00'05''$
OPB-12.7C05-4-5	$\phi 12.7$	5	$\lambda/4$	$<00'05''$
OPB-15C01-1-5	$\phi 15$	1	λ	$<00'05''$
OPB-15C01-P	$\phi 15$	1	$4\lambda^*$	$<03'00''$
OPB-15C02-10-5	$\phi 15$	2	$\lambda/10$	$<00'05''$
OPB-15C02-4-5	$\phi 15$	2	$\lambda/4$	$<00'05''$
OPB-15C02-1-5	$\phi 15$	2	λ	$<00'05''$
OPB-15C02-P	$\phi 15$	2	$4\lambda^*$	$<03'00''$
OPB-15C03-20-2	$\phi 15$	3	$\lambda/20$	$<00'02''$
OPB-15C03-10-5	$\phi 15$	3	$\lambda/10$	$<00'05''$
OPB-15C03-4-5	$\phi 15$	3	$\lambda/4$	$<00'05''$
OPB-15C03-1-5	$\phi 15$	3	λ	$<00'05''$
OPB-15C03-P	$\phi 15$	3	$4\lambda^*$	$<03'00''$
OPB-15C05-20-2	$\phi 15$	5	$\lambda/20$	$<00'02''$
OPB-15C05-10-5	$\phi 15$	5	$\lambda/10$	$<00'05''$
OPB-15C05-4-5	$\phi 15$	5	$\lambda/4$	$<00'05''$
OPB-15C05-1-5	$\phi 15$	5	λ	$<00'05''$
OPB-15C05-P	$\phi 15$	5	$4\lambda^*$	$<03'00''$
OPB-20C01-1-5	$\phi 20$	1	λ	$<00'05''$
OPB-20C01-P	$\phi 20$	1	$4\lambda^*$	$<03'00''$
OPB-20C02-10-5	$\phi 20$	2	$\lambda/10$	$<00'05''$
OPB-20C02-4-5	$\phi 20$	2	$\lambda/4$	$<00'05''$
OPB-20C02-1-5	$\phi 20$	2	λ	$<00'05''$
OPB-20C02-P	$\phi 20$	2	$4\lambda^*$	$<03'00''$
OPB-20C03-20-2	$\phi 20$	3	$\lambda/20$	$<00'02''$
OPB-20C03-10-5	$\phi 20$	3	$\lambda/10$	$<00'05''$
OPB-20C03-4-5	$\phi 20$	3	$\lambda/4$	$<00'05''$
OPB-20C03-1-5	$\phi 20$	3	λ	$<00'05''$
OPB-20C03-P	$\phi 20$	3	$4\lambda^*$	$<03'00''$
OPB-20C05-20-2	$\phi 20$	5	$\lambda/20$	$<00'02''$
OPB-20C05-10-5	$\phi 20$	5	$\lambda/10$	$<00'05''$
OPB-20C05-4-5	$\phi 20$	5	$\lambda/4$	$<00'05''$
OPB-20C05-1-5	$\phi 20$	5	λ	$<00'05''$
OPB-20C05-P	$\phi 20$	5	$4\lambda^*$	$<03'00''$

* 4λ shows the surface flatness of the measurement area of $\phi 30\text{mm}$.

BK7/Circle $\phi 25 - \phi 40$				
Part Number	Diameter ϕD [mm]	Thickness t [mm]	Surface flatness	Parallelism
OPB-25C01-1-5	$\phi 25$	1	λ	$<00'05''$
OPB-25C01-P	$\phi 25$	1	$4\lambda^*$	$<03'00''$
OPB-25C02-10-5	$\phi 25$	2	$\lambda/10$	$<00'05''$
OPB-25C02-4-5	$\phi 25$	2	$\lambda/4$	$<00'05''$
OPB-25C02-1-5	$\phi 25$	2	λ	$<00'05''$
OPB-25C02-P	$\phi 25$	2	$4\lambda^*$	$<03'00''$
OPB-25C03-10-5	$\phi 25$	3	$\lambda/10$	$<00'05''$
OPB-25C03-4-5	$\phi 25$	3	$\lambda/4$	$<00'05''$
OPB-25C03-1-5	$\phi 25$	3	λ	$<00'05''$
OPB-25C03-P	$\phi 25$	3	$4\lambda^*$	$<03'00''$
OPB-25C05-20-2	$\phi 25$	5	$\lambda/20$	$<00'02''$
OPB-25C05-10-5	$\phi 25$	5	$\lambda/10$	$<00'05''$
OPB-25C05-4-5	$\phi 25$	5	$\lambda/4$	$<00'05''$
OPB-25C05-1-5	$\phi 25$	5	λ	$<00'05''$
OPB-25C05-P	$\phi 25$	5	$4\lambda^*$	$<03'00''$
OPB-25.4C03-10-5	$\phi 25.4$	3	$\lambda/10$	$<00'05''$
OPB-25.4C03-4-5	$\phi 25.4$	3	$\lambda/4$	$<00'05''$
OPB-25.4C05-10-5	$\phi 25.4$	5	$\lambda/10$	$<00'05''$
OPB-25.4C05-4-5	$\phi 25.4$	5	$\lambda/4$	$<00'05''$
OPB-30C01-1-5	$\phi 30$	1	λ	$<00'05''$
OPB-30C01-P	$\phi 30$	1	$4\lambda^*$	$<03'00''$
OPB-30C02-10-5	$\phi 30$	2	$\lambda/10$	$<00'05''$
OPB-30C02-4-5	$\phi 30$	2	$\lambda/4$	$<00'05''$
OPB-30C02-1-5	$\phi 30$	2	λ	$<00'05''$
OPB-30C02-P	$\phi 30$	2	$4\lambda^*$	$<03'00''$
OPB-30C03-10-5	$\phi 30$	3	$\lambda/10$	$<00'05''$
OPB-30C03-4-5	$\phi 30$	3	$\lambda/4$	$<00'05''$
OPB-30C03-1-5	$\phi 30$	3	λ	$<00'05''$
OPB-30C03-P	$\phi 30$	3	$4\lambda^*$	$<03'00''$
OPB-30C04-10-5	$\phi 30$	4	$\lambda/10$	$<00'05''$
OPB-30C04-4-5	$\phi 30$	4	$\lambda/4$	$<00'05''$
OPB-30C04-1-5	$\phi 30$	4	λ	$<00'05''$
OPB-30C04-P	$\phi 30$	4	$4\lambda^*$	$<03'00''$
OPB-30C05-20-2	$\phi 30$	5	$\lambda/20$	$<00'02''$
OPB-30C05-10-5	$\phi 30$	5	$\lambda/10$	$<00'05''$
OPB-30C05-4-5	$\phi 30$	5	$\lambda/4$	$<00'05''$
OPB-30C05-1-5	$\phi 30$	5	λ	$<00'05''$
OPB-30C05-P	$\phi 30$	5	$4\lambda^*$	$<03'00''$
OPB-40C01-1-5	$\phi 40$	1	λ	$<00'05''$
OPB-40C01-P	$\phi 40$	1	$4\lambda^*$	$<03'00''$
OPB-40C02-1-5	$\phi 40$	2	λ	$<00'05''$
OPB-40C02-P	$\phi 40$	2	$4\lambda^*$	$<03'00''$
OPB-40C03-4-5	$\phi 40$	3	$\lambda/4$	$<00'05''$
OPB-40C03-1-5	$\phi 40$	3	λ	$<00'05''$
OPB-40C03-P	$\phi 40$	3	$4\lambda^*$	$<03'00''$
OPB-40C04-10-5	$\phi 40$	4	$\lambda/10$	$<00'05''$
OPB-40C04-4-5	$\phi 40$	4	$\lambda/4$	$<00'05''$
OPB-40C04-1-5	$\phi 40$	4	λ	$<00'05''$
OPB-40C04-P	$\phi 40$	4	$4\lambda^*$	$<03'00''$
OPB-40C06-20-2	$\phi 40$	6	$\lambda/20$	$<00'02''$
OPB-40C06-10-5	$\phi 40$	6	$\lambda/10$	$<00'05''$
OPB-40C06-4-5	$\phi 40$	6	$\lambda/4$	$<00'05''$
OPB-40C06-1-5	$\phi 40$	6	λ	$<00'05''$
OPB-40C06-P	$\phi 40$	6	$4\lambda^*$	$<03'00''$

* 4λ shows the surface flatness of the measurement area of $\phi 30\text{mm}$.

Compatible Optic Mounts

MLH-10, -15 / MHG-MP12.7-NL / BSHL-15-2, -20-2 / MHG-HS25-NL, -HS30-NL / MHAN-40S

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BK7/Circle $\phi 50 - \phi 80$				
Part Number	Diameter ϕD [mm]	Thickness t [mm]	Surface flatness	Parallelism
OPB-50C01-1-5	$\phi 50$	1	λ	$<00'05''$
OPB-50C01-P	$\phi 50$	1	$4\lambda^*$	$<03'00''$
OPB-50C02-1-5	$\phi 50$	2	λ	$<00'05''$
OPB-50C02-P	$\phi 50$	2	$4\lambda^*$	$<03'00''$
OPB-50C03-4-5	$\phi 50$	3	$\lambda/4$	$<00'05''$
OPB-50C03-1-5	$\phi 50$	3	λ	$<00'05''$
OPB-50C03-P	$\phi 50$	3	$4\lambda^*$	$<03'00''$
OPB-50C05-10-5	$\phi 50$	5	$\lambda/10$	$<00'05''$
OPB-50C05-4-5	$\phi 50$	5	$\lambda/4$	$<00'05''$
OPB-50C05-1-5	$\phi 50$	5	λ	$<00'05''$
OPB-50C05-P	$\phi 50$	5	$4\lambda^*$	$<03'00''$
OPB-50C08-20-2	$\phi 50$	8	$\lambda/20$	$<00'02''$
OPB-50C08-10-5	$\phi 50$	8	$\lambda/10$	$<00'05''$
OPB-50C08-4-5	$\phi 50$	8	$\lambda/4$	$<00'05''$
OPB-50C08-1-5	$\phi 50$	8	λ	$<00'05''$
OPB-50C08-P	$\phi 50$	8	$4\lambda^*$	$<03'00''$
OPB-50.8C05-10-5	$\phi 50.8$	5	$\lambda/10$	$<00'05''$
OPB-50.8C05-4-5	$\phi 50.8$	5	$\lambda/4$	$<00'05''$
OPB-50.8C08-10-5	$\phi 50.8$	8	$\lambda/10$	$<00'05''$
OPB-50.8C08-4-5	$\phi 50.8$	8	$\lambda/4$	$<00'05''$
OPB-60C03-1-5	$\phi 60$	3	λ	$<00'05''$
OPB-60C03-P	$\phi 60$	3	$4\lambda^*$	$<03'00''$
OPB-60C06-10-5	$\phi 60$	6	$\lambda/10$	$<00'05''$
OPB-60C06-4-5	$\phi 60$	6	$\lambda/4$	$<00'05''$
OPB-60C06-1-5	$\phi 60$	6	λ	$<00'05''$
OPB-60C06-P	$\phi 60$	6	$4\lambda^*$	$<03'00''$
OPB-60C10-20-2	$\phi 60$	10	$\lambda/20$	$<00'02''$
OPB-60C10-10-5	$\phi 60$	10	$\lambda/10$	$<00'05''$
OPB-60C10-4-5	$\phi 60$	10	$\lambda/4$	$<00'05''$
OPB-60C10-1-5	$\phi 60$	10	λ	$<00'05''$
OPB-60C10-P	$\phi 60$	10	$4\lambda^*$	$<03'00''$
OPB-80C08-10-5	$\phi 80$	8	$\lambda/10$	$<00'05''$
OPB-80C08-4-5	$\phi 80$	8	$\lambda/4$	$<00'05''$
OPB-80C08-1-5	$\phi 80$	8	λ	$<00'05''$
OPB-80C08-P	$\phi 80$	8	$4\lambda^*$	$<03'00''$
OPB-80C12-20-2	$\phi 80$	12	$\lambda/20$	$<00'02''$
OPB-80C12-10-5	$\phi 80$	12	$\lambda/10$	$<00'05''$
OPB-80C12-4-5	$\phi 80$	12	$\lambda/4$	$<00'05''$
OPB-80C12-1-5	$\phi 80$	12	λ	$<00'05''$
OPB-80C12-P	$\phi 80$	12	$4\lambda^*$	$<03'00''$

* 4λ shows the surface flatness of the measurement area of $\phi 30\text{mm}$.

BK7/Circle $\phi 100 - \phi 150$				
Part Number	Diameter ϕD [mm]	Thickness t [mm]	Surface flatness	Parallelism
OPB-100C10-10-5	$\phi 100$	10	$\lambda/10$	$<00'05''$
OPB-100C10-4-5	$\phi 100$	10	$\lambda/4$	$<00'05''$
OPB-100C10-1-5	$\phi 100$	10	λ	$<00'05''$
OPB-100C10-P	$\phi 100$	10	$4\lambda^*$	$<03'00''$
OPB-100C15-20-2	$\phi 100$	15	$\lambda/20$	$<00'02''$
OPB-100C15-10-5	$\phi 100$	15	$\lambda/10$	$<00'05''$
OPB-100C15-4-5	$\phi 100$	15	$\lambda/4$	$<00'05''$
OPB-100C15-1-5	$\phi 100$	15	λ	$<00'05''$
OPB-100C15-P	$\phi 100$	15	$4\lambda^*$	$<03'00''$
OPB-130C13-10-5	$\phi 130$	13	$\lambda/10$	$<00'05''$
OPB-130C13-4-5	$\phi 130$	13	$\lambda/4$	$<00'05''$
OPB-130C13-1-5	$\phi 130$	13	λ	$<00'05''$
OPB-130C13-P	$\phi 130$	13	$4\lambda^*$	$<03'00''$
OPB-130C18-10-5	$\phi 130$	18	$\lambda/10$	$<00'05''$
OPB-130C18-4-5	$\phi 130$	18	$\lambda/4$	$<00'05''$
OPB-130C18-1-5	$\phi 130$	18	λ	$<00'05''$
OPB-130C18-P	$\phi 130$	18	$4\lambda^*$	$<03'00''$
OPB-150C15-10-5	$\phi 150$	15	$\lambda/10$	$<00'05''$
OPB-150C15-4-5	$\phi 150$	15	$\lambda/4$	$<00'05''$
OPB-150C15-1-5	$\phi 150$	15	λ	$<00'05''$
OPB-150C15-P	$\phi 150$	15	$4\lambda^*$	$<03'00''$
OPB-150C20-10-5	$\phi 150$	20	$\lambda/10$	$<00'05''$
OPB-150C20-4-5	$\phi 150$	20	$\lambda/4$	$<00'05''$
OPB-150C20-1-5	$\phi 150$	20	λ	$<00'05''$
OPB-150C20-P	$\phi 150$	20	$4\lambda^*$	$<03'00''$

* 4λ shows the surface flatness of the measurement area of $\phi 30\text{mm}$.

Compatible Optic Mounts

MHG-PM50-NL, -PM50.8-NL, -80-NL, -100-NL / MHA-130AS, -150S / MHAN-60S



BK7/Square □10 – □20				
Part Number	Length A [mm]	Thickness t [mm]	Surface flatness	Parallelism
OPB-10S01-10-5	□10	1	$\lambda/10$	<00'05"
OPB-10S01-4-5	□10	1	$\lambda/4$	<00'05"
OPB-10S01-1-5	□10	1	λ	<00'05"
OPB-10S01-P	□10	1	4 λ^*	<03'00"
OPB-10S02-20-2	□10	2	$\lambda/20$	<00'02"
OPB-10S02-10-5	□10	2	$\lambda/10$	<00'05"
OPB-10S02-4-5	□10	2	$\lambda/4$	<00'05"
OPB-10S02-1-5	□10	2	λ	<00'05"
OPB-10S02-P	□10	2	4 λ^*	<03'00"
OPB-10S03-20-2	□10	3	$\lambda/20$	<00'02"
OPB-10S03-10-5	□10	3	$\lambda/10$	<00'05"
OPB-10S03-4-5	□10	3	$\lambda/4$	<00'05"
OPB-10S03-1-5	□10	3	λ	<00'05"
OPB-10S03-P	□10	3	4 λ^*	<03'00"
OPB-10S05-20-2	□10	5	$\lambda/20$	<00'02"
OPB-10S05-10-5	□10	5	$\lambda/10$	<00'05"
OPB-10S05-4-5	□10	5	$\lambda/4$	<00'05"
OPB-10S05-1-5	□10	5	λ	<00'05"
OPB-10S05-P	□10	5	4 λ^*	<03'00"
OPB-15S01-1-5	□15	1	λ	<00'05"
OPB-15S01-P	□15	1	4 λ^*	<03'00"
OPB-15S02-10-5	□15	2	$\lambda/10$	<00'05"
OPB-15S02-4-5	□15	2	$\lambda/4$	<00'05"
OPB-15S02-1-5	□15	2	λ	<00'05"
OPB-15S02-P	□15	2	4 λ^*	<03'00"
OPB-15S03-20-2	□15	3	$\lambda/20$	<00'02"
OPB-15S03-10-5	□15	3	$\lambda/10$	<00'05"
OPB-15S03-4-5	□15	3	$\lambda/4$	<00'05"
OPB-15S03-1-5	□15	3	λ	<00'05"
OPB-15S03-P	□15	3	4 λ^*	<03'00"
OPB-15S05-20-2	□15	5	$\lambda/20$	<00'02"
OPB-15S05-10-5	□15	5	$\lambda/10$	<00'05"
OPB-15S05-4-5	□15	5	$\lambda/4$	<00'05"
OPB-15S05-1-5	□15	5	λ	<00'05"
OPB-15S05-P	□15	5	4 λ^*	<03'00"
OPB-20S01-1-5	□20	1	λ	<00'05"
OPB-20S01-P	□20	1	4 λ^*	<03'00"
OPB-20S02-10-5	□20	2	$\lambda/10$	<00'05"
OPB-20S02-4-5	□20	2	$\lambda/4$	<00'05"
OPB-20S02-1-5	□20	2	λ	<00'05"
OPB-20S02-P	□20	2	4 λ^*	<03'00"
OPB-20S03-20-2	□20	3	$\lambda/20$	<00'02"
OPB-20S03-10-5	□20	3	$\lambda/10$	<00'05"
OPB-20S03-4-5	□20	3	$\lambda/4$	<00'05"
OPB-20S03-1-5	□20	3	λ	<00'05"
OPB-20S03-P	□20	3	4 λ^*	<03'00"
OPB-20S05-20-2	□20	5	$\lambda/20$	<00'02"
OPB-20S05-10-5	□20	5	$\lambda/10$	<00'05"
OPB-20S05-4-5	□20	5	$\lambda/4$	<00'05"
OPB-20S05-1-5	□20	5	λ	<00'05"
OPB-20S05-P	□20	5	4 λ^*	<03'00"

* 4 λ shows the surface flatness of the measurement area of $\phi 30\text{mm}$.

BK7/Square □25 – □50				
Part Number	Length A [mm]	Thickness t [mm]	Surface flatness	Parallelism
OPB-25S01-1-5	□25	1	λ	<00'05"
OPB-25S01-P	□25	1	4 λ^*	<03'00"
OPB-25S02-1-5	□25	2	λ	<00'05"
OPB-25S02-P	□25	2	4 λ^*	<03'00"
OPB-25S03-10-5	□25	3	$\lambda/10$	<00'05"
OPB-25S03-4-5	□25	3	$\lambda/4$	<00'05"
OPB-25S03-1-5	□25	3	λ	<00'05"
OPB-25S03-P	□25	3	4 λ^*	<03'00"
OPB-25S05-20-2	□25	5	$\lambda/20$	<00'02"
OPB-25S05-10-5	□25	5	$\lambda/10$	<00'05"
OPB-25S05-4-5	□25	5	$\lambda/4$	<00'05"
OPB-25S05-1-5	□25	5	λ	<00'05"
OPB-25S05-P	□25	5	4 λ^*	<03'00"
OPB-30S01-1-5	□30	1	λ	<00'05"
OPB-30S01-P	□30	1	4 λ^*	<03'00"
OPB-30S02-1-5	□30	2	λ	<00'05"
OPB-30S02-P	□30	2	4 λ^*	<03'00"
OPB-30S03-10-5	□30	3	$\lambda/10$	<00'05"
OPB-30S03-4-5	□30	3	$\lambda/4$	<00'05"
OPB-30S03-1-5	□30	3	λ	<00'05"
OPB-30S03-P	□30	3	4 λ^*	<03'00"
OPB-30S05-20-2	□30	5	$\lambda/20$	<00'02"
OPB-30S05-10-5	□30	5	$\lambda/10$	<00'05"
OPB-30S05-4-5	□30	5	$\lambda/4$	<00'05"
OPB-30S05-1-5	□30	5	λ	<00'05"
OPB-30S05-P	□30	5	4 λ^*	<03'00"
OPB-40S02-1-5	□40	2	λ	<00'05"
OPB-40S02-P	□40	2	4 λ^*	<03'00"
OPB-40S03-1-5	□40	3	λ	<00'05"
OPB-40S03-P	□40	3	4 λ^*	<03'00"
OPB-40S04-10-5	□40	4	$\lambda/10$	<00'05"
OPB-40S04-4-5	□40	4	$\lambda/4$	<00'05"
OPB-40S04-1-5	□40	4	λ	<00'05"
OPB-40S04-P	□40	4	4 λ^*	<03'00"
OPB-40S06-20-2	□40	6	$\lambda/20$	<00'02"
OPB-40S06-10-5	□40	6	$\lambda/10$	<00'05"
OPB-40S06-4-5	□40	6	$\lambda/4$	<00'05"
OPB-40S06-1-5	□40	6	λ	<00'05"
OPB-40S06-P	□40	6	4 λ^*	<03'00"
OPB-50S02-1-5	□50	2	λ	<00'05"
OPB-50S02-P	□50	2	4 λ^*	<03'00"
OPB-50S03-1-5	□50	3	λ	<00'05"
OPB-50S03-P	□50	3	4 λ^*	<03'00"
OPB-50S05-10-5	□50	5	$\lambda/10$	<00'05"
OPB-50S05-4-5	□50	5	$\lambda/4$	<00'05"
OPB-50S05-1-5	□50	5	λ	<00'05"
OPB-50S05-P	□50	5	4 λ^*	<03'00"
OPB-50S08-20-2	□50	8	$\lambda/20$	<00'02"
OPB-50S08-10-5	□50	8	$\lambda/10$	<00'05"
OPB-50S08-4-5	□50	8	$\lambda/4$	<00'05"
OPB-50S08-1-5	□50	8	λ	<00'05"
OPB-50S08-P	□50	8	4 λ^*	<03'00"

* 4 λ shows the surface flatness of the measurement area of $\phi 30\text{mm}$.

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Synthetic fused silica/Circle $\phi 10 - \phi 20$				
Part Number	Diameter ϕD [mm]	Thickness t [mm]	Surface flatness	Parallelism
OPSQ-10C01-10-5	$\phi 10$	1	$\lambda/10$	$<00'05''$
OPSQ-10C01-1-5	$\phi 10$	1	λ	$<00'05''$
OPSQ-10C01-4-5	$\phi 10$	1	$\lambda/4$	$<00'05''$
OPSQ-10C01-P	$\phi 10$	1	$4\lambda^*$	$<03'00''$
OPSQ-10C02-20-2	$\phi 10$	2	$\lambda/20$	$<00'02''$
OPSQ-10C02-10-5	$\phi 10$	2	$\lambda/10$	$<00'05''$
OPSQ-10C02-4-5	$\phi 10$	2	$\lambda/4$	$<00'05''$
OPSQ-10C02-1-5	$\phi 10$	2	λ	$<00'05''$
OPSQ-10C02-P	$\phi 10$	2	$4\lambda^*$	$<03'00''$
OPSQ-10C2.3-1-10	$\phi 10$	2.3	λ	$<00'10''$
OPSQ-10C03-20-2	$\phi 10$	3	$\lambda/20$	$<00'02''$
OPSQ-10C03-10-5	$\phi 10$	3	$\lambda/10$	$<00'05''$
OPSQ-10C03-4-5	$\phi 10$	3	$\lambda/4$	$<00'05''$
OPSQ-10C03-1-5	$\phi 10$	3	λ	$<00'05''$
OPSQ-10C03-P	$\phi 10$	3	$4\lambda^*$	$<03'00''$
OPSQ-10C05-20-2	$\phi 10$	5	$\lambda/20$	$<00'02''$
OPSQ-10C05-10-5	$\phi 10$	5	$\lambda/10$	$<00'05''$
OPSQ-10C05-4-5	$\phi 10$	5	$\lambda/4$	$<00'05''$
OPSQ-10C05-1-5	$\phi 10$	5	λ	$<00'05''$
OPSQ-10C05-P	$\phi 10$	5	$4\lambda^*$	$<03'00''$
OPSQ-12.7C03-10-5	$\phi 12.7$	3	$\lambda/10$	$<00'05''$
OPSQ-12.7C03-4-5	$\phi 12.7$	3	$\lambda/4$	$<00'05''$
OPSQ-12.7C05-10-5	$\phi 12.7$	5	$\lambda/10$	$<00'05''$
OPSQ-15C01-1-5	$\phi 15$	1	λ	$<00'05''$
OPSQ-15C01-P	$\phi 15$	1	$4\lambda^*$	$<03'00''$
OPSQ-15C02-10-5	$\phi 15$	2	$\lambda/10$	$<00'05''$
OPSQ-15C02-4-5	$\phi 15$	2	$\lambda/4$	$<00'05''$
OPSQ-15C02-1-5	$\phi 15$	2	λ	$<00'05''$
OPSQ-15C02-P	$\phi 15$	2	$4\lambda^*$	$<03'00''$
OPSQ-15C2.3-1-10	$\phi 15$	2.3	λ	$<00'10''$
OPSQ-15C03-20-2	$\phi 15$	3	$\lambda/20$	$<00'02''$
OPSQ-15C03-10-5	$\phi 15$	3	$\lambda/10$	$<00'05''$
OPSQ-15C03-4-5	$\phi 15$	3	$\lambda/4$	$<00'05''$
OPSQ-15C03-1-5	$\phi 15$	3	λ	$<00'05''$
OPSQ-15C03-P	$\phi 15$	3	$4\lambda^*$	$<03'00''$
OPSQ-15C05-20-2	$\phi 15$	5	$\lambda/20$	$<00'02''$
OPSQ-15C05-10-5	$\phi 15$	5	$\lambda/10$	$<00'05''$
OPSQ-15C05-4-5	$\phi 15$	5	$\lambda/4$	$<00'05''$
OPSQ-15C05-1-5	$\phi 15$	5	λ	$<00'05''$
OPSQ-15C05-P	$\phi 15$	5	$4\lambda^*$	$<03'00''$
OPSQ-20C01-1-5	$\phi 20$	1	λ	$<00'05''$
OPSQ-20C01-P	$\phi 20$	1	$4\lambda^*$	$<03'00''$
OPSQ-20C02-10-5	$\phi 20$	2	$\lambda/10$	$<00'05''$
OPSQ-20C02-4-5	$\phi 20$	2	$\lambda/4$	$<00'05''$
OPSQ-20C02-1-5	$\phi 20$	2	λ	$<00'05''$
OPSQ-20C02-P	$\phi 20$	2	$4\lambda^*$	$<03'00''$
OPSQ-20C2.3-1-10	$\phi 20$	2.3	λ	$<00'10''$
OPSQ-20C03-20-2	$\phi 20$	3	$\lambda/20$	$<00'02''$
OPSQ-20C03-10-5	$\phi 20$	3	$\lambda/10$	$<00'05''$
OPSQ-20C03-4-5	$\phi 20$	3	$\lambda/4$	$<00'05''$
OPSQ-20C03-1-5	$\phi 20$	3	λ	$<00'05''$
OPSQ-20C03-P	$\phi 20$	3	$4\lambda^*$	$<03'00''$
OPSQ-20C05-20-2	$\phi 20$	5	$\lambda/20$	$<00'02''$
OPSQ-20C05-10-5	$\phi 20$	5	$\lambda/10$	$<00'05''$
OPSQ-20C05-4-5	$\phi 20$	5	$\lambda/4$	$<00'05''$
OPSQ-20C05-1-5	$\phi 20$	5	λ	$<00'05''$
OPSQ-20C05-P	$\phi 20$	5	$4\lambda^*$	$<03'00''$

* 4λ shows the surface flatness of the measurement area of $\phi 30\text{mm}$.

Synthetic fused silica/Circle $\phi 25 - \phi 40$				
Part Number	Diameter ϕD [mm]	Thickness t [mm]	Surface flatness	Parallelism
OPSQ-25C01-1-5	$\phi 25$	1	λ	$<00'05''$
OPSQ-25C01-P	$\phi 25$	1	$4\lambda^*$	$<03'00''$
OPSQ-25C02-10-5	$\phi 25$	2	$\lambda/10$	$<00'05''$
OPSQ-25C02-4-5	$\phi 25$	2	$\lambda/4$	$<00'05''$
OPSQ-25C02-1-5	$\phi 25$	2	λ	$<00'05''$
OPSQ-25C02-P	$\phi 25$	2	$4\lambda^*$	$<03'00''$
OPSQ-25C2.3-0.5-10	$\phi 25$	2.3	2λ	$<00'10''$
OPSQ-25C03-10-5	$\phi 25$	3	$\lambda/10$	$<00'05''$
OPSQ-25C03-4-5	$\phi 25$	3	$\lambda/4$	$<00'05''$
OPSQ-25C03-1-5	$\phi 25$	3	λ	$<00'05''$
OPSQ-25C03-P	$\phi 25$	3	$4\lambda^*$	$<03'00''$
OPSQ-25C05-20-2	$\phi 25$	5	$\lambda/20$	$<00'02''$
OPSQ-25C05-10-5	$\phi 25$	5	$\lambda/10$	$<00'05''$
OPSQ-25C05-4-5	$\phi 25$	5	$\lambda/4$	$<00'05''$
OPSQ-25C05-1-5	$\phi 25$	5	λ	$<00'05''$
OPSQ-25C05-P	$\phi 25$	5	$4\lambda^*$	$<03'00''$
OPSQ-25.4C03-10-5	$\phi 25.4$	3	$\lambda/10$	$<00'05''$
OPSQ-25.4C03-4-5	$\phi 25.4$	3	$\lambda/4$	$<00'05''$
OPSQ-25.4C05-10-5	$\phi 25.4$	5	$\lambda/10$	$<00'05''$
OPSQ-30C01-1-5	$\phi 30$	1	λ	$<00'05''$
OPSQ-30C01-P	$\phi 30$	1	$4\lambda^*$	$<03'00''$
OPSQ-30C02-10-5	$\phi 30$	2	$\lambda/10$	$<00'05''$
OPSQ-30C02-4-5	$\phi 30$	2	$\lambda/4$	$<00'05''$
OPSQ-30C02-1-5	$\phi 30$	2	λ	$<00'05''$
OPSQ-30C02-P	$\phi 30$	2	$4\lambda^*$	$<03'00''$
OPSQ-30C2.3-0.5-10	$\phi 30$	2.3	2λ	$<00'10''$
OPSQ-30C03-10-5	$\phi 30$	3	$\lambda/10$	$<00'05''$
OPSQ-30C03-4-5	$\phi 30$	3	$\lambda/4$	$<00'05''$
OPSQ-30C03-1-5	$\phi 30$	3	λ	$<00'05''$
OPSQ-30C03-P	$\phi 30$	3	$4\lambda^*$	$<03'00''$
OPSQ-30C05-20-2	$\phi 30$	5	$\lambda/20$	$<00'02''$
OPSQ-30C05-10-5	$\phi 30$	5	$\lambda/10$	$<00'05''$
OPSQ-30C05-4-5	$\phi 30$	5	$\lambda/4$	$<00'05''$
OPSQ-30C05-1-5	$\phi 30$	5	λ	$<00'05''$
OPSQ-30C05-P	$\phi 30$	5	$4\lambda^*$	$<03'00''$
OPSQ-40C01-1-5	$\phi 40$	1	λ	$<00'05''$
OPSQ-40C01-P	$\phi 40$	1	$4\lambda^*$	$<03'00''$
OPSQ-40C02-1-5	$\phi 40$	2	λ	$<00'05''$
OPSQ-40C02-P	$\phi 40$	2	$4\lambda^*$	$<03'00''$
OPSQ-40C2.3-0.25-10	$\phi 40$	2.3	4λ	$<00'10''$
OPSQ-40C03-4-5	$\phi 40$	3	$\lambda/4$	$<00'05''$
OPSQ-40C03-1-5	$\phi 40$	3	λ	$<00'05''$
OPSQ-40C03-P	$\phi 40$	3	$4\lambda^*$	$<03'00''$
OPSQ-40C04-10-5	$\phi 40$	4	$\lambda/10$	$<00'05''$
OPSQ-40C04-4-5	$\phi 40$	4	$\lambda/4$	$<00'05''$
OPSQ-40C04-1-5	$\phi 40$	4	λ	$<00'05''$
OPSQ-40C04-P	$\phi 40$	4	$4\lambda^*$	$<03'00''$
OPSQ-40C06-20-2	$\phi 40$	6	$\lambda/20$	$<00'02''$
OPSQ-40C06-10-5	$\phi 40$	6	$\lambda/10$	$<00'05''$
OPSQ-40C06-4-5	$\phi 40$	6	$\lambda/4$	$<00'05''$
OPSQ-40C06-1-5	$\phi 40$	6	λ	$<00'05''$
OPSQ-40C06-P	$\phi 40$	6	$4\lambda^*$	$<03'00''$

* 4λ shows the surface flatness of the measurement area of $\phi 30\text{mm}$.

Compatible Optic Mounts

MLH-10, -15 / BSHL-15-2, -20-2 / MHG-MP12.7-NL / MHG-HS25-NL, -HS30-NL / MHAN-40S



Synthetic fused silica/Circle $\phi 50 - \phi 80$				
Part Number	Diameter ϕD [mm]	Thickness t [mm]	Surface flatness	Parallelism
OPSQ-50C01-1-5	$\phi 50$	1	λ	<00'05"
OPSQ-50C01-P	$\phi 50$	1	4 λ^*	<03'00"
OPSQ-50C02-1-5	$\phi 50$	2	λ	<00'05"
OPSQ-50C02-P	$\phi 50$	2	4 λ^*	<03'00"
OPSQ-50C2.3-0.25-10	$\phi 50$	2.3	4 λ	<00'10"
OPSQ-50C03-4-5	$\phi 50$	3	$\lambda/4$	<00'05"
OPSQ-50C03-1-5	$\phi 50$	3	λ	<00'05"
OPSQ-50C03-P	$\phi 50$	3	4 λ^*	<03'00"
OPSQ-50C05-10-5	$\phi 50$	5	$\lambda/10$	<00'05"
OPSQ-50C05-4-5	$\phi 50$	5	$\lambda/4$	<00'05"
OPSQ-50C05-1-5	$\phi 50$	5	λ	<00'05"
OPSQ-50C05-P	$\phi 50$	5	4 λ^*	<03'00"
OPSQ-50C08-20-2	$\phi 50$	8	$\lambda/20$	<00'02"
OPSQ-50C08-10-5	$\phi 50$	8	$\lambda/10$	<00'05"
OPSQ-50C08-4-5	$\phi 50$	8	$\lambda/4$	<00'05"
OPSQ-50C08-1-5	$\phi 50$	8	λ	<00'05"
OPSQ-50C08-P	$\phi 50$	8	4 λ^*	<03'00"
OPSQ-50.8C05-10-5	$\phi 50.8$	5	$\lambda/10$	<00'05"
OPSQ-50.8C05-4-5	$\phi 50.8$	5	$\lambda/4$	<00'05"
OPSQ-50.8C08-10-5	$\phi 50.8$	8	$\lambda/10$	<00'05"
OPSQ-60C2.3-0.25-10	$\phi 60$	2.3	4 λ	<00'10"
OPSQ-60C03-1-5	$\phi 60$	3	λ	<00'05"
OPSQ-60C03-P	$\phi 60$	3	4 λ^*	<03'00"
OPSQ-60C06-10-5	$\phi 60$	6	$\lambda/10$	<00'05"
OPSQ-60C06-4-5	$\phi 60$	6	$\lambda/4$	<00'05"
OPSQ-60C06-1-5	$\phi 60$	6	λ	<00'05"
OPSQ-60C06-P	$\phi 60$	6	4 λ^*	<03'00"
OPSQ-60C10-20-2	$\phi 60$	10	$\lambda/20$	<00'02"
OPSQ-60C10-10-5	$\phi 60$	10	$\lambda/10$	<00'05"
OPSQ-60C10-4-5	$\phi 60$	10	$\lambda/4$	<00'05"
OPSQ-60C10-1-5	$\phi 60$	10	λ	<00'05"
OPSQ-60C10-P	$\phi 60$	10	4 λ^*	<03'00"
OPSQ-70C2.3-0.2-10	$\phi 70$	2.3	5 λ	<00'10"
OPSQ-80C2.3-0.2-10	$\phi 80$	2.3	5 λ	<00'10"
OPSQ-80C08-10-5	$\phi 80$	8	$\lambda/10$	<00'05"
OPSQ-80C08-4-5	$\phi 80$	8	$\lambda/4$	<00'05"
OPSQ-80C08-1-5	$\phi 80$	8	λ	<00'05"
OPSQ-80C08-P	$\phi 80$	8	4 λ^*	<03'00"
OPSQ-80C12-20-2	$\phi 80$	12	$\lambda/20$	<00'02"
OPSQ-80C12-10-5	$\phi 80$	12	$\lambda/10$	<00'05"
OPSQ-80C12-4-5	$\phi 80$	12	$\lambda/4$	<00'05"
OPSQ-80C12-1-5	$\phi 80$	12	λ	<00'05"
OPSQ-80C12-P	$\phi 80$	12	4 λ^*	<03'00"

* 4 λ shows the surface flatness of the measurement area of $\phi 30$ mm.

Synthetic fused silica/Circle $\phi 100 - \phi 150$				
Part Number	Diameter ϕD [mm]	Thickness t [mm]	Surface flatness	Parallelism
OPSQ-100C2.3-0.1-10	$\phi 100$	2.3	10 λ	<00'10"
OPSQ-100C10-10-5	$\phi 100$	10	$\lambda/10$	<00'05"
OPSQ-100C10-4-5	$\phi 100$	10	$\lambda/4$	<00'05"
OPSQ-100C10-1-5	$\phi 100$	10	λ	<00'05"
OPSQ-100C10-P	$\phi 100$	10	4 λ^*	<03'00"
OPSQ-100C15-20-2	$\phi 100$	15	$\lambda/20$	<00'02"
OPSQ-100C15-10-5	$\phi 100$	15	$\lambda/10$	<00'05"
OPSQ-100C15-4-5	$\phi 100$	15	$\lambda/4$	<00'05"
OPSQ-100C15-1-5	$\phi 100$	15	λ	<00'05"
OPSQ-100C15-P	$\phi 100$	15	4 λ^*	<03'00"
OPSQ-120C2.3-0.1-10	$\phi 120$	2.3	10 λ	<00'10"
OPSQ-125C2.3-0.1-10	$\phi 125$	2.3	10 λ	<00'10"
OPSQ-130C13-10-5	$\phi 130$	13	$\lambda/10$	<00'05"
OPSQ-130C13-4-5	$\phi 130$	13	$\lambda/4$	<00'05"
OPSQ-130C13-1-5	$\phi 130$	13	λ	<00'05"
OPSQ-130C13-P	$\phi 130$	13	4 λ^*	<03'00"
OPSQ-130C18-10-5	$\phi 130$	18	$\lambda/10$	<00'05"
OPSQ-130C18-4-5	$\phi 130$	18	$\lambda/4$	<00'05"
OPSQ-130C18-1-5	$\phi 130$	18	λ	<00'05"
OPSQ-130C18-P	$\phi 130$	18	4 λ^*	<03'00"
OPSQ-150C15-10-5	$\phi 150$	15	$\lambda/10$	<00'05"
OPSQ-150C15-4-5	$\phi 150$	15	$\lambda/4$	<00'05"
OPSQ-150C15-1-5	$\phi 150$	15	λ	<00'05"
OPSQ-150C15-P	$\phi 150$	15	4 λ^*	<03'00"
OPSQ-150C20-10-5	$\phi 150$	20	$\lambda/10$	<00'05"
OPSQ-150C20-4-5	$\phi 150$	20	$\lambda/4$	<00'05"
OPSQ-150C20-1-5	$\phi 150$	20	λ	<00'05"
OPSQ-150C20-P	$\phi 150$	20	4 λ^*	<03'00"

* 4 λ shows the surface flatness of the measurement area of $\phi 30$ mm.

Synthetic fused silica for excimer laser (248nm)				
Part Number	Diameter ϕD [mm]	Thickness t [mm]	Surface flatness	Parallelism
OPSQK-30C03-10-5	$\phi 30$	3	$\lambda/10$	<00'05"
OPSQK-30C05-10-5	$\phi 30$	5	$\lambda/10$	<00'05"
OPSQK-50C05-10-5	$\phi 50$	5	$\lambda/10$	<00'05"
OPSQK-50C08-10-5	$\phi 50$	8	$\lambda/10$	<00'05"

Compatible Optic Mounts

MHG-MP50-NL, MP50.8-NL / MHG-60MAD+MHG-MP80-NL / MHG-MP80-NL, MP100-NL / MHA-130AS, -150S / MHG-MP30-NL / LHA-150

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Synthetic fused silica/Square □10 – □20				
Part Number	Length A [mm]	Thickness t [mm]	Surface flatness	Parallelism
OPSQ-10S01-10-5	□10	1	$\lambda/10$	<00'05"
OPSQ-10S01-4-5	□10	1	$\lambda/4$	<00'05"
OPSQ-10S01-1-5	□10	1	λ	<00'05"
OPSQ-10S01-P	□10	1	4 λ^*	<03'00"
OPSQ-10S02-20-2	□10	2	$\lambda/20$	<00'02"
OPSQ-10S02-10-5	□10	2	$\lambda/10$	<00'05"
OPSQ-10S02-4-5	□10	2	$\lambda/4$	<00'05"
OPSQ-10S02-1-5	□10	2	λ	<00'05"
OPSQ-10S02-P	□10	2	4 λ^*	<03'00"
OPSQ-10S2.3-1-10	□10	2.3	λ	<00'10"
OPSQ-10S03-20-2	□10	3	$\lambda/20$	<00'02"
OPSQ-10S03-10-5	□10	3	$\lambda/10$	<00'05"
OPSQ-10S03-4-5	□10	3	$\lambda/4$	<00'05"
OPSQ-10S03-1-5	□10	3	λ	<00'05"
OPSQ-10S03-P	□10	3	4 λ^*	<03'00"
OPSQ-10S05-20-2	□10	5	$\lambda/20$	<00'02"
OPSQ-10S05-10-5	□10	5	$\lambda/10$	<00'05"
OPSQ-10S05-4-5	□10	5	$\lambda/4$	<00'05"
OPSQ-10S05-1-5	□10	5	λ	<00'05"
OPSQ-10S05-P	□10	5	4 λ^*	<03'00"
OPSQ-15S01-1-5	□15	1	λ	<00'05"
OPSQ-15S01-P	□15	1	4 λ^*	<03'00"
OPSQ-15S02-10-5	□15	2	$\lambda/10$	<00'05"
OPSQ-15S02-4-5	□15	2	$\lambda/4$	<00'05"
OPSQ-15S02-1-5	□15	2	λ	<00'05"
OPSQ-15S02-P	□15	2	4 λ^*	<03'00"
OPSQ-15S2.3-1-10	□15	2.3	λ	<00'10"
OPSQ-15S03-20-2	□15	3	$\lambda/20$	<00'02"
OPSQ-15S03-10-5	□15	3	$\lambda/10$	<00'05"
OPSQ-15S03-4-5	□15	3	$\lambda/4$	<00'05"
OPSQ-15S03-1-5	□15	3	λ	<00'05"
OPSQ-15S03-P	□15	3	4 λ^*	<03'00"
OPSQ-15S05-20-2	□15	5	$\lambda/20$	<00'02"
OPSQ-15S05-10-5	□15	5	$\lambda/10$	<00'05"
OPSQ-15S05-4-5	□15	5	$\lambda/4$	<00'05"
OPSQ-15S05-1-5	□15	5	λ	<00'05"
OPSQ-15S05-P	□15	5	4 λ^*	<03'00"
OPSQ-20S01-1-5	□20	1	λ	<00'05"
OPSQ-20S01-P	□20	1	4 λ^*	<03'00"
OPSQ-20S02-10-5	□20	2	$\lambda/10$	<00'05"
OPSQ-20S02-4-5	□20	2	$\lambda/4$	<00'05"
OPSQ-20S02-1-5	□20	2	λ	<00'05"
OPSQ-20S02-P	□20	2	4 λ^*	<03'00"
OPSQ-20S2.3-1-10	□20	2.3	λ	<00'10"
OPSQ-20S03-20-2	□20	3	$\lambda/20$	<00'02"
OPSQ-20S03-10-5	□20	3	$\lambda/10$	<00'05"
OPSQ-20S03-4-5	□20	3	$\lambda/4$	<00'05"
OPSQ-20S03-1-5	□20	3	λ	<00'05"
OPSQ-20S03-P	□20	3	4 λ^*	<03'00"
OPSQ-20S05-20-2	□20	5	$\lambda/20$	<00'02"
OPSQ-20S05-10-5	□20	5	$\lambda/10$	<00'05"
OPSQ-20S05-4-5	□20	5	$\lambda/4$	<00'05"
OPSQ-20S05-1-5	□20	5	λ	<00'05"
OPSQ-20S05-P	□20	5	4 λ^*	<03'00"

* 4 λ shows the surface flatness of the measurement area of $\phi 30\text{mm}$.

Synthetic fused silica/Square □25 – □126.6				
Part Number	Length A [mm]	Thickness t [mm]	Surface flatness	Parallelism
OPSQ-25S01-1-5	□25	1	λ	<00'05"
OPSQ-25S01-P	□25	1	4 λ^*	<03'00"
OPSQ-25S02-1-5	□25	2	λ	<00'05"
OPSQ-25S02-P	□25	2	4 λ^*	<03'00"
OPSQ-25S2.3-0.5-10	□25	2.3	2 λ	<00'10"
OPSQ-25S03-10-5	□25	3	$\lambda/10$	<00'05"
OPSQ-25S03-4-5	□25	3	$\lambda/4$	<00'05"
OPSQ-25S03-1-5	□25	3	λ	<00'05"
OPSQ-25S03-P	□25	3	4 λ^*	<03'00"
OPSQ-25S05-20-2	□25	5	$\lambda/20$	<00'02"
OPSQ-25S05-10-5	□25	5	$\lambda/10$	<00'05"
OPSQ-25S05-4-5	□25	5	$\lambda/4$	<00'05"
OPSQ-25S05-1-5	□25	5	λ	<00'05"
OPSQ-25S05-P	□25	5	4 λ^*	<03'00"
OPSQ-30S01-1-5	□30	1	λ	<00'05"
OPSQ-30S01-P	□30	1	4 λ^*	<03'00"
OPSQ-30S02-1-5	□30	2	λ	<00'05"
OPSQ-30S02-P	□30	2	4 λ^*	<03'00"
OPSQ-30S2.3-0.5-10	□30	2.3	2 λ	<00'10"
OPSQ-30S03-10-5	□30	3	$\lambda/10$	<00'05"
OPSQ-30S03-4-5	□30	3	$\lambda/4$	<00'05"
OPSQ-30S03-1-5	□30	3	λ	<00'05"
OPSQ-30S03-P	□30	3	4 λ^*	<03'00"
OPSQ-30S05-20-2	□30	5	$\lambda/20$	<00'02"
OPSQ-30S05-10-5	□30	5	$\lambda/10$	<00'05"
OPSQ-30S05-4-5	□30	5	$\lambda/4$	<00'05"
OPSQ-30S05-1-5	□30	5	λ	<00'05"
OPSQ-30S05-P	□30	5	4 λ^*	<03'00"
OPSQ-40S02-1-5	□40	2	λ	<00'05"
OPSQ-40S02-P	□40	2	4 λ^*	<03'00"
OPSQ-40S2.3-0.25-10	□40	2.3	4 λ	<00'10"
OPSQ-40S03-1-5	□40	3	λ	<00'05"
OPSQ-40S03-P	□40	3	4 λ^*	<03'00"
OPSQ-40S04-10-5	□40	4	$\lambda/10$	<00'05"
OPSQ-40S04-4-5	□40	4	$\lambda/4$	<00'05"
OPSQ-40S04-1-5	□40	4	λ	<00'05"
OPSQ-40S04-P	□40	4	4 λ^*	<03'00"
OPSQ-40S06-20-2	□40	6	$\lambda/20$	<00'02"
OPSQ-40S06-10-5	□40	6	$\lambda/10$	<00'05"
OPSQ-40S06-4-5	□40	6	$\lambda/4$	<00'05"
OPSQ-40S06-1-5	□40	6	λ	<00'05"
OPSQ-40S06-P	□40	6	4 λ^*	<03'00"
OPSQ-50S02-1-5	□50	2	λ	<00'05"
OPSQ-50S02-P	□50	2	4 λ^*	<03'00"
OPSQ-50S2.3-0.25-10	□50	2.3	4 λ	<00'10"
OPSQ-50S03-1-5	□50	3	λ	<00'05"
OPSQ-50S03-P	□50	3	4 λ^*	<03'00"
OPSQ-50S05-10-5	□50	5	$\lambda/10$	<00'05"
OPSQ-50S05-4-5	□50	5	$\lambda/4$	<00'05"
OPSQ-50S05-1-5	□50	5	λ	<00'05"
OPSQ-50S05-P	□50	5	4 λ^*	<03'00"
OPSQ-50S08-20-2	□50	8	$\lambda/20$	<00'02"
OPSQ-50S08-10-5	□50	8	$\lambda/10$	<00'05"
OPSQ-50S08-4-5	□50	8	$\lambda/4$	<00'05"
OPSQ-50S08-1-5	□50	8	λ	<00'05"
OPSQ-50S08-P	□50	8	4 λ^*	<03'00"
OPSQ-60S2.3-0.25-10	□60	2.3	4 λ	<00'10"
OPSQ-70S2.3-0.2-10	□70	2.3	5 λ	<00'10"
OPSQ-80S2.3-0.2-10	□80	2.3	5 λ	<00'10"
OPSQ-100S2.3-0.1-10	□100	2.3	10 λ	<00'10"
OPSQ-120S2.3-0.1-10	□120	2.3	10 λ	<00'10"
OPSQ-127S2.3-0.1-10	□126.6	2.3	10 λ	<00'10"

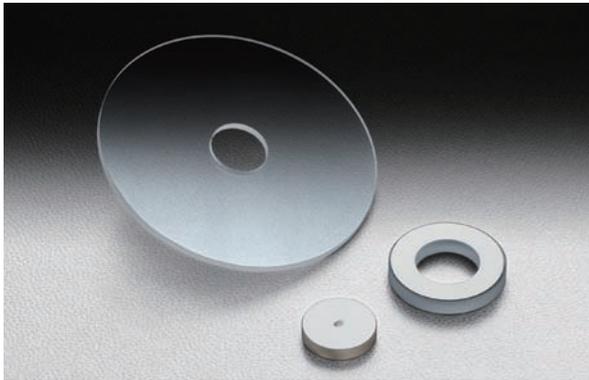
* 4 λ shows the surface flatness of the measurement area of $\phi 30\text{mm}$.

Compatible Optic Mounts

CHA-25, -60, -130

We can provide custom made holes on an optic or window to meet your requirements. We can make through-holes, counterbore holes, taper holes, inclined holes, blind holes or any type of holes. Please contact our Sales Division with your requests.

- Ultrasonic machining system is used to avoid damaging the optic.
- We can do polishing on machined hole with no cracks on the inner edge of the hole.
- We can provide custom made holes any size. There may be a fee for the tooling (jig), please contact our Sales Division with your requests.



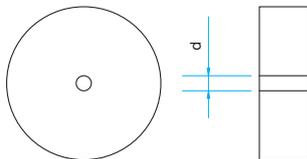
Specifications		
Possible to specify type of hole	Through-hole d (mm)	1.0, 1.5, 2.0, 2.5, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10, 12, 13, 15, 17, 18, 20, 22, 25, 28, 30
	Blind hole d (mm)	3.0, 5.0, 7.0, 10, 15, 20
Processing tolerance	Hole size (mm)	$D_{-0.15}^{+0}$
	Hole position (mm)	$X \pm 0.2$

Processing specification		
Machining Type	Hole size d [mm]	Specifying part number code (□□ is hole sized)
Vertical hole	$\leq \phi 2.5$	-SH□□
	$\phi 3 - \phi 10$	
	$\phi 12 - \phi 30$	
Counterbore hole	$\leq \phi 2.5$	-SZH□□
	$\phi 3 - \phi 10$	
	$\phi 12 - \phi 30$	
45° taper hole	$\leq \phi 2.5$	-TH□□-45
	$\phi 3 - \phi 10$	
	$\phi 12 - \phi 30$	
Incline hole	$\leq \phi 2.5$	-KH□□-45
	$\phi 3 - \phi 10$	
	$\phi 12 - \phi 30$	
Vertical blind hole	$\leq \phi 7$	-SMH□□
	$\phi 10 - \phi 20$	

[Example of specification]
 Part number of Optical Flats ($\phi 30$ t5): OPB-30C05-4-5
 When need to make a dia 10mm vertical hole on the substrate.
 ⇒ OPB-30C05-4-5-SH10

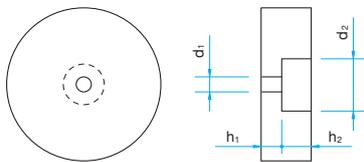
Outline Drawing (in mm)

Vertical hole type (-SH□□)



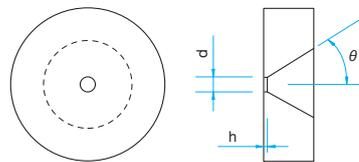
Hole size	d
Chamfering size	c (0 if no specifications)
Hole position	Center or specify the position (XY)

Counterbore hole type (-SZH□□)



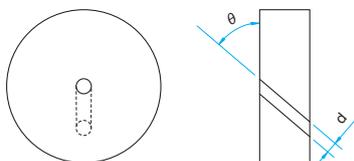
Hole size	d ₁
Hole depth	h ₁
Counterbore hole size	d ₂
Counterbore hole depth	h ₂
Chamfering size	c (0 if no specifications)
Hole position	Center or specify the position (XY)

45° taper hole type (-TH□□-45)



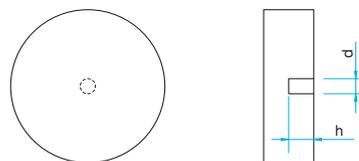
Hole size	d
Hole depth	h (h > specify as 0.15)
Taper angle	$\theta = 45^\circ$ (45° unless specify)
Chamfering size	No chamfer
Hole position	Center or specify the position (XY)

Incline hole type (-KH□□-45)



Hole size	d (Hole form)
Incline angle	$\theta = 45^\circ$ (45° unless specify)
Chamfering size	No chamfer
Hole position	Center or specify the position (XY)

Vertical blind hole type (-SMH□□)



Hole size	d
Hole depth	h
Chamfering size	c (0 if no specifications)
Hole position	Center or specify the position (XY)

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Wedge Substrates

Concave Mirror Substrates

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Windows

Wedge substrates can separate the reflected beam by the front and back surface of the substrates by the slight wedge angle.

They can be used as a reference test plate for interferometers and beam samplers.

- It can also be used as a prism to refract at a small angle. Beam deflection angle δ can be calculated refractive index n , from the wedge angle α .

$$\delta = \sin^{-1}(n \sin \alpha) - \alpha \approx (n - 1) \alpha$$

- In BK7, 0.52 times the angle of the wedge, and in synthetic fused silica, 0.46 times the angle of the wedge. (Visible range, normal incidence)



Specifications

Material	BK7, Synthetic fused silica, Synthetic fused silica for excimer laser (248nm)
Clear aperture	90% of real diameter

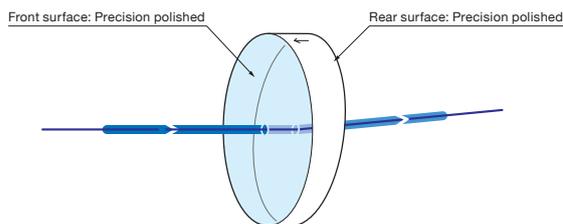
Guide

- An arrow mark on the thicker side of the edge indicates front surface of the substrate.
- It is also available beam sampler (BS4) coated with anti-reflection coating on the back. [Reference](#) B066
- It is also available fabrication of the wedge substrates with a requested coating.

Attention

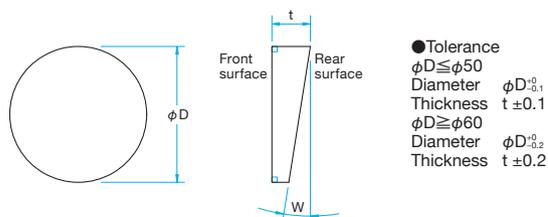
- Wedge substrates are not coated on both sides. There is a 3.5 to 4% reflection of the surface of the glass.
- If the wedge substrate is inserted in the optical path of the laser beam, the transmitted beam is inclined slightly causing the refraction.

Schematic

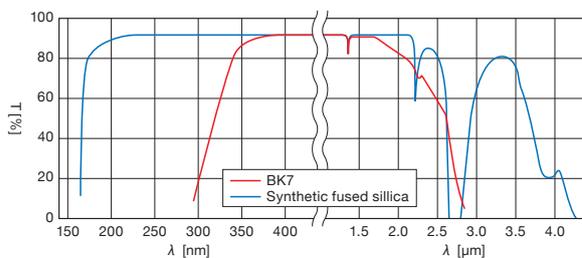


Outline Drawing

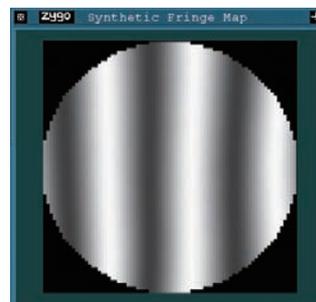
(in mm)



Typical Transmittance Data T: Transmission



Surface Accuracy Data (reference data)



- Surface accuracy measurement method: Measured with Zygo laser interferometer
- Surface accuracy measurement wavelength: 632.8nm
- Surface accuracy guaranteed temperature: 23°C±2°C

Compatible Optic Mounts

MHG-MP20-NL, -MP25-NL, -MP30-NL / MHG-40MAD / MHG-MP50-NL / MHG-60MAD + MHG-MP80-NL / MHG-MP80-NL, -MP100-NL



BK7					
Part Number	Diameter ϕ D [mm]	Thickness t [mm]	Surface flatness	Wedge angle W	Surface Quality (Scratch-Dig)
WSB-10C05-10-1	ϕ 10	5	$\lambda/10$	$1^{\circ}\pm 5'$	10-5
WSB-10C05-20-1	ϕ 10	5	$\lambda/20$	$1^{\circ}\pm 5'$	10-5
WSB-15C05-10-1	ϕ 15	5	$\lambda/10$	$1^{\circ}\pm 5'$	10-5
WSB-15C05-20-1	ϕ 15	5	$\lambda/20$	$1^{\circ}\pm 5'$	10-5
WSB-20C05-10-1	ϕ 20	5	$\lambda/10$	$1^{\circ}\pm 5'$	10-5
WSB-20C05-20-1	ϕ 20	5	$\lambda/20$	$1^{\circ}\pm 5'$	10-5
WSB-25C05-10-1	ϕ 25	5	$\lambda/10$	$1^{\circ}\pm 5'$	10-5
WSB-25C05-20-1	ϕ 25	5	$\lambda/20$	$1^{\circ}\pm 5'$	10-5
WSB-30C05-10-0.5	ϕ 30	5	$\lambda/10$	$0.5^{\circ}\pm 5'$	10-5
WSB-30C05-20-0.5	ϕ 30	5	$\lambda/20$	$0.5^{\circ}\pm 5'$	10-5
WSB-30C05-10-1	ϕ 30	5	$\lambda/10$	$1^{\circ}\pm 5'$	10-5
WSB-30C05-20-1	ϕ 30	5	$\lambda/20$	$1^{\circ}\pm 5'$	10-5
WSB-30C05-10-2	ϕ 30	5	$\lambda/10$	$2^{\circ}\pm 5'$	10-5
WSB-30C05-20-2	ϕ 30	5	$\lambda/20$	$2^{\circ}\pm 5'$	10-5
WSB-30C07-10-3	ϕ 30	7	$\lambda/10$	$3^{\circ}\pm 5'$	10-5
WSB-30C07-20-3	ϕ 30	7	$\lambda/20$	$3^{\circ}\pm 5'$	10-5
WSB-40C06-10-1	ϕ 40	6	$\lambda/10$	$1^{\circ}\pm 5'$	10-5
WSB-40C06-20-1	ϕ 40	6	$\lambda/20$	$1^{\circ}\pm 5'$	10-5
WSB-50C08-10-0.5	ϕ 50	8	$\lambda/10$	$0.5^{\circ}\pm 5'$	10-5
WSB-50C08-20-0.5	ϕ 50	8	$\lambda/20$	$0.5^{\circ}\pm 5'$	10-5
WSB-50C08-10-1	ϕ 50	8	$\lambda/10$	$1^{\circ}\pm 5'$	10-5
WSB-50C08-20-1	ϕ 50	8	$\lambda/20$	$1^{\circ}\pm 5'$	10-5
WSB-50C08-10-2	ϕ 50	8	$\lambda/10$	$2^{\circ}\pm 5'$	10-5
WSB-50C08-20-2	ϕ 50	8	$\lambda/20$	$2^{\circ}\pm 5'$	10-5
WSB-50C10-10-3	ϕ 50	10	$\lambda/10$	$3^{\circ}\pm 5'$	10-5
WSB-50C10-20-3	ϕ 50	10	$\lambda/20$	$3^{\circ}\pm 5'$	10-5
WSB-60C10-10-1	ϕ 60	10	$\lambda/10$	$1^{\circ}\pm 5'$	10-5
WSB-60C10-20-1	ϕ 60	10	$\lambda/20$	$1^{\circ}\pm 5'$	10-5
WSB-80C12-10-1	ϕ 80	12	$\lambda/10$	$1^{\circ}\pm 5'$	10-5
WSB-80C12-20-1	ϕ 80	12	$\lambda/20$	$1^{\circ}\pm 5'$	10-5
WSB-100C15-10-1	ϕ 100	15	$\lambda/10$	$1^{\circ}\pm 5'$	10-5
WSB-100C15-20-1	ϕ 100	15	$\lambda/20$	$1^{\circ}\pm 5'$	10-5

Synthetic fused silica					
Part Number	Diameter ϕ D [mm]	Thickness t [mm]	Surface flatness	Wedge angle W	Surface Quality (Scratch-Dig)
WSSQ-10C05-10-1	ϕ 10	5	$\lambda/10$	$1^{\circ}\pm 5'$	20-10
WSSQ-10C05-20-1	ϕ 10	5	$\lambda/20$	$1^{\circ}\pm 5'$	20-10
WSSQ-15C05-10-1	ϕ 15	5	$\lambda/10$	$1^{\circ}\pm 5'$	20-10
WSSQ-15C05-20-1	ϕ 15	5	$\lambda/20$	$1^{\circ}\pm 5'$	20-10
WSSQ-20C05-10-1	ϕ 20	5	$\lambda/10$	$1^{\circ}\pm 5'$	20-10
WSSQ-20C05-20-1	ϕ 20	5	$\lambda/20$	$1^{\circ}\pm 5'$	20-10
WSSQ-25C05-10-1	ϕ 25	5	$\lambda/10$	$1^{\circ}\pm 5'$	20-10
WSSQ-25C05-20-1	ϕ 25	5	$\lambda/20$	$1^{\circ}\pm 5'$	20-10
WSSQ-30C05-10-0.5	ϕ 30	5	$\lambda/10$	$0.5^{\circ}\pm 5'$	20-10
WSSQ-30C05-20-0.5	ϕ 30	5	$\lambda/20$	$0.5^{\circ}\pm 5'$	20-10
WSSQ-30C05-10-1	ϕ 30	5	$\lambda/10$	$1^{\circ}\pm 5'$	20-10
WSSQ-30C05-20-1	ϕ 30	5	$\lambda/20$	$1^{\circ}\pm 5'$	20-10
WSSQ-30C05-10-2	ϕ 30	5	$\lambda/10$	$2^{\circ}\pm 5'$	20-10
WSSQ-30C05-20-2	ϕ 30	5	$\lambda/20$	$2^{\circ}\pm 5'$	20-10
WSSQ-30C07-10-3	ϕ 30	7	$\lambda/10$	$3^{\circ}\pm 5'$	20-10
WSSQ-30C07-20-3	ϕ 30	7	$\lambda/20$	$3^{\circ}\pm 5'$	20-10
WSSQ-40C06-10-1	ϕ 40	6	$\lambda/10$	$1^{\circ}\pm 5'$	20-10
WSSQ-40C06-20-1	ϕ 40	6	$\lambda/20$	$1^{\circ}\pm 5'$	20-10
WSSQ-50C08-10-0.5	ϕ 50	8	$\lambda/10$	$0.5^{\circ}\pm 5'$	20-10
WSSQ-50C08-20-0.5	ϕ 50	8	$\lambda/20$	$0.5^{\circ}\pm 5'$	20-10
WSSQ-50C08-10-1	ϕ 50	8	$\lambda/10$	$1^{\circ}\pm 5'$	20-10
WSSQ-50C08-20-1	ϕ 50	8	$\lambda/20$	$1^{\circ}\pm 5'$	20-10
WSSQ-50C08-10-2	ϕ 50	8	$\lambda/10$	$2^{\circ}\pm 5'$	20-10
WSSQ-50C08-20-2	ϕ 50	8	$\lambda/20$	$2^{\circ}\pm 5'$	20-10
WSSQ-50C10-10-3	ϕ 50	10	$\lambda/10$	$3^{\circ}\pm 5'$	20-10
WSSQ-50C10-20-3	ϕ 50	10	$\lambda/20$	$3^{\circ}\pm 5'$	20-10
WSSQ-60C10-10-1	ϕ 60	10	$\lambda/10$	$1^{\circ}\pm 5'$	20-10
WSSQ-60C10-20-1	ϕ 60	10	$\lambda/20$	$1^{\circ}\pm 5'$	20-10
WSSQ-80C12-10-1	ϕ 80	12	$\lambda/10$	$1^{\circ}\pm 5'$	20-10
WSSQ-80C12-20-1	ϕ 80	12	$\lambda/20$	$1^{\circ}\pm 5'$	20-10
WSSQ-100C15-10-1	ϕ 100	15	$\lambda/10$	$1^{\circ}\pm 5'$	20-10
WSSQ-100C15-20-1	ϕ 100	15	$\lambda/20$	$1^{\circ}\pm 5'$	20-10

Synthetic fused silica for excimer laser					
Part Number	Diameter ϕ D [mm]	Thickness t [mm]	Surface flatness	Wedge angle W	Surface Quality (Scratch-Dig)
WSSQK-30C05-10-1	ϕ 30	5	$\lambda/10$	$1^{\circ}\pm 5'$	20-10
WSSQK-50C08-10-1	ϕ 50	8	$\lambda/10$	$1^{\circ}\pm 5'$	20-10

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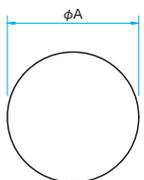
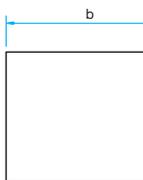
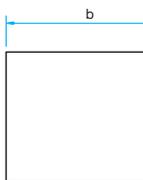
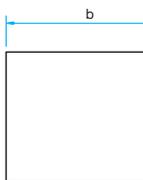
Master Optics

Windows

Contact sheet for Custom Optical Parallels and Optical Flats Estimation Order

Date

 To: Sigma Koki Co., Ltd. **FAX +81-3-5638-6550**

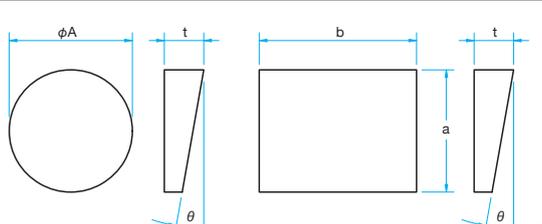
Affiliation (Organization Name)					
Department		Name			
TEL		FAX		E-mail	
Country/Address					
Name & Designation <small>(Tentative name is okay)</small>					
Drawing Number			Estimate		<input type="checkbox"/> Yes: by Date <input type="checkbox"/> No
Desired Delivery Date			Budget		JP Yen
Material		<input type="checkbox"/> BK7 <input type="checkbox"/> Synthetic fused silica <input type="checkbox"/> Other ()			Quantity
Dimensions <small>If you do not specify a dimension tolerance is outside the standard tolerance</small>				ϕA	mm
				a	mm
				b	mm
				t	mm
Surface flatness		<input type="checkbox"/> $\lambda/10$ <input type="checkbox"/> $\lambda/4$ <input type="checkbox"/> λ <input type="checkbox"/> Other () * λ is 632.8nm.			
Parallelism		<input type="checkbox"/> less than 3' <input type="checkbox"/> less than 5' <input type="checkbox"/> Other ()			
Specifications of Coating <small>Select metallic coating or dielectric multi-layer coating.</small>		<input type="checkbox"/> Metallic coating <input type="checkbox"/> Al only <input type="checkbox"/> Al+MgF ₂ <input type="checkbox"/> Al+SiO <input type="checkbox"/> Cr+Au <input type="checkbox"/> Pt <input type="checkbox"/> Other ()			
		<input type="checkbox"/> Dielectric multi-layer coating	Reflectance	R= % or more	
Specifications of Light Source Used		Wavelength Range	$\lambda=$ nm	Type	
		Output or Energy	W	Beam size	mm
		J	Pulse width	s	Repetition frequency
Incident angle		$\theta=$	Polarization conditions	<small>(If there is no specification in advance, we will process a circular polarization or an unpolarized light.)</small>	
Hole		<input type="checkbox"/> Drill a hole <input type="checkbox"/> None			* For special specifications on hole processing, please see previous page of this catalog and indicate here below.
Other		* Write more detailed specifications here. (Rough illustration is acceptable.)			

Contact sheet for Custom Wedged Substrates

Estimation Order

Date

To: Sigma Koki Co., Ltd. **FAX +81-3-5638-6550**

Affiliation (Organization Name)			
Department		Name	
TEL	FAX	E-mail	
Country/Address			
Name & Designation		(Tentative name is okay)	
Drawing Number		Estimate	<input type="checkbox"/> Yes: by Date <input type="checkbox"/> No
Desired Delivery Date		Budget	JP Yen
Material	<input type="checkbox"/> BK7 <input type="checkbox"/> Synthetic fused silica <input type="checkbox"/> Other ()		Quantity
Dimensions <small>If you do not specify a dimension tolerance is outside the standard tolerance</small>			ϕA mm
			a mm
			b mm
			t mm
	* Please fill out the tolerance of the wedge angle.		Wedge angle (θ)
Surface flatness	<input type="checkbox"/> $\lambda/10$ <input type="checkbox"/> $\lambda/4$ <input type="checkbox"/> λ <input type="checkbox"/> Other () * λ is 632.8nm.		
Coating	<input type="checkbox"/> Coating <input type="checkbox"/> None		Type <input type="checkbox"/> Metal <input type="checkbox"/> Dielectric multi-layer <input type="checkbox"/> Other ()
	Specifications		
Other	* Write more detailed specifications here. (Rough illustration is acceptable.)		

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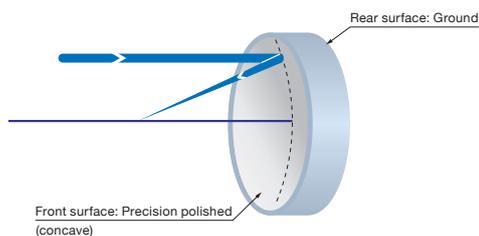
TCBS/TCA/TCAN

RoHS

Coatings on all concave mirror substrate models are available. Pre-coated aluminum concave mirrors are available. These substrates are mainly used as the primary mirror in a reflecting telescope or as reflection mirror of a collimating optical system light-source.

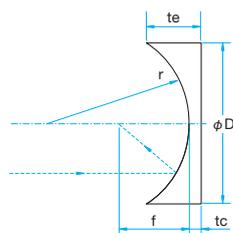


Schematic



Outline Drawing

(in mm)



- Tolerance Diameter $\phi D_{\pm 0.1}$ Thickness $tc \pm 0.2$

- Relationship between focal length "f" and the radius of curvature "r" of the concave mirror $r = 2f$

- Large selection from outer size to radius of curvature is available on our website and in our catalog.
- Contact our Sales Division for your choice of coating specifications.

Specifications

Material	BK7
Spherical accuracy	$\lambda/2$
Radius Tolerance	$\pm 2\%$
Coating	Substrates: Uncoated Mirrors with Protective layer: Al+MgF ₂ Mirrors without Protective layer: Al
Clear aperture	85% of actual aperture
Surface Quality (Scratch-Dig)	Substrates: 20-10 With coating: 40-20
Rear Surface	Ground

Guide

- ▶ For high power lasers use concave substrates (LCBS) suitable for Laser resonator applications. [Reference](#) B308

Attention

- ▶ The back side of the substrate has a ground surface; it is not usable for transmission. For transmission we recommend plano concave lenses (SLB-N). [Reference](#) B118
- ▶ For cold-mirror or partial reflection application, please contact our Sales Division for a concave mirror on the back side polished.
- ▶ The outer edge of the concave surface is chamfered, the thickness of the edge varies therefore use the back side of the substrate as datum.

φ10

Substrates						Mirror coating	
Part Number	Diameter ϕD [mm]	Edge thickness t_e [mm]	Center thickness t_c [mm]	Radius of curvature r [mm]	Focal length f [mm]	With Protective layer Part Number	Without Protective layer Part Number
TCBS-10C05-10	φ10	5	3.7	10	5	TCA-10C05-10	TCAN-10C05-10
TCBS-10C05-15	φ10	5	4.1	15	7.5	TCA-10C05-15	TCAN-10C05-15
TCBS-10C05-20	φ10	5	4.4	20	10	TCA-10C05-20	TCAN-10C05-20
TCBS-10C05-25	φ10	5	4.5	25	12.5	TCA-10C05-25	TCAN-10C05-25
TCBS-10C05-30	φ10	5	4.6	30	15	TCA-10C05-30	TCAN-10C05-30
TCBS-10C05-40	φ10	5	4.7	40	20	TCA-10C05-40	TCAN-10C05-40
TCBS-10C05-50	φ10	5	4.7	50	25	TCA-10C05-50	TCAN-10C05-50
TCBS-10C05-60	φ10	5	4.8	60	30	TCA-10C05-60	TCAN-10C05-60
TCBS-10C05-70	φ10	5	4.8	70	35	TCA-10C05-70	TCAN-10C05-70
TCBS-10C05-80	φ10	5	4.8	80	40	TCA-10C05-80	TCAN-10C05-80
TCBS-10C05-90	φ10	5	4.9	90	45	TCA-10C05-90	TCAN-10C05-90
TCBS-10C05-100	φ10	5	4.9	100	50	TCA-10C05-100	TCAN-10C05-100
TCBS-10C05-120	φ10	5	4.9	120	60	TCA-10C05-120	TCAN-10C05-120
TCBS-10C05-150	φ10	5	4.9	150	75	TCA-10C05-150	TCAN-10C05-150
TCBS-10C05-200	φ10	5	4.9	200	100	TCA-10C05-200	TCAN-10C05-200
TCBS-10C05-250	φ10	5	4.9	250	125	TCA-10C05-250	TCAN-10C05-250
TCBS-10C05-300	φ10	5	5.0	300	150	TCA-10C05-300	TCAN-10C05-300
TCBS-10C05-400	φ10	5	5.0	400	200	TCA-10C05-400	TCAN-10C05-400
TCBS-10C05-500	φ10	5	5.0	500	250	TCA-10C05-500	TCAN-10C05-500
TCBS-10C05-600	φ10	5	5.0	600	300	TCA-10C05-600	TCAN-10C05-600
TCBS-10C05-700	φ10	5	5.0	700	350	TCA-10C05-700	TCAN-10C05-700
TCBS-10C05-800	φ10	5	5.0	800	400	TCA-10C05-800	TCAN-10C05-800
TCBS-10C05-1000	φ10	5	5.0	1000	500	TCA-10C05-1000	TCAN-10C05-1000
TCBS-10C05-1500	φ10	5	5.0	1500	750	TCA-10C05-1500	TCAN-10C05-1500
TCBS-10C05-2000	φ10	5	5.0	2000	1000	TCA-10C05-2000	TCAN-10C05-2000
TCBS-10C05-2500	φ10	5	5.0	2500	1250	TCA-10C05-2500	TCAN-10C05-2500
TCBS-10C05-3000	φ10	5	5.0	3000	1500	TCA-10C05-3000	TCAN-10C05-3000
TCBS-10C05-4000	φ10	5	5.0	4000	2000	TCA-10C05-4000	TCAN-10C05-4000
TCBS-10C05-5000	φ10	5	5.0	5000	2500	TCA-10C05-5000	TCAN-10C05-5000
TCBS-10C05-10000	φ10	5	5.0	10000	5000	TCA-10C05-10000	TCAN-10C05-10000

Compatible Optic Mounts

LHCM-10, -15 / LHCM-20 / ALHN-25-3RO, -30-3RO / LHCM-40 / ALHN-50-3RO



φ15 – φ20							
Substrates						Mirror coating	
Part Number	Diameter φD [mm]	Edge thickness te [mm]	Center thickness tc [mm]	Radius of curvature r [mm]	Focal length f [mm]	With Protective layer Part Number	Without Protective layer Part Number
TCBS-15C07-10	φ15	7	3.6	10	5	TCA-15C07-10	TCAN-15C07-10
TCBS-15C07-15	φ15	7	5.0	15	7.5	TCA-15C07-15	TCAN-15C07-15
TCBS-15C05-20	φ15	5	3.5	20	10	TCA-15C05-20	TCAN-15C05-20
TCBS-15C05-25	φ15	5	3.8	25	12.5	TCA-15C05-25	TCAN-15C05-25
TCBS-15C05-30	φ15	5	4.0	30	15	TCA-15C05-30	TCAN-15C05-30
TCBS-15C05-40	φ15	5	4.3	40	20	TCA-15C05-40	TCAN-15C05-40
TCBS-15C05-50	φ15	5	4.4	50	25	TCA-15C05-50	TCAN-15C05-50
TCBS-15C05-60	φ15	5	4.5	60	30	TCA-15C05-60	TCAN-15C05-60
TCBS-15C05-70	φ15	5	4.6	70	35	TCA-15C05-70	TCAN-15C05-70
TCBS-15C05-80	φ15	5	4.6	80	40	TCA-15C05-80	TCAN-15C05-80
TCBS-15C05-90	φ15	5	4.7	90	45	TCA-15C05-90	TCAN-15C05-90
TCBS-15C05-100	φ15	5	4.7	100	50	TCA-15C05-100	TCAN-15C05-100
TCBS-15C05-120	φ15	5	4.8	120	60	TCA-15C05-120	TCAN-15C05-120
TCBS-15C05-150	φ15	5	4.8	150	75	TCA-15C05-150	TCAN-15C05-150
TCBS-15C05-200	φ15	5	4.9	200	100	TCA-15C05-200	TCAN-15C05-200
TCBS-15C05-250	φ15	5	4.9	250	125	TCA-15C05-250	TCAN-15C05-250
TCBS-15C05-300	φ15	5	4.9	300	150	TCA-15C05-300	TCAN-15C05-300
TCBS-15C05-400	φ15	5	4.9	400	200	TCA-15C05-400	TCAN-15C05-400
TCBS-15C05-500	φ15	5	4.9	500	250	TCA-15C05-500	TCAN-15C05-500
TCBS-15C05-600	φ15	5	5.0	600	300	TCA-15C05-600	TCAN-15C05-600
TCBS-15C05-700	φ15	5	5.0	700	350	TCA-15C05-700	TCAN-15C05-700
TCBS-15C05-800	φ15	5	5.0	800	400	TCA-15C05-800	TCAN-15C05-800
TCBS-15C05-1000	φ15	5	5.0	1000	500	TCA-15C05-1000	TCAN-15C05-1000
TCBS-15C05-1500	φ15	5	5.0	1500	750	TCA-15C05-1500	TCAN-15C05-1500
TCBS-15C05-2000	φ15	5	5.0	2000	1000	TCA-15C05-2000	TCAN-15C05-2000
TCBS-15C05-2500	φ15	5	5.0	2500	1250	TCA-15C05-2500	TCAN-15C05-2500
TCBS-15C05-3000	φ15	5	5.0	3000	1500	TCA-15C05-3000	TCAN-15C05-3000
TCBS-15C05-4000	φ15	5	5.0	4000	2000	TCA-15C05-4000	TCAN-15C05-4000
TCBS-15C05-5000	φ15	5	5.0	5000	2500	TCA-15C05-5000	TCAN-15C05-5000
TCBS-15C05-10000	φ15	5	5.0	10000	5000	TCA-15C05-10000	TCAN-15C05-10000
TCBS-15C05-30000	φ15	5	5.0	30000	15000	TCA-15C05-30000	TCAN-15C05-30000
TCBS-20C08-15	φ20	8	4.2	15	7.5	TCA-20C08-15	TCAN-20C08-15
TCBS-20C08-20	φ20	8	5.3	20	10	TCA-20C08-20	TCAN-20C08-20
TCBS-20C08-25	φ20	8	5.9	25	12.5	TCA-20C08-25	TCAN-20C08-25
TCBS-20C05-30	φ20	5	3.3	30	15	TCA-20C05-30	TCAN-20C05-30
TCBS-20C05-40	φ20	5	3.7	40	20	TCA-20C05-40	TCAN-20C05-40
TCBS-20C05-50	φ20	5	4.0	50	25	TCA-20C05-50	TCAN-20C05-50
TCBS-20C05-60	φ20	5	4.2	60	30	TCA-20C05-60	TCAN-20C05-60
TCBS-20C05-70	φ20	5	4.3	70	35	TCA-20C05-70	TCAN-20C05-70
TCBS-20C05-80	φ20	5	4.4	80	40	TCA-20C05-80	TCAN-20C05-80
TCBS-20C05-90	φ20	5	4.4	90	45	TCA-20C05-90	TCAN-20C05-90
TCBS-20C05-100	φ20	5	4.5	100	50	TCA-20C05-100	TCAN-20C05-100
TCBS-20C05-120	φ20	5	4.6	120	60	TCA-20C05-120	TCAN-20C05-120
TCBS-20C05-150	φ20	5	4.7	150	75	TCA-20C05-150	TCAN-20C05-150
TCBS-20C05-200	φ20	5	4.7	200	100	TCA-20C05-200	TCAN-20C05-200
TCBS-20C05-250	φ20	5	4.8	250	125	TCA-20C05-250	TCAN-20C05-250
TCBS-20C05-300	φ20	5	4.8	300	150	TCA-20C05-300	TCAN-20C05-300
TCBS-20C05-400	φ20	5	4.9	400	200	TCA-20C05-400	TCAN-20C05-400
TCBS-20C05-500	φ20	5	4.9	500	250	TCA-20C05-500	TCAN-20C05-500
TCBS-20C05-600	φ20	5	4.9	600	300	TCA-20C05-600	TCAN-20C05-600
TCBS-20C05-700	φ20	5	4.9	700	350	TCA-20C05-700	TCAN-20C05-700
TCBS-20C05-800	φ20	5	4.9	800	400	TCA-20C05-800	TCAN-20C05-800
TCBS-20C05-1000	φ20	5	5.0	1000	500	TCA-20C05-1000	TCAN-20C05-1000
TCBS-20C05-1500	φ20	5	5.0	1500	750	TCA-20C05-1500	TCAN-20C05-1500
TCBS-20C05-2000	φ20	5	5.0	2000	1000	TCA-20C05-2000	TCAN-20C05-2000
TCBS-20C05-2500	φ20	5	5.0	2500	1250	TCA-20C05-2500	TCAN-20C05-2500
TCBS-20C05-3000	φ20	5	5.0	3000	1500	TCA-20C05-3000	TCAN-20C05-3000
TCBS-20C05-4000	φ20	5	5.0	4000	2000	TCA-20C05-4000	TCAN-20C05-4000
TCBS-20C05-5000	φ20	5	5.0	5000	2500	TCA-20C05-5000	TCAN-20C05-5000
TCBS-20C05-10000	φ20	5	5.0	10000	5000	TCA-20C05-10000	TCAN-20C05-10000
TCBS-20C05-30000	φ20	5	5.0	30000	15000	TCA-20C05-30000	TCAN-20C05-30000

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TCBS/TCA/TCAN

φ25 – φ30								
Application Systems	Substrates						Mirror coating	
	Part Number	Diameter φD [mm]	Edge thickness te [mm]	Center thickness tc [mm]	Radius of curvature r [mm]	Focal length f [mm]	With Protective layer Part Number	Without Protective layer Part Number
Optics & Optical Coatings	TCBS-25C10-15	φ25	10	3.3	15	7.5	TCA-25C10-15	TCAN-25C10-15
	TCBS-25C07-20	φ25	7	2.6	20	10	TCA-25C07-20	TCAN-25C07-20
	TCBS-25C07-25	φ25	7	3.7	25	12.5	TCA-25C07-25	TCAN-25C07-25
Opto-Mechanics	TCBS-25C07-30	φ25	7	4.3	30	15	TCA-25C07-30	TCAN-25C07-30
	TCBS-25C07-40	φ25	7	5.0	40	20	TCA-25C07-40	TCAN-25C07-40
	TCBS-25C07-50	φ25	7	5.4	50	25	TCA-25C07-50	TCAN-25C07-50
	TCBS-25C05-60	φ25	5	3.7	60	30	TCA-25C05-60	TCAN-25C05-60
Bases	TCBS-25C05-70	φ25	5	3.9	70	35	TCA-25C05-70	TCAN-25C05-70
	TCBS-25C05-80	φ25	5	4.0	80	40	TCA-25C05-80	TCAN-25C05-80
Manual Stages	TCBS-25C05-90	φ25	5	4.1	90	45	TCA-25C05-90	TCAN-25C05-90
	TCBS-25C05-100	φ25	5	4.2	100	50	TCA-25C05-100	TCAN-25C05-100
	TCBS-25C05-120	φ25	5	4.3	120	60	TCA-25C05-120	TCAN-25C05-120
Actuators & Adjusters	TCBS-25C05-150	φ25	5	4.5	150	75	TCA-25C05-150	TCAN-25C05-150
	TCBS-25C05-200	φ25	5	4.6	200	100	TCA-25C05-200	TCAN-25C05-200
Motorized Stages	TCBS-25C05-250	φ25	5	4.6	250	125	TCA-25C05-250	TCAN-25C05-250
	TCBS-25C05-300	φ25	5	4.7	300	150	TCA-25C05-300	TCAN-25C05-300
	TCBS-25C05-400	φ25	5	4.7	400	200	TCA-25C05-400	TCAN-25C05-400
	TCBS-25C05-500	φ25	5	4.8	500	250	TCA-25C05-500	TCAN-25C05-500
Light Sources & Laser Safety	TCBS-25C05-600	φ25	5	4.8	600	300	TCA-25C05-600	TCAN-25C05-600
	TCBS-25C05-700	φ25	5	4.9	700	350	TCA-25C05-700	TCAN-25C05-700
	TCBS-25C05-800	φ25	5	4.9	800	400	TCA-25C05-800	TCAN-25C05-800
Index	TCBS-25C05-1000	φ25	5	4.9	1000	500	TCA-25C05-1000	TCAN-25C05-1000
	TCBS-25C05-1500	φ25	5	4.9	1500	750	TCA-25C05-1500	TCAN-25C05-1500
	TCBS-25C05-2000	φ25	5	4.9	2000	1000	TCA-25C05-2000	TCAN-25C05-2000
	TCBS-25C05-2500	φ25	5	5.0	2500	1250	TCA-25C05-2500	TCAN-25C05-2500
Guide	TCBS-25C05-3000	φ25	5	5.0	3000	1500	TCA-25C05-3000	TCAN-25C05-3000
	TCBS-25C05-4000	φ25	5	5.0	4000	2000	TCA-25C05-4000	TCAN-25C05-4000
Mirrors	TCBS-25C05-5000	φ25	5	5.0	5000	2500	TCA-25C05-5000	TCAN-25C05-5000
Beamsplitters	TCBS-25C05-10000	φ25	5	5.0	10000	5000	TCA-25C05-10000	TCAN-25C05-10000
	TCBS-25C05-30000	φ25	5	5.0	30000	15000	TCA-25C05-30000	TCAN-25C05-30000
Polarizers	TCBS-25.4C07-50	φ25.4	7	5.4	50	25	TCA-25.4C07-50	TCAN-25.4C07-50
	TCBS-25.4C05-100	φ25.4	5	4.2	100	50	TCA-25.4C05-100	TCAN-25.4C05-100
Lenses	TCBS-25.4C05-250	φ25.4	5	4.7	250	125	TCA-25.4C05-250	TCAN-25.4C05-250
	TCBS-25.4C05-500	φ25.4	5	4.8	500	250	TCA-25.4C05-500	TCAN-25.4C05-500
Multi-Element Optics	TCBS-25.4C05-1000	φ25.4	5	4.9	1000	500	TCA-25.4C05-1000	TCAN-25.4C05-1000
	TCBS-30C10-20	φ30	10	3.2	20	10	TCA-30C10-20	TCAN-30C10-20
Filters	TCBS-30C10-25	φ30	10	5.0	25	12.5	TCA-30C10-25	TCAN-30C10-25
	TCBS-30C07-30	φ30	7	3.0	30	15	TCA-30C07-30	TCAN-30C07-30
Prisms	TCBS-30C07-40	φ30	7	4.1	40	20	TCA-30C07-40	TCAN-30C07-40
	TCBS-30C07-50	φ30	7	4.7	50	25	TCA-30C07-50	TCAN-30C07-50
	TCBS-30C07-60	φ30	7	5.1	60	30	TCA-30C07-60	TCAN-30C07-60
Substrates/Windows	TCBS-30C07-70	φ30	7	5.4	70	35	TCA-30C07-70	TCAN-30C07-70
	TCBS-30C07-80	φ30	7	5.6	80	40	TCA-30C07-80	TCAN-30C07-80
	TCBS-30C07-90	φ30	7	5.7	90	45	TCA-30C07-90	TCAN-30C07-90
	TCBS-30C07-100	φ30	7	5.9	100	50	TCA-30C07-100	TCAN-30C07-100
Optical Data	TCBS-30C05-120	φ30	5	4.1	120	60	TCA-30C05-120	TCAN-30C05-120
	TCBS-30C05-150	φ30	5	4.2	150	75	TCA-30C05-150	TCAN-30C05-150
Maintenance	TCBS-30C05-200	φ30	5	4.4	200	100	TCA-30C05-200	TCAN-30C05-200
	TCBS-30C05-250	φ30	5	4.5	250	125	TCA-30C05-250	TCAN-30C05-250
Selection Guide	TCBS-30C05-300	φ30	5	4.6	300	150	TCA-30C05-300	TCAN-30C05-300
	TCBS-30C05-400	φ30	5	4.7	400	200	TCA-30C05-400	TCAN-30C05-400
Low Scattering	TCBS-30C05-500	φ30	5	4.8	500	250	TCA-30C05-500	TCAN-30C05-500
	TCBS-30C05-600	φ30	5	4.8	600	300	TCA-30C05-600	TCAN-30C05-600
Optical Flats	TCBS-30C05-700	φ30	5	4.8	700	350	TCA-30C05-700	TCAN-30C05-700
	TCBS-30C05-800	φ30	5	4.9	800	400	TCA-30C05-800	TCAN-30C05-800
Optical Parallels	TCBS-30C05-1000	φ30	5	4.9	1000	500	TCA-30C05-1000	TCAN-30C05-1000
	TCBS-30C05-1500	φ30	5	4.9	1500	750	TCA-30C05-1500	TCAN-30C05-1500
Wedged Substrates	TCBS-30C05-2000	φ30	5	4.9	2000	1000	TCA-30C05-2000	TCAN-30C05-2000
	TCBS-30C05-2500	φ30	5	5.0	2500	1250	TCA-30C05-2500	TCAN-30C05-2500
Concave Mirror Substrates	TCBS-30C05-3000	φ30	5	5.0	3000	1500	TCA-30C05-3000	TCAN-30C05-3000
	TCBS-30C05-3500	φ30	5	5.0	3500	1750	TCA-30C05-3500	TCAN-30C05-3500
Master Optics	TCBS-30C05-4000	φ30	5	5.0	4000	2000	TCA-30C05-4000	TCAN-30C05-4000
	TCBS-30C05-5000	φ30	5	5.0	5000	2500	TCA-30C05-5000	TCAN-30C05-5000
Windows	TCBS-30C05-10000	φ30	5	5.0	10000	5000	TCA-30C05-10000	TCAN-30C05-10000
	TCBS-30C05-15000	φ30	5	5.0	15000	7500	TCA-30C05-15000	TCAN-30C05-15000
	TCBS-30C05-20000	φ30	5	5.0	20000	10000	TCA-30C05-20000	TCAN-30C05-20000
	TCBS-30C05-30000	φ30	5	5.0	30000	15000	TCA-30C05-30000	TCAN-30C05-30000



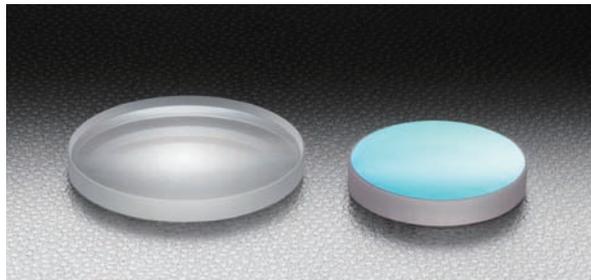
φ40 – φ50							
Substrates						Mirror coating	
Part Number	Diameter φD [mm]	Edge thickness te [mm]	Center thickness tc [mm]	Radius of curvature r [mm]	Focal length f [mm]	With Protective layer Part Number	Without Protective layer Part Number
TCBS-40C13-25	φ40	13	3.0	25	12.5	TCA-40C13-25	TCAN-40C13-25
TCBS-40C13-30	φ40	13	5.4	30	15	TCA-40C13-30	TCAN-40C13-30
TCBS-40C13-40	φ40	13	7.6	40	20	TCA-40C13-40	TCAN-40C13-40
TCBS-40C13-50	φ40	13	8.8	50	25	TCA-40C13-50	TCAN-40C13-50
TCBS-40C10-60	φ40	10	6.6	60	30	TCA-40C10-60	TCAN-40C10-60
TCBS-40C10-70	φ40	10	7.1	70	35	TCA-40C10-70	TCAN-40C10-70
TCBS-40C08-80	φ40	8	5.5	80	40	TCA-40C08-80	TCAN-40C08-80
TCBS-40C08-90	φ40	8	5.7	90	45	TCA-40C08-90	TCAN-40C08-90
TCBS-40C08-100	φ40	8	6.0	100	50	TCA-40C08-100	TCAN-40C08-100
TCBS-40C07-150	φ40	7	5.7	150	75	TCA-40C07-150	TCAN-40C07-150
TCBS-40C07-200	φ40	7	6.0	200	100	TCA-40C07-200	TCAN-40C07-200
TCBS-40C07-250	φ40	7	6.2	250	125	TCA-40C07-250	TCAN-40C07-250
TCBS-40C06-300	φ40	6	5.3	300	150	TCA-40C06-300	TCAN-40C06-300
TCBS-40C06-400	φ40	6	5.5	400	200	TCA-40C06-400	TCAN-40C06-400
TCBS-40C06-500	φ40	6	5.6	500	250	TCA-40C06-500	TCAN-40C06-500
TCBS-40C06-1000	φ40	6	5.8	1000	500	TCA-40C06-1000	TCAN-40C06-1000
TCBS-40C06-1500	φ40	6	5.9	1500	750	TCA-40C06-1500	TCAN-40C06-1500
TCBS-50C16-40	φ50	16	7.2	40	20	TCA-50C16-40	TCAN-50C16-40
TCBS-50C13-50	φ50	13	6.3	50	25	TCA-50C13-50	TCAN-50C13-50
TCBS-50C10-60	φ50	10	4.5	60	30	TCA-50C10-60	TCAN-50C10-60
TCBS-50C10-70	φ50	10	5.4	70	35	TCA-50C10-70	TCAN-50C10-70
TCBS-50C10-80	φ50	10	6.0	80	40	TCA-50C10-80	TCAN-50C10-80
TCBS-50C10-90	φ50	10	6.5	90	45	TCA-50C10-90	TCAN-50C10-90
TCBS-50C10-100	φ50	10	6.8	100	50	TCA-50C10-100	TCAN-50C10-100
TCBS-50C08-120	φ50	8	5.4	120	60	TCA-50C08-120	TCAN-50C08-120
TCBS-50C08-150	φ50	8	5.9	150	75	TCA-50C08-150	TCAN-50C08-150
TCBS-50C08-200	φ50	8	6.4	200	100	TCA-50C08-200	TCAN-50C08-200
TCBS-50C08-250	φ50	8	6.7	250	125	TCA-50C08-250	TCAN-50C08-250
TCBS-50C08-300	φ50	8	7.0	300	150	TCA-50C08-300	TCAN-50C08-300
TCBS-50C08-400	φ50	8	7.2	400	200	TCA-50C08-400	TCAN-50C08-400
TCBS-50C08-500	φ50	8	7.4	500	250	TCA-50C08-500	TCAN-50C08-500
TCBS-50C08-600	φ50	8	7.5	600	300	TCA-50C08-600	TCAN-50C08-600
TCBS-50C08-700	φ50	8	7.6	700	350	TCA-50C08-700	TCAN-50C08-700
TCBS-50C08-800	φ50	8	7.6	800	400	TCA-50C08-800	TCAN-50C08-800
TCBS-50C08-1000	φ50	8	7.7	1000	500	TCA-50C08-1000	TCAN-50C08-1000
TCBS-50C08-1500	φ50	8	7.8	1500	750	TCA-50C08-1500	TCAN-50C08-1500
TCBS-50C08-2000	φ50	8	7.8	2000	1000	TCA-50C08-2000	TCAN-50C08-2000
TCBS-50C08-2500	φ50	8	7.9	2500	1250	TCA-50C08-2500	TCAN-50C08-2500
TCBS-50C08-3000	φ50	8	7.9	3000	1500	TCA-50C08-3000	TCAN-50C08-3000
TCBS-50C08-3500	φ50	8	7.9	3500	1750	TCA-50C08-3500	TCAN-50C08-3500
TCBS-50C08-4000	φ50	8	7.9	4000	2000	TCA-50C08-4000	TCAN-50C08-4000
TCBS-50C08-5000	φ50	8	7.9	5000	2500	TCA-50C08-5000	TCAN-50C08-5000
TCBS-50C08-10000	φ50	8	8.0	10000	5000	TCA-50C08-10000	TCAN-50C08-10000
TCBS-50C08-30000	φ50	8	8.0	30000	15000	TCA-50C08-30000	TCAN-50C08-30000

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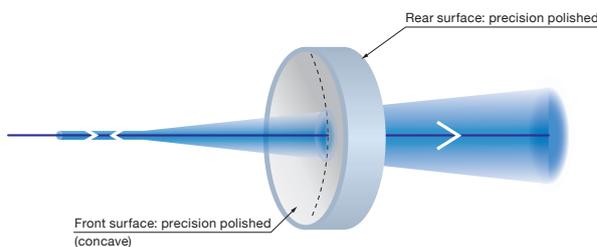
Concave Mirror Substrate for Laser | LCBS



These concave substrates are the primary substrate used by mirrors for the laser resonator. It is processed with high surface flatness on both the front and back surface of the concave mirror. Concave mirrors are also available with a dielectric multi-layer film with high laser damage threshold.

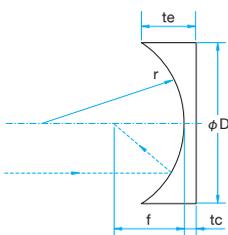


Schematic



Outline Drawing

(in mm)



- Tolerance Diameter $\phi D: \pm 0.1$
Thickness $t_c \pm 0.2$
- Relationship between focal length "f" and the radius of curvature "r" of the concave mirror $r = 2f$

- Large selection of diameter and focal length is available on our website and in our catalog.
- Because it is also polished on the back side, it is possible to use for input of excitation laser or extraction of sample beam.
- The substrate can also be used as a test plate for convex lens surface because of the high accuracy and precision of the radius of curvature.

Specifications

Material	BK7
Surface accuracy	Front (concave) $\lambda/4$ Rear (flat) $\lambda/4$
Radius Tolerance	$\pm 1\%$
Coating	Uncoated
Clear aperture	90% of actual diameter
Surface Quality (Scratch-Dig)	20-10

Guide

► Concave reflector mirror substrate (TCA) is also available for use with a light source or lamp reflector telescope. [Reference](#) B304

Attention

► The outer periphery of the concave edge is chamfered and thickness of edge (te) may vary. For this reason, please use the back side as the reference plane.

φ10					
Part Number	Diameter φD [mm]	Edge thickness te [mm]	Center thickness tc [mm]	Radius of curvature r [mm]	Focal length f [mm]
LCBS-10C05-10	φ10	5	3.7	10	5
LCBS-10C05-15	φ10	5	4.1	15	7.5
LCBS-10C05-20	φ10	5	4.4	20	10
LCBS-10C05-25	φ10	5	4.5	25	12.5
LCBS-10C05-30	φ10	5	4.6	30	15
LCBS-10C05-40	φ10	5	4.7	40	20
LCBS-10C05-50	φ10	5	4.7	50	25
LCBS-10C05-60	φ10	5	4.8	60	30
LCBS-10C05-70	φ10	5	4.8	70	35
LCBS-10C05-80	φ10	5	4.8	80	40
LCBS-10C05-90	φ10	5	4.9	90	45
LCBS-10C05-100	φ10	5	4.9	100	50
LCBS-10C05-120	φ10	5	4.9	120	60
LCBS-10C05-150	φ10	5	4.9	150	75
LCBS-10C05-200	φ10	5	4.9	200	100
LCBS-10C05-250	φ10	5	4.9	250	125
LCBS-10C05-300	φ10	5	5.0	300	150
LCBS-10C05-400	φ10	5	5.0	400	200
LCBS-10C05-500	φ10	5	5.0	500	250
LCBS-10C05-600	φ10	5	5.0	600	300
LCBS-10C05-700	φ10	5	5.0	700	350
LCBS-10C05-800	φ10	5	5.0	800	400
LCBS-10C05-1000	φ10	5	5.0	1000	500
LCBS-10C05-1500	φ10	5	5.0	1500	750
LCBS-10C05-2000	φ10	5	5.0	2000	1000
LCBS-10C05-2500	φ10	5	5.0	2500	1250
LCBS-10C05-3000	φ10	5	5.0	3000	1500
LCBS-10C05-4000	φ10	5	5.0	4000	2000
LCBS-10C05-5000	φ10	5	5.0	5000	2500
LCBS-10C05-10000	φ10	5	5.0	10000	5000
LCBS-10C05-30000	φ10	5	5.0	30000	15000

φ15					
Part Number	Diameter φD [mm]	Edge thickness te [mm]	Center thickness tc [mm]	Radius of curvature r [mm]	Focal length f [mm]
LCBS-15C07-10	φ15	7	3.6	10	5
LCBS-15C07-15	φ15	7	5.0	15	7.5
LCBS-15C05-20	φ15	5	3.5	20	10
LCBS-15C05-25	φ15	5	3.8	25	12.5
LCBS-15C05-30	φ15	5	4.0	30	15
LCBS-15C05-40	φ15	5	4.3	40	20
LCBS-15C05-50	φ15	5	4.4	50	25
LCBS-15C05-60	φ15	5	4.5	60	30
LCBS-15C05-70	φ15	5	4.6	70	35
LCBS-15C05-80	φ15	5	4.6	80	40
LCBS-15C05-90	φ15	5	4.7	90	45
LCBS-15C05-100	φ15	5	4.7	100	50
LCBS-15C05-120	φ15	5	4.8	120	60
LCBS-15C05-150	φ15	5	4.8	150	75
LCBS-15C05-200	φ15	5	4.9	200	100
LCBS-15C05-250	φ15	5	4.9	250	125
LCBS-15C05-300	φ15	5	4.9	300	150
LCBS-15C05-400	φ15	5	4.9	400	200
LCBS-15C05-500	φ15	5	4.9	500	250
LCBS-15C05-600	φ15	5	5.0	600	300
LCBS-15C05-700	φ15	5	5.0	700	350
LCBS-15C05-800	φ15	5	5.0	800	400
LCBS-15C05-1000	φ15	5	5.0	1000	500
LCBS-15C05-1500	φ15	5	5.0	1500	750
LCBS-15C05-2000	φ15	5	5.0	2000	1000
LCBS-15C05-2500	φ15	5	5.0	2500	1250
LCBS-15C05-3000	φ15	5	5.0	3000	1500
LCBS-15C05-4000	φ15	5	5.0	4000	2000
LCBS-15C05-5000	φ15	5	5.0	5000	2500
LCBS-15C05-10000	φ15	5	5.0	10000	5000
LCBS-15C05-30000	φ15	5	5.0	30000	15000



φ20 – φ25					
Part Number	Diameter φD [mm]	Edge thickness te [mm]	Center thickness tc [mm]	Radius of curvature r [mm]	Focal length f [mm]
LCBS-20C08-15	φ20	8	4.2	15	7.5
LCBS-20C08-20	φ20	8	5.3	20	10
LCBS-20C08-25	φ20	8	5.9	25	12.5
LCBS-20C05-30	φ20	5	3.3	30	15
LCBS-20C05-40	φ20	5	3.7	40	20
LCBS-20C05-50	φ20	5	4.0	50	25
LCBS-20C05-60	φ20	5	4.2	60	30
LCBS-20C05-70	φ20	5	4.3	70	35
LCBS-20C05-80	φ20	5	4.4	80	40
LCBS-20C05-90	φ20	5	4.4	90	45
LCBS-20C05-100	φ20	5	4.5	100	50
LCBS-20C05-120	φ20	5	4.6	120	60
LCBS-20C05-150	φ20	5	4.7	150	75
LCBS-20C05-200	φ20	5	4.7	200	100
LCBS-20C05-250	φ20	5	4.8	250	125
LCBS-20C05-300	φ20	5	4.8	300	150
LCBS-20C05-400	φ20	5	4.9	400	200
LCBS-20C05-500	φ20	5	4.9	500	250
LCBS-20C05-600	φ20	5	4.9	600	300
LCBS-20C05-700	φ20	5	4.9	700	350
LCBS-20C05-800	φ20	5	4.9	800	400
LCBS-20C05-1000	φ20	5	5.0	1000	500
LCBS-20C05-1500	φ20	5	5.0	1500	750
LCBS-20C05-2000	φ20	5	5.0	2000	1000
LCBS-20C05-2500	φ20	5	5.0	2500	1250
LCBS-20C05-3000	φ20	5	5.0	3000	1500
LCBS-20C05-4000	φ20	5	5.0	4000	2000
LCBS-20C05-5000	φ20	5	5.0	5000	2500
LCBS-20C05-10000	φ20	5	5.0	10000	5000
LCBS-20C05-30000	φ20	5	5.0	30000	15000
LCBS-25C10-15	φ25	10	3.3	15	7.5
LCBS-25C07-20	φ25	7	2.6	20	10
LCBS-25C07-25	φ25	7	3.7	25	12.5
LCBS-25C07-30	φ25	7	4.3	30	15
LCBS-25C07-40	φ25	7	5.0	40	20
LCBS-25C07-50	φ25	7	5.4	50	25
LCBS-25C05-60	φ25	5	3.7	60	30
LCBS-25C05-70	φ25	5	3.9	70	35
LCBS-25C05-80	φ25	5	4.0	80	40
LCBS-25C05-90	φ25	5	4.1	90	45
LCBS-25C05-100	φ25	5	4.2	100	50
LCBS-25C05-120	φ25	5	4.3	120	60
LCBS-25C05-150	φ25	5	4.5	150	75
LCBS-25C05-200	φ25	5	4.6	200	100
LCBS-25C05-250	φ25	5	4.7	250	125
LCBS-25C05-300	φ25	5	4.7	300	150
LCBS-25C05-400	φ25	5	4.8	400	200
LCBS-25C05-500	φ25	5	4.8	500	250
LCBS-25C05-600	φ25	5	4.9	600	300
LCBS-25C05-700	φ25	5	4.9	700	350
LCBS-25C05-800	φ25	5	4.9	800	400
LCBS-25C05-1000	φ25	5	4.9	1000	500
LCBS-25C05-1500	φ25	5	4.9	1500	750
LCBS-25C05-2000	φ25	5	5.0	2000	1000
LCBS-25C05-2500	φ25	5	5.0	2500	1250
LCBS-25C05-3000	φ25	5	5.0	3000	1500
LCBS-25C05-4000	φ25	5	5.0	4000	2000
LCBS-25C05-5000	φ25	5	5.0	5000	2500
LCBS-25C05-10000	φ25	5	5.0	10000	5000
LCBS-25C05-30000	φ25	5	5.0	30000	15000

φ30					
Part Number	Diameter φD [mm]	Edge thickness te [mm]	Center thickness tc [mm]	Radius of curvature r [mm]	Focal length f [mm]
LCBS-30C10-20	φ30	10	3.2	20	10
LCBS-30C10-25	φ30	10	5.0	25	12.5
LCBS-30C07-30	φ30	7	3.0	30	15
LCBS-30C07-40	φ30	7	4.1	40	20
LCBS-30C07-50	φ30	7	4.7	50	25
LCBS-30C07-60	φ30	7	5.1	60	30
LCBS-30C07-70	φ30	7	5.4	70	35
LCBS-30C07-80	φ30	7	5.6	80	40
LCBS-30C07-90	φ30	7	5.7	90	45
LCBS-30C07-100	φ30	7	5.9	100	50
LCBS-30C05-120	φ30	5	4.1	120	60
LCBS-30C05-150	φ30	5	4.2	150	75
LCBS-30C05-200	φ30	5	4.4	200	100
LCBS-30C05-250	φ30	5	4.5	250	125
LCBS-30C05-300	φ30	5	4.6	300	150
LCBS-30C05-400	φ30	5	4.7	400	200
LCBS-30C05-500	φ30	5	4.8	500	250
LCBS-30C05-600	φ30	5	4.8	600	300
LCBS-30C05-700	φ30	5	4.8	700	350
LCBS-30C05-800	φ30	5	4.9	800	400
LCBS-30C05-1000	φ30	5	4.9	1000	500
LCBS-30C05-1500	φ30	5	4.9	1500	750
LCBS-30C05-2000	φ30	5	4.9	2000	1000
LCBS-30C05-2500	φ30	5	5.0	2500	1250
LCBS-30C05-3000	φ30	5	5.0	3000	1500
LCBS-30C05-3500	φ30	5	5.0	3500	1750
LCBS-30C05-4000	φ30	5	5.0	4000	2000
LCBS-30C05-5000	φ30	5	5.0	5000	2500
LCBS-30C05-10000	φ30	5	5.0	10000	5000
LCBS-30C05-30000	φ30	5	5.0	30000	15000

Compatible Optic Mounts

MHG-HS25-NL, -HS30-NL / LHCM-10, -15 / ALHN-25-5RO, -30-5RO

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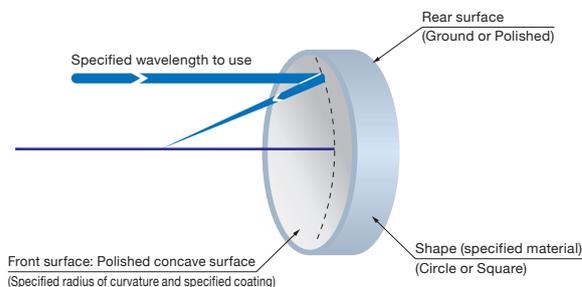
In addition to the substrates that are listed in the catalog, we offer custom fabrication of the mirror curvature and size. Please use the "Contact Us form for custom mirror" or contact our Sales Division with your custom specifications including Thin Film Coatings for your application.



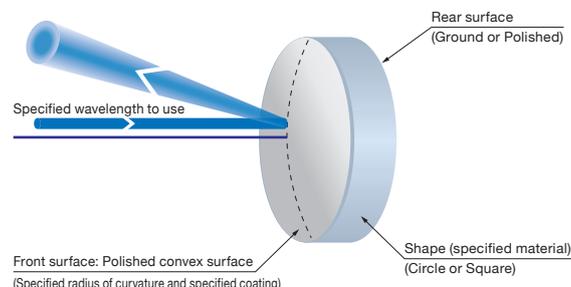
- For the specifications of our coating, please refer to the mirror coating properties in the catalog or on our website. Please refer to the "cost of custom coating" of "optical data" chapter for the cost of custom coating.
- We offer the production of custom-made curved mirrors in small to volume quantities.
- We list below the typical radius of curvature of our curved mirrors. If you require a radius of curvature that is not on this list there may be additional costs for jigs and tools. For more information, please consult our Sales Division.

Schematic

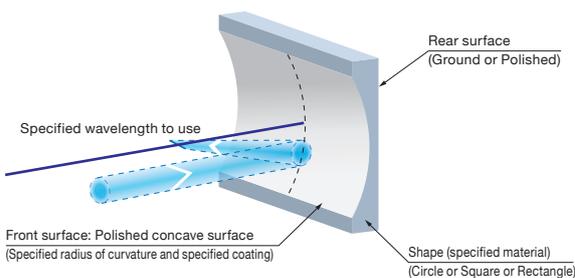
● Concave mirror



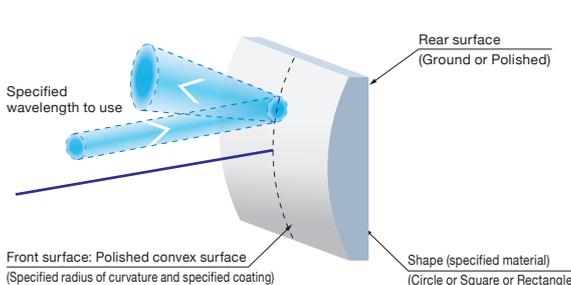
● Convex mirror



● Cylindrical concave mirror



● Cylindrical convex mirror



List of spherical radius curvature (in mm)			
10	100	1000	10000
15	120	1500	20000
20	150	2000	30000
25	200	2500	
30	250	3000	
40	300	4000	
50	400	5000	
60	500		
70	600		
80	700		
90	800		

List of cylindrical radius curvature (in mm)				
6.90	10.38	32.20	103.80	460.0
7.79	11.50	36.33	115.00	519.0
9.20	12.98	36.80	129.80	
	13.80	41.52	138.00	
	15.57	46.00	155.70	
	18.40	51.90	184.00	
	20.76	59.80	207.60	
	23.00	67.47	230.00	
	25.95	69.00	259.50	
	27.60	77.85	322.00	
	31.14	92.00	363.30	

* If you specify a radius of curvature not on this list, it may take some other processing cost of margin for jig. For more information, please consult our International Sales Division.

Contact sheet for Special Order for Custom Curved Mirror Estimation Order

Date

To: Sigma Koki Co., Ltd. FAX +81-3-5638-6550

Affiliation (Organization Name)		Department		Name	
TEL		FAX		E-mail	
Country/Address					
Name & Designation (Tentative name is okay)					
Drawing Number				Estimate <input type="checkbox"/> Yes: by Date <input type="checkbox"/> No	
Desired Delivery Date				Budget JP Yen	
Substrate				If you are using a substrate of standard product, please fill in the product number. * If you specify a standard product of the substrate, it is not necessary to fill in fields marked with ▲.	
Material▲		<input type="checkbox"/> BK7 <input type="checkbox"/> Synthetic fused silica <input type="checkbox"/> Pyrex® <input type="checkbox"/> Other ()		Quantity▲	
Type▲		<input type="checkbox"/> spherical <input type="checkbox"/> cylindrical <input type="checkbox"/> concave <input type="checkbox"/> convex		Rear surface▲ <input type="checkbox"/> Polished <input type="checkbox"/> Ground <input type="checkbox"/> None	
Dimensions▲ If you do not specify a dimension tolerance is outside the standard tolerance				ϕA	mm
				tc	mm
				r	mm
				a	mm
				b	mm
				Standard radius of curvature	10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100, 120, 150, 200, 250, 300, 400, 500, 600, 700, 800, 1000, 1500, 2000, 2500, 3000, 4000, 5000, 10000, 20000, 30000 ● For cylindrical lens, please refer to the W3144 When fabricating a lens other than the above curvature radius, it may be necessary tooling costs.
Specifications of Coating		<input type="checkbox"/> Metallic coating <input type="checkbox"/> Al only <input type="checkbox"/> Al+MgF ₂ <input type="checkbox"/> Al+SiO <input type="checkbox"/> Cr+Au <input type="checkbox"/> Pt <input type="checkbox"/> Other ()			
Select metallic coating or dielectric multi-layer coating. <input type="checkbox"/> Dielectric multi-layer coating		Reflectance	R = %		
Specifications of Light Source Used	Wavelength Range	$\lambda =$	nm	Type	
	Output or Energy	W		Beam size	mm
		J	Pulse width	s	Repetition frequency
Incident angle	$\theta =$	°	Polarization conditions	(If there is no specification in advance, we will process a circular polarization or a random polarization.)	
Other * Write more detailed specifications here. (Rough illustration is acceptable.)					

Optical Flats | HMPQP/HMPZP

RoHS

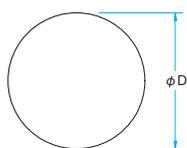
It is a substrate polished to high precision where material change of the shape is very small due to the temperature variation. It can be used as test plates of the interferometer and the Newton test plate.

- Inspection data of interferometric surface accuracy is provided with the optical flats.
- You can select the required optical flat from our range of products listed by various sizes and surface accuracy.
- In the high-precision and large size optical flats, a material having a lower thermal expansion than synthetic fused silica is used.
- Arrow on the side of the component indicates the surface that is polished to the high surface accuracy.
- Optical flats are delivered in case for storage.



Outline Drawing

(in mm)



● Tolerance
 $D \leq \phi 50$
 Diameter $\phi D_{-0.1}^{\circ}$
 Thickness $t \pm 0.1$

$D \geq \phi 60$
 Diameter $\phi D_{-0.2}^{\circ}$
 Thickness $t \pm 0.2$

Specifications

Material	Synthetic fused silica low-expansion glass (ZERODUR® or CLEARCERAM®-Z)
Parallelism	<3'
Surface Quality (Scratch-Dig)	20-10
Rear Surface	Polished
Clear aperture	95% of actual aperture Surface flatness $\lambda/40$ in 90% of actual aperture

Guide

- ▶ Zerodur® is a registered trademark of SCHOTT AG.
- ▶ CLEARCERAM® is a registered trademark of Ohara Corporation.
- ▶ Wedge substrates are also available that can be used to prevent the influence of back reflection (WSB / WSSQ / WSSQK).
[Reference](#) ▶ B300

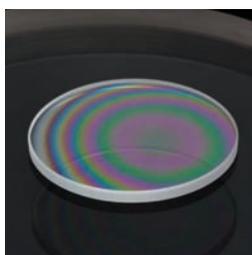
Reference

- ▶ A Newton ring is a rainbow-colored fringes that can be observed when the sample is adhered with optical flat. It is possible to estimate the flatness of the sample surface from the shape and number of this fringes.
- ▶ PVR of reflected wavefront accuracy is a method for evaluating the surface accuracy and is divided by the spatial frequency component image data by the interferometer. On images of the low frequency, it is using the peak to valley values, and on the image of intermediate frequency, it is evaluated using the RMS values.

Attention

- ▶ When used as a Newton test plate, it may scratch the sample if used improperly. If inspecting an object that is easily scratched, use a laser interferometer.
- ▶ The number of Newton rings is approximately twice the value of the PV result of analysis by interferometer.
- ▶ Optical flats are not coated in order to maintain the surface accuracy. If you need a coating, please contact to our Sales Division.
- ▶ If there is a crack or chipping visible on the edges of an optical flats, the damage may have reduced the surface flatness. Please do not use damaged optical flats as they should be replaced.

Reference image



Newton ring

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Standard type				
Part Number	Diameter ϕ D [mm]	Thickness t [mm]	Material	Surface flatness PV
HMPQP-30C10-6	ϕ 30	10	Synthetic fused silica	$\lambda/6$
HMPQP-30C10-12	ϕ 30	10	Synthetic fused silica	$\lambda/12$
HMPQP-30C10-20	ϕ 30	10	Synthetic fused silica	$\lambda/20$
HMPQP-40C10-6	ϕ 40	10	Synthetic fused silica	$\lambda/6$
HMPQP-40C10-12	ϕ 40	10	Synthetic fused silica	$\lambda/12$
HMPQP-40C10-20	ϕ 40	10	Synthetic fused silica	$\lambda/20$
HMPQP-50C10-6	ϕ 50	10	Synthetic fused silica	$\lambda/6$
HMPQP-50C10-12	ϕ 50	10	Synthetic fused silica	$\lambda/12$
HMPQP-50C10-20	ϕ 50	10	Synthetic fused silica	$\lambda/20$
HMPQP-60C12-6	ϕ 60	12	Synthetic fused silica	$\lambda/6$
HMPQP-60C12-12	ϕ 60	12	Synthetic fused silica	$\lambda/12$
HMPQP-60C12-20	ϕ 60	12	Synthetic fused silica	$\lambda/20$
HMPQP-80C15-6	ϕ 80	15	Synthetic fused silica	$\lambda/6$
HMPQP-80C15-12	ϕ 80	15	Synthetic fused silica	$\lambda/12$
HMPQP-80C15-20	ϕ 80	15	Synthetic fused silica	$\lambda/20$
HMPQP-100C20-6	ϕ 100	20	Synthetic fused silica	$\lambda/6$
HMPQP-100C20-12	ϕ 100	20	Synthetic fused silica	$\lambda/12$
HMPQP-100C20-20	ϕ 100	20	Synthetic fused silica	$\lambda/20$
HMPZP-100C17-6	ϕ 100	17	low-expansion glass	$\lambda/6$
HMPZP-100C17-12	ϕ 100	17	low-expansion glass	$\lambda/12$
HMPZP-100C17-20	ϕ 100	17	low-expansion glass	$\lambda/20$
HMPQP-130C25-6	ϕ 130	25	Synthetic fused silica	$\lambda/6$
HMPQP-130C25-12	ϕ 130	25	Synthetic fused silica	$\lambda/12$
HMPQP-130C25-20	ϕ 130	25	Synthetic fused silica	$\lambda/20$
HMPZP-130C20-6	ϕ 130	20	low-expansion glass	$\lambda/6$
HMPZP-130C20-12	ϕ 130	20	low-expansion glass	$\lambda/12$
HMPZP-130C20-20	ϕ 130	20	low-expansion glass	$\lambda/20$
HMPQP-150C30-6	ϕ 150	30	Synthetic fused silica	$\lambda/6$
HMPQP-150C30-12	ϕ 150	30	Synthetic fused silica	$\lambda/12$
HMPQP-150C30-20	ϕ 150	30	Synthetic fused silica	$\lambda/20$
HMPZP-150C25-6	ϕ 150	25	low-expansion glass	$\lambda/6$
HMPZP-150C25-12	ϕ 150	25	low-expansion glass	$\lambda/12$
HMPZP-150C25-20	ϕ 150	25	low-expansion glass	$\lambda/20$

High precision type				
Part Number	Diameter ϕ D [mm]	Thickness t [mm]	Material	Surface flatness PVr
HMPQP-30C10-40	ϕ 30	10	Synthetic fused silica	$\lambda/40$
HMPQP-40C10-40	ϕ 40	10	Synthetic fused silica	$\lambda/40$
HMPQP-50C10-40	ϕ 50	10	Synthetic fused silica	$\lambda/40$
HMPQP-60C12-40	ϕ 60	12	Synthetic fused silica	$\lambda/40$
HMPQP-80C15-40	ϕ 80	15	Synthetic fused silica	$\lambda/40$
HMPQP-100C20-40	ϕ 100	20	Synthetic fused silica	$\lambda/40$
HMPQP-130C25-40	ϕ 130	25	Synthetic fused silica	$\lambda/40$
HMPQP-150C30-40	ϕ 150	30	Synthetic fused silica	$\lambda/40$
HMPZP-150C25-40	ϕ 150	25	low-expansion glass	$\lambda/40$

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We will fabricate custom substrates to your request of shape, size, reflected wavefront and transmitted wavefront with high precision.

Production of large-diameter optical grade polishing to 300mm diameter maximum is available.

We can also provide special processing, such as drilling hole or rectangular shape.

- A data of transmitted wavefront measurement or reflected wavefront by the interferometer is provided.
- We offer a selection of substrates made from various low-expansion material suitable to the required accuracy and environment of your use.
- Thin film coatings are also available on the master optics. However, depending on the type of coating it we may not be able to guarantee the surface flatness.



Specifications

Maximum Diameter	φ300mm
Proper thickness	50 – 38mm (Approximately 1/6 to 1/8 of diameter)
Clear aperture	90% of actual aperture
Material	Various synthetic fused silica or low-expansion glass.
Surface flatness	λ/10 (It may vary depending on the thickness and outer diameter.)

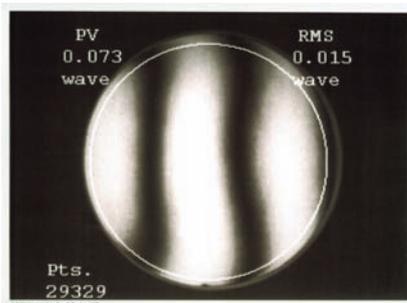
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- ▶ Optical flats (HMPQP / HMPZP) that has been standardized by the reflecting surface flatness are available. [Reference](#) ▶ B312
- ▶ Optical flats (OFXP) with surface flatness of λ/10 and less φ150mm are available. [Reference](#) ▶ B288

Attention

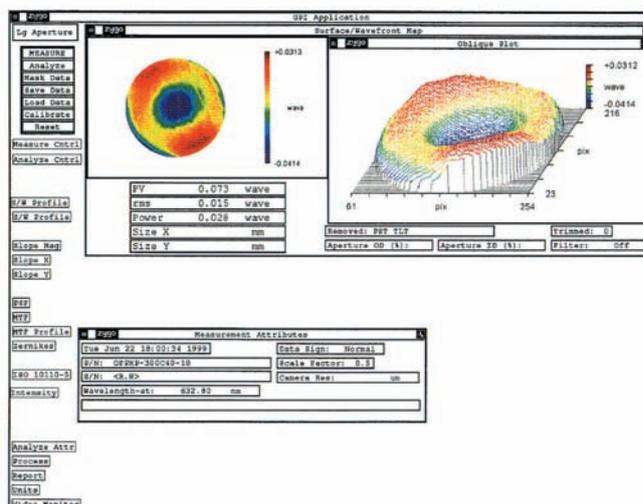
- ▶ Surface flatness may not be guaranteed if coating is applied to master optics.
- ▶ Due to the difficulty in procurement of the materials and processing conditions, lead-time may be longer, please check with our Sales Division for accurate delivery.
- ▶ If the holder is fixed to the master optics, by tightening screws too strongly, or the use of curable adhesives the surface flatness may be reduce on the master optics.

Surface flatness data (reference data)



Fringe image

- Surface accuracy measurement method: Measured with Zygo laser interferometer
- Surface accuracy measurement wavelength 632.8nm
- Surface accuracy guaranteed temperature 23°C±2°C



Analysis of three-dimensional data

Contact sheet for Special Order for Master Optics

Estimation Order

Date

To: Sigma Koki Co., Ltd. **FAX +81-3-5638-6550**

Affiliation (Organization Name)						
Department		Name				
TEL	FAX	E-mail				
Country/Address						
Name & Designation		(Tentative name is okay)				
Drawing Number		Estimate	<input type="checkbox"/> Yes: by Date <input type="checkbox"/> No			
Desired Delivery Date		Budget	JP Yen			
Dimensions <small>If you do not specify a dimension tolerance is outside the standard tolerance</small>						
	ϕA		mm			
	a		mm			
	b		mm			
		t	mm			
Application	<input type="checkbox"/> Optical flat for Newton ring <input type="checkbox"/> Master Optical flat <input type="checkbox"/> Window <input type="checkbox"/> Optical Flats <input type="checkbox"/> Optical Parallels <input type="checkbox"/> Wedged Substrates <input type="checkbox"/> Optical flats with hole <input type="checkbox"/> Other ()		Material			
			<input type="checkbox"/> Synthetic fused silica <input type="checkbox"/> BK7 <input type="checkbox"/> Pyrex® <input type="checkbox"/> Low-expansion glass <input type="checkbox"/> CLEARCERAM®-Z <input type="checkbox"/> ULE™ <input type="checkbox"/> ZERODUR® <input type="checkbox"/> Other ()			
Surface Flatness	<input type="checkbox"/> Reflected wavefront distortion: $\lambda/$ <input type="checkbox"/> Transmitted wavefront distortion: $\lambda/$		Quantity			
Parallelism	Rear surface	<input type="checkbox"/> Ground <input type="checkbox"/> Polished <input type="checkbox"/> None				
Wedge angle	<input type="checkbox"/> Wedge <input type="checkbox"/> Parallel	* If you check Yes (with), please indicate your required details on the right column.	Attached data <input type="checkbox"/> Photography of interference fringe <input type="checkbox"/> Data analysis of the interference fringes (PV, RMS, 3D chart)			
Hole	<input type="checkbox"/> With hole <input type="checkbox"/> Flat					
Specifications of Coating	Type of coat	<input type="checkbox"/> Metal coat (Al, Cr, Au) <input type="checkbox"/> Single-layer anti-reflection coating <input type="checkbox"/> Multi-layer anti-reflection coating				
		Center wavelength	nm			
	Surface	<input type="checkbox"/> Single side <input type="checkbox"/> Both sides	Wavelength Range	nm		
			Incident angle	°		
	Type	Wavelength Range	nm	Beam size	mm	
Output or Energy	W	J	Pulse width	s	Repetition frequency	Hz
Other	* Write more detailed specifications here. (Rough illustration is acceptable.)					



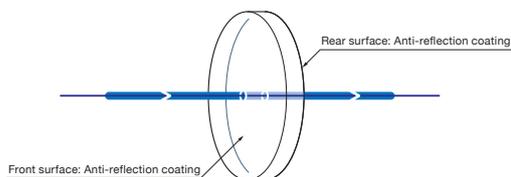
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These optical windows have high-quality and may be used when light is passed through the opposite side of the partition or in the vacuum chamber. Since the windows have anti-reflection coatings the transmittance is increased so they can be used as a window for laser irradiation windows and the observation of the sample.

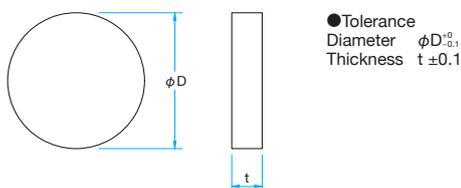
- By anti-reflection coating with a dielectric multi-layer, it is reduced to less than 1% to 4% reflection loss of the glass surface.
- Since we are using the high quality material, the image will not be distorted by the transmission of the glass, and the laser beam is not diffused.
- When you insert an window perpendicular to the optical path of the laser, the angle of the transmitted beam will not be changed.



Schematic



Outline Drawing



How to specify the anti-reflection coating

In case of specifying an anti-reflection coating 633nm – 1064nm to near infrared lens of WBMA-30C02-10-550
 \Rightarrow WBMA-30C02-10-IR1

Type of AR Coat	Part Number	Wavelength Range [nm]	Transmittance [%]
Visible range	WBMA-30C02-10-550	400 – 700	> Average 99
Near-infrared	WBMA-30C02-10-IR1	633 – 1064	> Average 98.5
Infrared	WBMA-30C02-10-IR2	750 – 1550	> Average 98.5

! Part of the above is an example of if you want to coat anti-reflective coating on the lens of the WBMA-30C02-10-550.

! Anti-reflection coating can be available to the lens of all of WBMA.

Specifications

Part Number	How to specify the anti-reflection coating		Diameter ϕD [mm]	Thickness t [mm]
	Near-infrared 633 – 1064nm	Infrared 750 – 1550nm		
WBMA-15C02-10-550	-IR1	-IR2	$\phi 15$	2
WBMA-15C03-10-550	-IR1	-IR2	$\phi 15$	3
WBMA-20C02-10-550	-IR1	-IR2	$\phi 20$	2
WBMA-20C03-10-550	-IR1	-IR2	$\phi 20$	3
WBMA-25.4C03-10-550	-IR1	-IR2	$\phi 25.4$	3
WBMA-25C02-10-550	-IR1	-IR2	$\phi 25$	2
WBMA-25C03-10-550	-IR1	-IR2	$\phi 25$	3
WBMA-30C02-10-550	-IR1	-IR2	$\phi 30$	2
WBMA-30C03-10-550	-IR1	-IR2	$\phi 30$	3
WBMA-40C04-10-550	-IR1	-IR2	$\phi 40$	4
WBMA-50C05-10-550	-IR1	-IR2	$\phi 50$	5

Compatible Optic Mounts

LHF-15S, -20S, -25.4S, -25S, -30S, -40S, -50S

Specifications

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

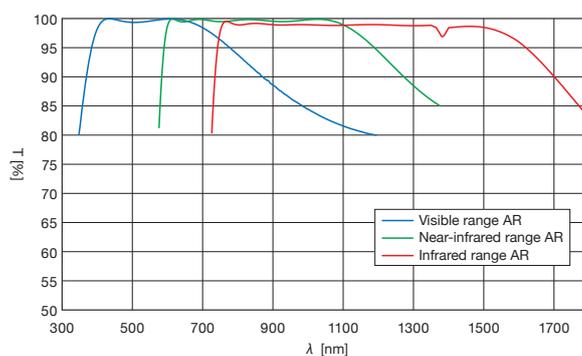
Guide

- ▶ Anti-reflection coatings are also available at your specified wavelength.
- ▶ In addition to the products described on our website and in the catalog other sizes and wedged windows are available.

Attention

- ▶ When using a laser which has a large diameter, there is a possibility that very little interference fringes will be observed in the luminance distribution of the transmitted light. To avoid this effect of the interference fringes, we provide wedged substrates.
- ▶ When used at wavelengths other than the specified wavelength region, the loss of transmittance increases slightly.
- ▶ When used in a large incident angle, there is a possibility that the transmittance decreases. Also available are anti-reflection coating to increase the transmittance at a particular angle of incidence.

Typical Transmittance Data



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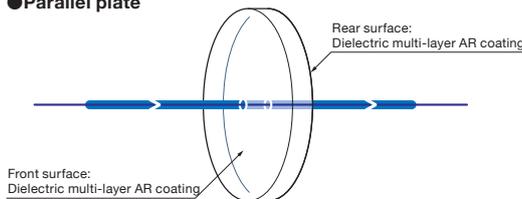
These optical windows have high-quality and may be used when light is passed through the opposite side of the partition or in the vacuum chamber. Since the windows have anti-reflection coatings the transmittance is increased so they can be used as a window for laser irradiation windows and the observation of the sample.

- When you insert an window perpendicular to the optical path of the laser, the angle of the transmitted beam is not changed.
- Since the high laser threshold coating is applied on the low scattering substrate, it can be used for the high-energy pulsed laser.

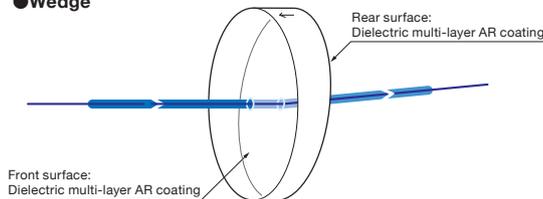


Schematic

● Parallel plate



● Wedge



Specifications

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

Guide

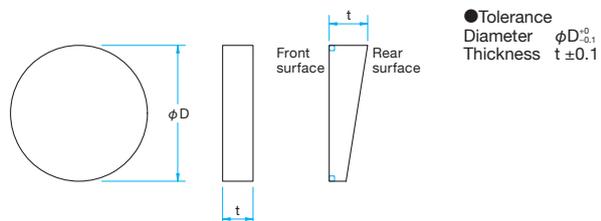
- ▶ We also offer AR coatings in accordance to your wavelength selection.
- ▶ Product sizes and wedges which are not mentioned on our website or in this catalog are available, please ask our Sales Division.

Attention

- ▶ When wedge type windows are inserted into the optical path of the laser beam, the beam tilt of about 0.5° is expected.
- ▶ When used at a wavelength other than the designed wavelength, the loss of transmitted light will be higher.
- ▶ When used at a large incident angle, the transmittance may decrease. We can provide AR coatings with highest transmission at a specific angle of incidence upon request.
- ▶ When using a high-energy laser with thin diameter, there is a possibility that damage may occur. Before using, make sure that the laser beam does not exceed the laser damage threshold.
- ▶ Wedged substrates are marked with an arrow toward the direction of front surface at the thickest point.

Outline Drawing

(in mm)



Specifications

Part Number	Wavelength Range [nm]	Diameter φD [mm]	Thickness t [mm]	Parallelism Wedge angle	Laser Damage Threshold* [J/cm²]
WSQNAHP-25.4C03-10-266	266	φ25.4	3	<5'	4
WSQNAHP-30C03-10-266	266	φ30	3	<5'	4
WSQNAHP-30C05-10W-266	266	φ30	5	1°±5'	4
WSQNAHP-50C05-10-266	266	φ50	5	<5'	4
WSQNAHP-50C08-10W-266	266	φ50	8	1°±5'	4
WSQNAHP-25.4C03-10-355	355	φ25.4	3	<5'	4
WSQNAHP-30C03-10-355	355	φ30	3	<5'	4
WSQNAHP-30C05-10W-355	355	φ30	5	1°±5'	4
WSQNAHP-50C05-10-355	355	φ50	5	<5'	4
WSQNAHP-50C08-10W-355	355	φ50	8	1°±5'	4
WSQNAHP-25.4C03-10-532	532	φ25.4	3	<5'	15
WSQNAHP-30C03-10-532	532	φ30	3	<5'	15
WSQNAHP-30C05-10W-532	532	φ30	5	1°±5'	15
WSQNAHP-50C05-10-532	532	φ50	5	<5'	15
WSQNAHP-50C08-10W-532	532	φ50	8	1°±5'	15
WSQNAHP-25.4C03-10-1064	1064	φ25.4	3	<5'	20
WSQNAHP-30C03-10-1064	1064	φ30	3	<5'	20
WSQNAHP-30C05-10W-1064	1064	φ30	5	1°±5'	20
WSQNAHP-50C05-10-1064	1064	φ50	5	<5'	20
WSQNAHP-50C08-10W-1064	1064	φ50	8	1°±5'	20

* Laser pulse width 10ns, repetition frequency 20Hz

Compatible Optic Mounts

LH-25.4S, -30S, -50S

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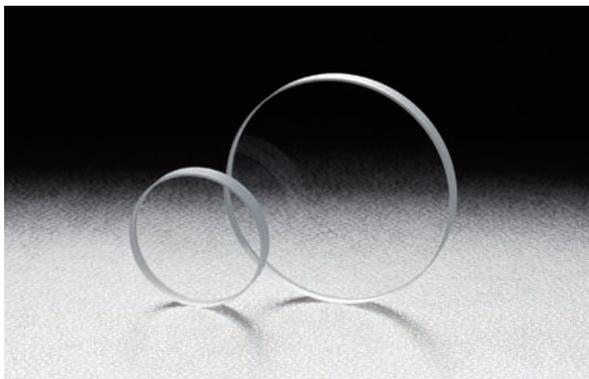
Concave Mirror Substrates

Master Optics

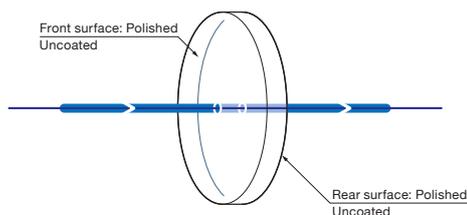
Windows

A standard Fused silica window has hydroxyl absorption (OH radical group) at wavelength 1.4 μ m, 2.2 μ m, 2.7 μ m. Anhydrous synthetic quartz is a special material that does not absorb water molecules in the molecular glass; therefore there is no hydroxyl absorption at the IR region.

- The physical characteristics and optical properties of none hydroxyl absorption at IR region is the only difference from conventional synthetic quartz.
- The material is physically robust and provide higher stability and is recommend for use in vacuum and high pressure environments.

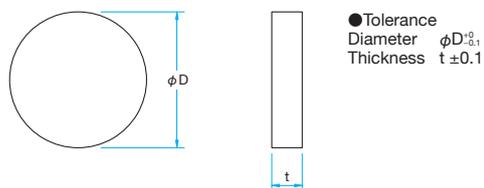


Schematic

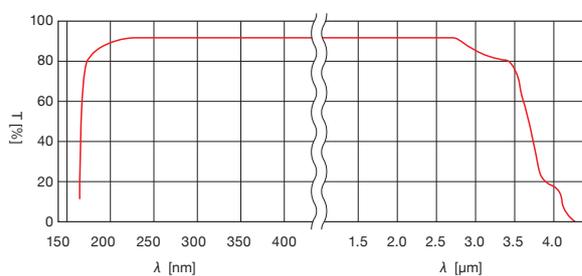


Outline Drawing

(in mm)



Typical Transmittance Data T: Transmission



Specifications

Part Number	Diameter ϕD [mm]	Thickness t [mm]
OPNQ-30C03-P	$\phi 30$	3
OPNQ-30C05-P	$\phi 30$	5
OPNQ-50C03-P	$\phi 50$	3
OPNQ-50C05-P	$\phi 50$	5

Compatible Optic Mounts

LHF -30S, -50S

Specifications

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

Guide

- ▶ We also offer AR coatings in accordance to your wavelength selection.
- ▶ Product sizes and wedges which are not mentioned on our website or in this catalog are available, please ask our Sales Division.

Attention

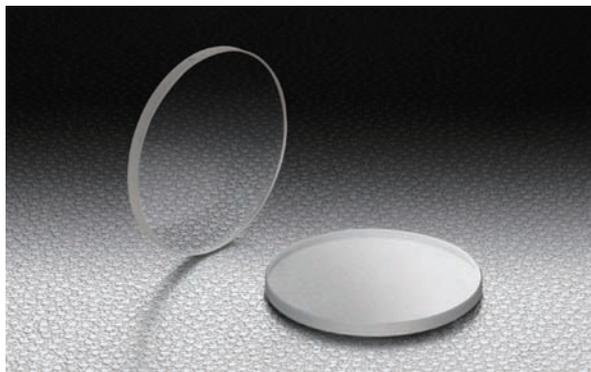
- ▶ Fluorescence illuminant may occur with strong UV light exposure. For high UV exposure applications we recommend CaF₂ Windows (OPCF) [Reference](#) B320 and Excimer laser use Fused silica windows (OPSQK) [Reference](#) B297.
- ▶ Windows are offered standard with no AR coating and provide transmittance of 94% after loss of 3% for each surface.
- ▶ Wavefront reflection and transmission is not guaranteed; for interferometer and high precision optical application, please contact our Sales Division with your custom requests.

Physics

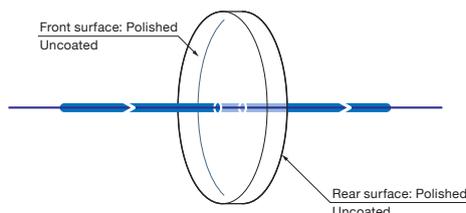
Wavelength [nm]	Refractive Index
193.5	1.561
200	1.548
250	1.509
300	1.486
350	1.476
400	1.470
500	1.462
600	1.458
700	1.455
800	1.453
1000	1.451
1500	1.445
2000	1.438
2500	1.430
3000	1.419
3500	1.407
Density	2.20g/cm ³
Thermal Conductivity	1.38W·m ⁻¹ ·K ⁻¹
Thermal Expansion Coefficient	0.55×10 ⁻⁶ /°C

These Sapphire windows contain no impurities and provide high transmittance without any absorption covering the visible and infrared regions of the spectrum. Recommended to use these sapphire windows where the most durable surface is required such as cover windows.

- Sapphire windows have excellent heat and weather resistance and can be used in outdoor applications or as a protective glass for optical systems.
- High transmittance from visible regions to Infrared regions of the spectrum and are widely used as windows for detector systems.

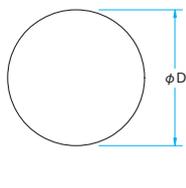


Schematic



Outline Drawing

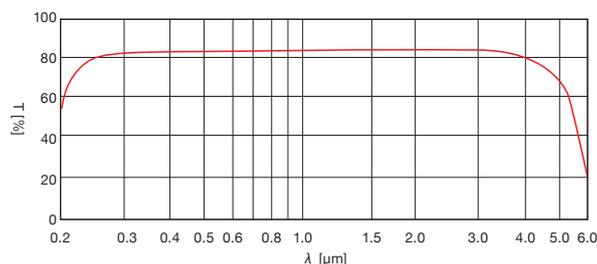
(in mm)



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

Typical Transmittance Data

T: Transmission



Specifications

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

Guide

- ▶ For Wavelength from 130nm to 8μm, we recommend to use the UV substrates CaF₂ window substrates (OPCFU). [Reference](#) B320
- ▶ For product sizes and wedges which are not listed on our website or in our catalog, please contact our Sales Division with your requests.

Attention

- ▶ Fluorescence illuminant may occur with strong UV light exposure. For high UV exposure applications we recommend CaF₂ Windows (OPCF). [Reference](#) B320
- ▶ Windows are offered standard with no AR coating and provide transmittance of 94% after loss of 3% for each surface.

Physics

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/cm ³
Thermal Conductivity	42W·m ⁻¹ 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)

Specifications

Part Number	Diameter φD [mm]	Thickness t [mm]
OPSH-20C02-P	φ20	2
OPSH-25C02-P	φ25	2
OPSH-30C02-P	φ30	2
OPSH-40C02-P	φ40	2
OPSH-50C02-P	φ50	2

Compatible Optic Mounts

LHF-20S, -25S, -30S, -40S, -50S

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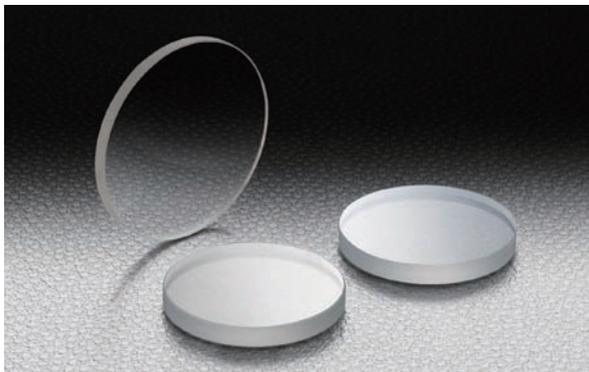
Concave Mirror
Substrates

Master Optics

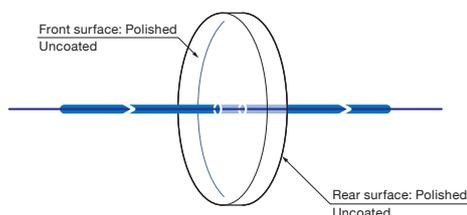
Windows

The CaF₂ (Calcium Fluoride) crystal windows offer superior transmission in broad wavelength range from vacuum ultraviolet (130nm) to Infra-red (8μm).

- These CaF₂ windows contain low impurities and assure a high transmission in the UV regions.
- High durability in a high humidity environment when compared to other glass materials.
- CaF₂ is an isotropic type of optics, there is no birefringence.

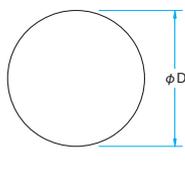


Schematic



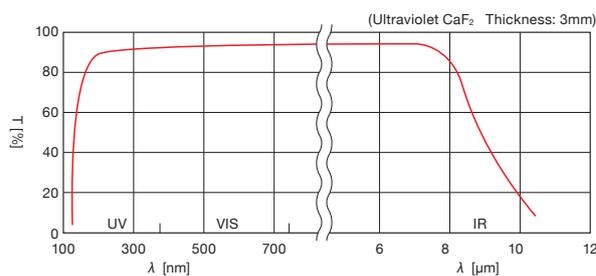
Outline Drawing

(in mm)



- Tolerance
Diameter $\phi D_{\pm 0.1}$
Thickness $t_{\pm 0.1}$

Typical Transmittance Data T: Transmission



Ultraviolet – Near infrared

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

Compatible Optic Mounts

LHF-20S, -25S, -30S, -40S, -50S

Specifications

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

Guide

- ▶ We also offer AR coating and Protective layer coating on substrates.
- ▶ For product sizes and wedges which are not listed on our website or in our catalog, please contact our Sales Division with your requests.

Attention

- ▶ CaF₂ are soft and susceptible to cracking as well as cleavage if subjected to rapid changes in temperature. They should be handled accordingly.
- ▶ Windows are offered standard with no AR coating and provide transmittance of 94% after loss of 3% for each surface.
- ▶ Wavefront reflection and transmission is not guaranteed; for interferometer and high precision optical application, please contact our Sales Division with your custom requests.

Physics

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 ⁻¹ K ⁻¹
Thermal Expansion Coefficient	24×10 ⁻⁶ /°C (20 – 60°C)

Visible – Near infrared

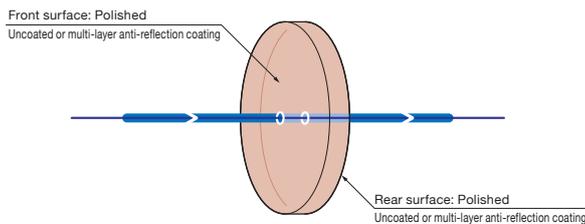
Part Number	Diameter ϕD [mm]	Thickness t [mm]	Wavelength Range [nm]
OPCF-20C01-P	$\phi 20$	1	300 – 8000
OPCF-20C02-P	$\phi 20$	2	300 – 8000
OPCF-25C02-P	$\phi 25$	2	300 – 8000
OPCF-25C03-P	$\phi 25$	3	300 – 8000
OPCF-30C02-P	$\phi 30$	2	300 – 8000
OPCF-30C03-P	$\phi 30$	3	300 – 8000
OPCF-40C03-P	$\phi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

Windows made of zinc selenide (ZnSe) is the most commonly used optical material that allows transmission of infrared light. Nonhygroscopic and extremely stable under normal conditions, in contrast to other salt-based infrared materials.

- Non-coated and AR coated products for CO₂ lasers are available.
- In contrast to other optical materials for infrared light such as Ge (germanium), or Si (silicon), ZnSe windows allow transmission of some visible light, enabling easier adjustment (alignment) of the optical axis of infrared laser systems and enabling use of more convenient and inexpensive He-Ne lasers.

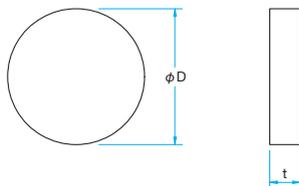


Schematic



Schematic

(in mm)



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

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

Guide

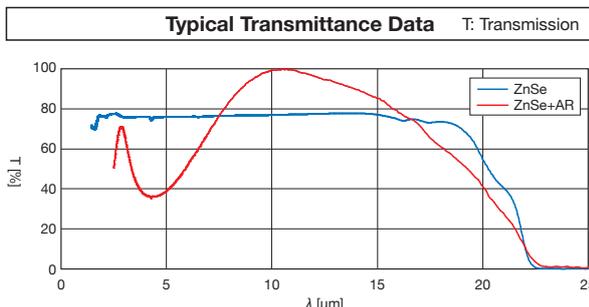
- ▶ We also offer ZnSe lens (SLZS) for use in CO₂ Laser. [Reference](#) B164
- ▶ For product sizes and wedges which are not listed on our website or in our catalog, please contact our Sales Division with your requests.

Attention

- ▶ Toxic hydrogen selenide is generated by contact with strong acids when it is immersed in a solution such as sulfuric acid or hydrochloric acid. Please do not use liquid solution to be in contact with ZnSe.
- ▶ Focusing with a high power laser onto the ZnSe lens, toxic gases may occur by heat decomposition. When ZnSe is damaged with over heating of Laser a large amount of gas and powder may occur. In case of breaking ZnSe, please avoid touching the substrates with bare hand and avoid breathing on powder and the gas.
- ▶ The surface and the back side of non-coated type has approximately 17% of reflectivity on each surface. The total power loss in transmittance is estimated at 30%.
- ▶ The WZSQ type must be used at incident angle at 0 degrees for a best transmittance.

About the handling policy of ZnSe optics

Legally, ZnSe has been considered as a toxic optic substance, the non-coated product (OPZS) must be delivered with a certificate of Acquisition of Poisonous and Harmful Substances. In addition, ZnSe Optics disposal after use is prohibited in general. However, we only take back products that we supplied. This policy noted is in Japan and other countries may differ in the treatment of ZnSe (Zinc selenide), please contact your local sales office.



ZnSe Windows for Infrared Laser | OPZS/WZSA

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Uncoated

Part Number	Diameter ϕD [mm]	Thickness t [mm]	Parallelism	Transmission (Wavelength 10.6 μm) [%]
OPZS-30C03-10-3	$\phi 30$	3	<3'	65
OPZS-40C04-10-3	$\phi 40$	4	<3'	65

AR coating

Part Number	Diameter ϕD [mm]	Thickness t [mm]	Parallelism	Transmission (Wavelength 10.6 μm) [%]
WZSA-19C2.5-10600	$\phi 19$	2.5	<5"	>99
WZSA-20C2.5-10600	$\phi 20$	2.5	<5"	>99
WZSA-25.4C03-10600	$\phi 25.4$	3	<5"	>99
WZSA-30C03-10-10600	$\phi 30$	3	<3'	>99
WZSA-38.1C03-10600	$\phi 38.1$	3	<5"	>99
WZSA-40C04-10-10600	$\phi 40$	4	<3'	>99
WZSA-50.8C03-10600	$\phi 50.8$	3	<5"	>99

Physics

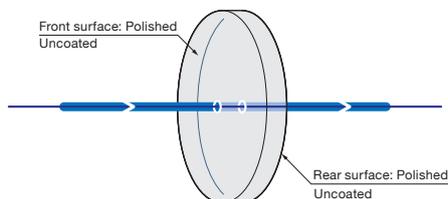
Wavelength [μm]	Refractive Index
0.59	2.625
0.63	2.594
1.0	2.489
2.2	2.444
4.0	2.433
6.0	2.426
8.0	2.417
10.6	2.403
16.0	2.356
Density	5.27g/cm ³ (25°C)
Thermal Conductivity	18W·m ⁻¹ K ⁻¹ (23°C)
Thermal Expansion Coefficient	7.1×10 ⁻⁶ /°C(0°C)

Silicon is a mono crystal primarily used in semi-conductor and is non-absorptive at 1.2μm to 6μm IR regions. It is used here as an optical component for IR region applications.

- These silicon windows do not transmit at 1μm region or below, therefore its main application is in IR regions.
- Because of its high thermal conductivity, it is suitable for use as a high power laser mirror.

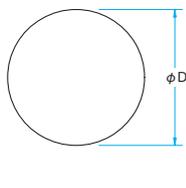


Schematic



Outline Drawing

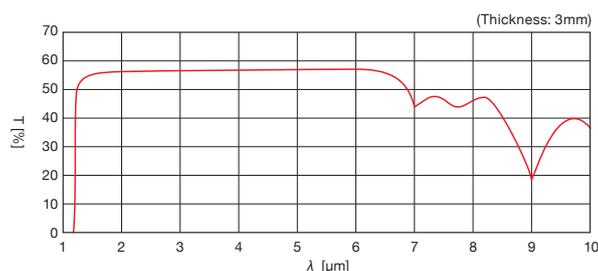
(in mm)



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

Typical Transmittance Data

T: Transmission



Specifications

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

Guide

- ▶ For transmittance at visible regions optics, we recommend to use ZnSe IR spectrum windows. [Reference](#) B321
- ▶ For product sizes and wedges which are not listed on our website or in our catalog, please contact our Sales Division with your requests.

Attention

- ▶ Silicon windows have a shiny metal surface; it reflects and absorbs but does not transmit in the visible regions.
- ▶ Silicon windows surface reflection results in transmittance loss of 53%. (measured data 1 surface reflection at 27%)

Physics

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/cm ³
Thermal Conductivity	129W·m ⁻¹ K ⁻¹ (40°C)
Thermal Expansion Coefficient	4.2×10 ⁻⁶ /°C (25°C)

Specifications

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

Compatible Optic Mounts

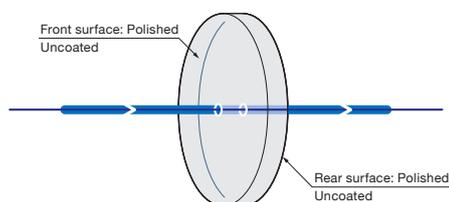
LHF-30S, -40S, -50S

The Germanium as a mono crystal primarily used in semi-conductor is non-absorptive at 2 μ m to 20 μ m IR regions. It is used here as an optical component for IR region applications.

- These germanium windows do not transmit at 1.5 μ m region or below, therefore its main application is in the IR regions.
- Germanium windows can be used in various infrared experiments.

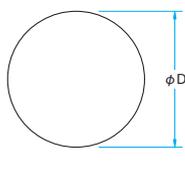


Schematic



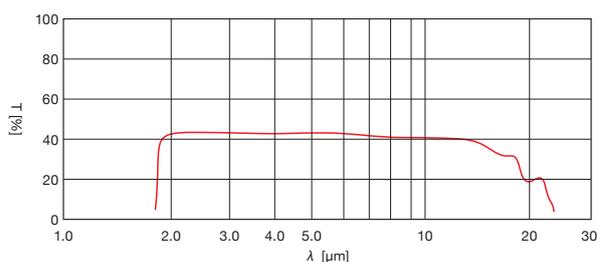
Outline Drawing

(in mm)



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

Typical Transmittance Data T: Transmission



Specifications

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

Guide

- ▶ For transmittance at visible regions optics, we recommend to use ZnSe IR spectrum windows. [Reference](#) B321
- ▶ For product sizes and wedges which are not listed on our website or in our catalog, please contact our Sales Division with your requests.

Attention

- ▶ Germanium windows have a shiny metal surface; it reflects and absorbs but does not transmit in the visible regions..
- ▶ Germanium windows surface reflection results in transmittance loss of 42%. (Measured data 1 surface reflection at 35%)

Physics

Wavelength [um]	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/cm ³
Thermal Conductivity	58.6W·m ⁻¹ K ⁻¹ (20°C)
Thermal Expansion Coefficient	5.5×10 ⁻⁶ /°C (25°C)

Specifications

Part Number	Diameter ϕD [mm]	Thickness t [mm]
OPGE-30C03-P	$\phi 30$	3
OPGE-50C05-P	$\phi 50$	5

Compatible Optic Mounts

LHF-30S, -50S

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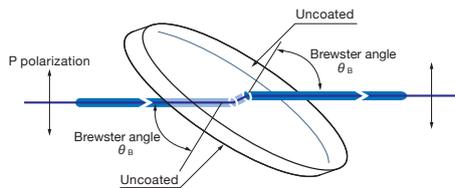
This window plate transmits 100% linearly polarized laser beam with a nonreflective effect of the P-polarized light at Brewster angle.

Brewster window can be used as a window in many laser instruments.

- When window is aligned at Brewster angle the incident beam a circular effective diameter can be obtained.
- Since both sides are not coated, it can be used with a high-energy pulse laser.
- Please specify the materials (synthetic fused silica or BK7), transmitted beam diameter, thickness, and the wavelength to be used (or Brewster angle).



Schematic

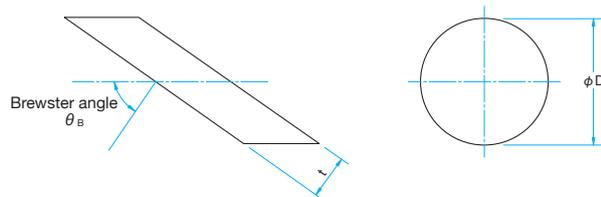


Attention

- ▶ If the incident polarization state is other than P-polarized light, the transmission losses occur due to reflection at the front and back surfaces.
- ▶ If contamination exist on the entrance surface or the exit surface, the surface reflection may occur even for the incident P polarized light.
- ▶ If the incident angle deviates slightly from the Brewster angle, surface reflection occurs.

Outline Drawing

(in mm)



Brewster angle with respect to the wavelength of the refractive index of BK7 and synthetic fused silica

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

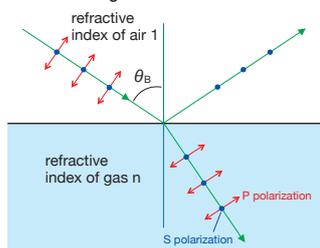
About Brewster angle

Surface reflection of the glass varies with the angle of incidence. In addition, there is a difference in reflectance also by the light oscillation direction (azimuthally polarization). Surface reflection is 0 when (the vibration direction of incident light and the plane containing the normal to the reflecting surface) P-polarized light is incident at an angle θ_B Brewster, the incident light is transmitted in all of the glass. This Brewster angle can be calculated by the following equation by the refractive index of the glass.

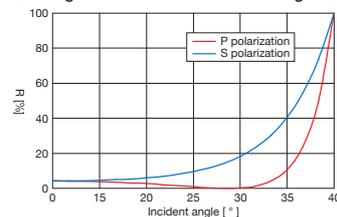
$$\text{Brewster condition } \tan\theta_B = n$$

On the other hand, S polarized (vibration direction parallel to the reflecting surface), reflectance increases as the incident angle increases, the reflection becomes never 0.

Brewster angle



Change in reflectance for incident angle



Contact sheet for Special Order for Windows

 Estimation Order

Date

 To: Sigma Koki Co., Ltd. **FAX +81-3-5638-6550**

Affiliation (Organization Name)							
Department		Name					
TEL		FAX		E-mail			
Country/Address							
Name & Designation <small>(Tentative name is okay)</small>							
Drawing Number			Estimate		<input type="checkbox"/> Yes: by Date <input type="checkbox"/> No		
Desired Delivery Date			Budget		JP Yen		
Quantity							
Substrates <small>If you do not specify a dimension tolerance is outside the standard tolerance.</small>	Standard product					If you are using a substrate of standard product, please fill in the product number.	
	Custom	Material	<input type="checkbox"/> BK7 <input type="checkbox"/> Synthetic fused silica <input type="checkbox"/> Other ()				
			ϕA	mm			
			a	mm			
			b	mm			
			t	mm			
Surface flatness	($\lambda = 632.8\text{nm}$)						
Parallelism			Wedge				
Anti-reflection coating	<input type="checkbox"/> None <input type="checkbox"/> Single-layer anti-reflection coating (SLAR) <input type="checkbox"/> Multi-layer anti-reflection coating (MLAR) <input type="checkbox"/> Other ()						
	Wavelength Range	$\lambda =$	nm	Incident angle	<input type="checkbox"/> 0° <input type="checkbox"/> Other ()		
Other	* Write more detailed specifications here. (Rough illustration is acceptable.)						

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