


Substrates & Windows



Substrates & Windows Selection Guide **B285**


Low Scattering

 Low scattering substrate
 OPSQSP/OPCFSP/OPMFSP/
 WSSQSP/WSCFSP/WSMFSP **B286**

Optical Flats


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

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

Float glass
 OPFL **B291**


Optical Parallels

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

Optical flats with hole
 Custom-made **B299**

Wedged Substrates

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

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

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

Concave Mirror Substrates

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


Concave mirror substrate for laser
 LCBS **B308**

Custom curved mirror
 Custom-made **B310**

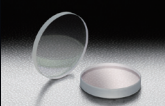
Contact sheet for Special Order for Custom curved mirror — **B311**

Master Optics

 Optical Flats
 HMPQP/HMPZP **B312**

Master Optics

 Master Optics
 Custom-made **B314**

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

Windows

 Optical Windows
 with anti-reflection coating
 WBMA **B316**

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

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

Sapphire Windows
 for Infrared Laser
 OPSH **B319**

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

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

Silicon Windows
 for Infrared Laser
 OPSI **B323**

Germanium Windows
 for Infrared Laser
 OPGE **B324**

Brewster Windows
 Custom-made **B325**

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

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Substrates

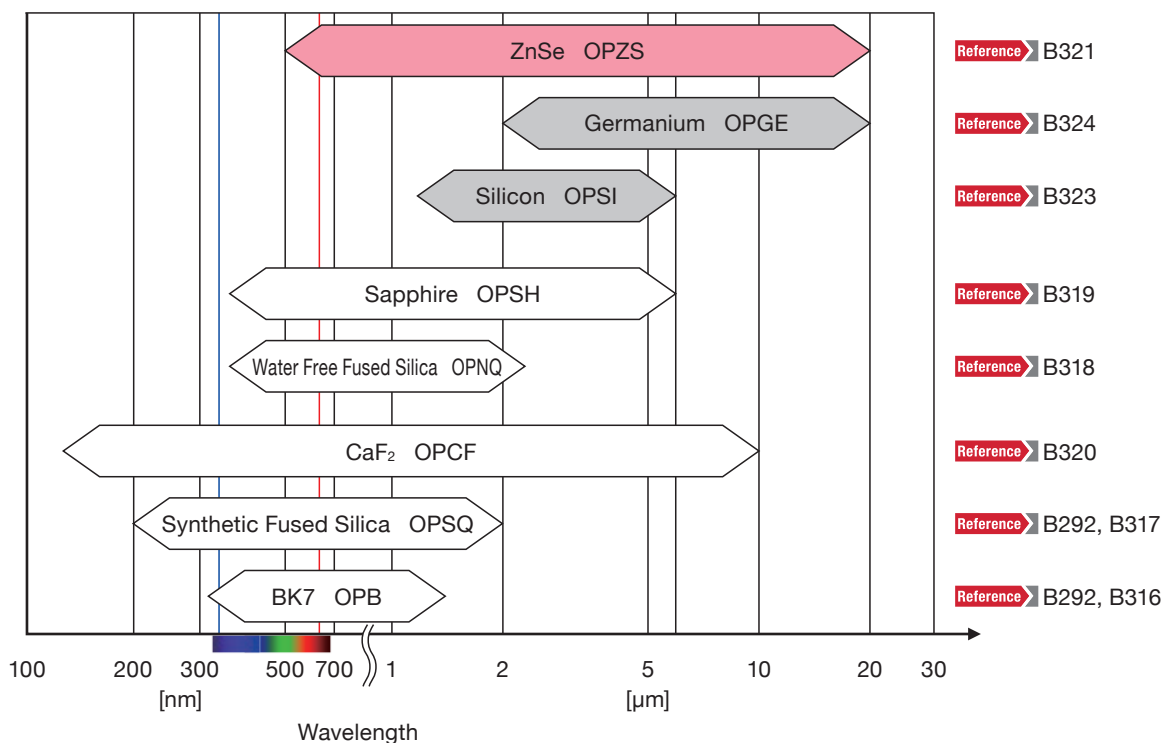
Uncoated optical glasses (substrates) used for mirrors or beamsplitters. If you want to construct mirrors or beamsplitters with custom specification, you will be able to apply custom coating to the standard substrates.

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

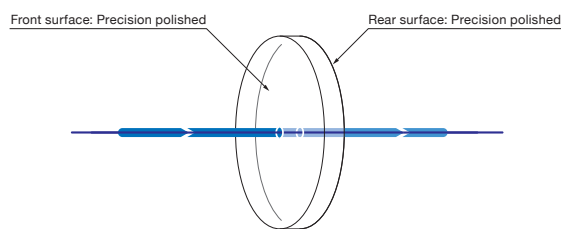
W3140

We can provide special optics polishing service for optics or wedge substrate; achieving surface roughness at <math><0.2\text{nm}</math> (Ra). There is a strong demand in high power laser or X-ray application where substrate scattering is a major problem.

- Use a wedge substrate instead for a beam splitter to prevent back reflection of effects.
- CaF_2 (calcium fluoride) and MgF_2 (magnesium fluoride) are mainly used in UV and IR for its high transmittance.
- Our high technical processing can get close to ideal number for surface roughness (microscopic irregularities) and surface accuracy (flatness of whole surface).

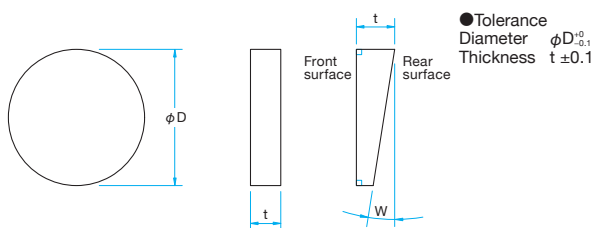


Schematic



Outline Drawing

(in mm)



Specifications

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

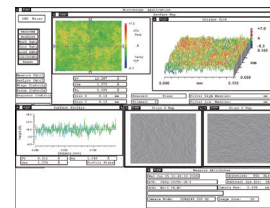
Guide

- ▶ For thick wedge substrate, we will indicate the substrate surface with an arrow print.

Attention

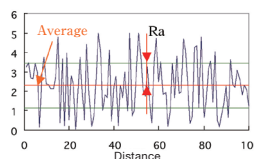
- ▶ The low scattering substrates are uncoated; the reflectance from the surface is 2.5% to 4%.
- ▶ If using wedge substrate for transmission application, the beam will be deviate around 0.5 degrees.
- ▶ The CaF_2 substrate surface can be easily scratched. Do not use contact cleaning, please use air-blow 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 cabin 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 [$^\circ$]	Surface Quality (Scratch-Dig)
OPSQSP-25.4C05-10-5	$\phi 25.4$	5	Synthetic fused silica	$\lambda/10$	<math><5</math>	10-5
OPSQSP-30C03-10-5	$\phi 30$	3	Synthetic fused silica	$\lambda/10$	<math><5</math>	10-5
OPSQSP-30C05-10-5	$\phi 30$	5	Synthetic fused silica	$\lambda/10$	<math><5</math>	10-5
OPSQSP-50C05-10-5	$\phi 50$	5	Synthetic fused silica	$\lambda/10$	<math><5</math>	10-5
OPCFSP-25.4C05-10-5	$\phi 25.4$	5	CaF_2	$\lambda/10$	<math><5</math>	20-10
OPCFSP-30C05-10-5	$\phi 30$	5	CaF_2	$\lambda/10$	<math><5</math>	20-10
OPMFSP-25.4C05-10-5	$\phi 25.4$	5	MgF_2	$\lambda/10$	<math><5</math>	20-10
OPMFSP-30C05-10-5	$\phi 30$	5	MgF_2	$\lambda/10$	<math><5</math>	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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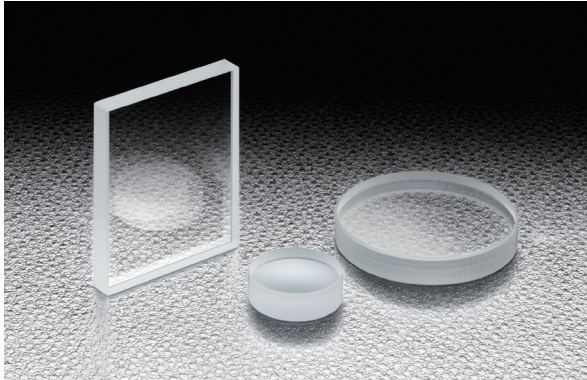
Master Optics

Windows

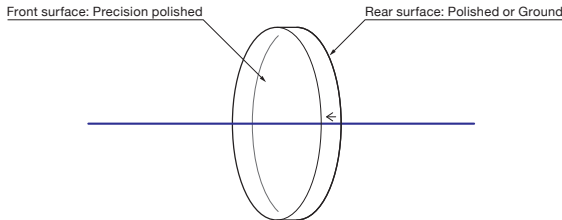
One side is polished to a high accuracy, it is a planar substrate with a reduced level laser mirror scratched up.

Is used as a substrate to be coated with an optical thin film, such as custom-made mirror.

- From among the wide variety that has been subdivided shapes and sizes, thickness and surface accuracy available for selection according to your specifications.

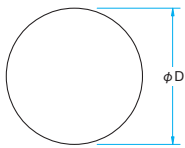


Schematic



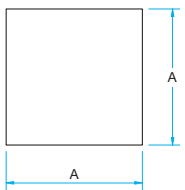
Outline Drawing (in mm)

Circle



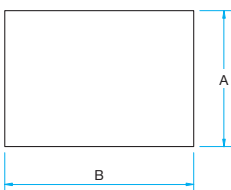
- Tolerance $\phi D \leq \phi 50.8$
Diameter $\phi D_{-0.1}^{+0.1}$
Thickness $t \pm 0.1$
- $\phi D \geq \phi 60$
Diameter $\phi D_{-0.2}^{+0.1}$
Thickness $t \pm 0.2$

Square



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

Rectangle



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

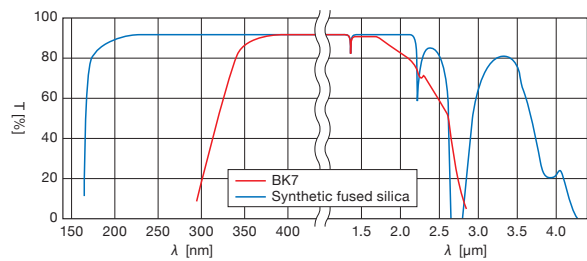
Guide

- Substrates highly 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. There is a 3.5 to 4% reflection of the surface of the glass.
- When used in the transmission (back surface is polished) the planar substrate, there is a possibility that the transmitted beam is slightly inclined. If you want to use in transmission, please use the parallel planar substrate (OPB, OPSQ, OPSQK). Reference B292
- Data of guarantee accuracy on surface is not attached with the product. If you need a written guarantee accuracy of the flatness data, then it will cost of data creation asked separately. Please contact our International Sales Division.

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

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

Optical Flats | OFB/OFBP/OFSQ/OFPXP/OFSQ

Catalog Code W3134

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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
OFPXP-60C10-1	ϕ 60	10	PX	λ	10-5	Polished
OFPXP-60C10-4	ϕ 60	10	PX	$\lambda/4$	10-5	Polished
OFPXP-60C10-10	ϕ 60	10	PX	$\lambda/10$	10-5	Polished
OFPXP-60C10-20	ϕ 60	10	PX	$\lambda/20$	10-5	Polished
OFPXP-80C12-1	ϕ 80	12	PX	λ	10-5	Polished
OFPXP-80C12-4	ϕ 80	12	PX	$\lambda/4$	10-5	Polished
OFPXP-80C12-10	ϕ 80	12	PX	$\lambda/10$	10-5	Polished
OFPXP-80C12-20	ϕ 80	12	PX	$\lambda/20$	10-5	Polished
OFPXP-100C15-1	ϕ 100	15	PX	λ	10-5	Polished
OFPXP-100C15-4	ϕ 100	15	PX	$\lambda/4$	10-5	Polished
OFPXP-100C15-10	ϕ 100	15	PX	$\lambda/10$	10-5	Polished
OFPXP-130C18-1	ϕ 130	18	PX	λ	10-5	Polished
OFPXP-130C18-4	ϕ 130	18	PX	$\lambda/4$	10-5	Polished
OFPXP-130C18-10	ϕ 130	18	PX	$\lambda/10$	10-5	Polished
OFPXP-150C20-1	ϕ 150	20	PX	λ	10-5	Polished
OFPXP-150C20-4	ϕ 150	20	PX	$\lambda/4$	10-5	Polished
OFPXP-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
OFPXP-40S06-1	\square 40	6	PX	λ	10-5	Polished
OFPXP-40S06-4	\square 40	6	PX	$\lambda/4$	10-5	Polished
OFPXP-40S06-10	\square 40	6	PX	$\lambda/10$	10-5	Polished
OFPXP-40S06-20	\square 40	6	PX	$\lambda/20$	10-5	Polished
OFPXP-50S08-1	\square 50	8	PX	λ	10-5	Polished
OFPXP-50S08-4	\square 50	8	PX	$\lambda/4$	10-5	Polished
OFPXP-50S08-10	\square 50	8	PX	$\lambda/10$	10-5	Polished
OFPXP-50S08-20	\square 50	8	PX	$\lambda/20$	10-5	Polished
OFPXP-60S10-1	\square 60	10	PX	λ	10-5	Polished
OFPXP-60S10-4	\square 60	10	PX	$\lambda/4$	10-5	Polished
OFPXP-60S10-10	\square 60	10	PX	$\lambda/10$	10-5	Polished
OFPXP-60S10-20	\square 60	10	PX	$\lambda/20$	10-5	Polished
OFPXP-80S12-1	\square 80	12	PX	λ	10-5	Polished
OFPXP-80S12-4	\square 80	12	PX	$\lambda/4$	10-5	Polished
OFPXP-80S12-10	\square 80	12	PX	$\lambda/10$	10-5	Polished
OFPXP-80S12-20	\square 80	12	PX	$\lambda/20$	10-5	Polished
OFPXP-100S15-1	\square 100	15	PX	λ	10-5	Polished
OFPXP-100S15-4	\square 100	15	PX	$\lambda/4$	10-5	Polished
OFPXP-100S15-10	\square 100	15	PX	$\lambda/10$	10-5	Polished
OFPXP-130S18-1	\square 130	18	PX	λ	10-5	Polished
OFPXP-130S18-4	\square 130	18	PX	$\lambda/4$	10-5	Polished
OFPXP-130S18-10	\square 130	18	PX	$\lambda/10$	10-5	Polished
OFPXP-150S20-1	\square 150	20	PX	λ	10-5	Polished
OFPXP-150S20-4	\square 150	20	PX	$\lambda/4$	10-5	Polished
OFPXP-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-130S / 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
OFFXP-3040R06-1	30x40	6	PX	λ	10-5	Polished
OFFXP-3040R06-4	30x40	6	PX	$\lambda/4$	10-5	Polished
OFFXP-3040R06-10	30x40	6	PX	$\lambda/10$	10-5	Polished
OFFXP-3040R06-20	30x40	6	PX	$\lambda/20$	10-5	Polished
OFSQP-3040R08-20	30x40	8	Synthetic fused silica	$\lambda/20$	20-10	Polished
OFFXP-4050R08-1	40x50	8	PX	λ	10-5	Polished
OFFXP-4050R08-4	40x50	8	PX	$\lambda/4$	10-5	Polished
OFFXP-4050R08-10	40x50	8	PX	$\lambda/10$	10-5	Polished
OFFXP-4050R08-20	40x50	8	PX	$\lambda/20$	10-5	Polished
OFFXP-5060R10-1	50x60	10	PX	λ	10-5	Polished
OFFXP-5060R10-4	50x60	10	PX	$\lambda/4$	10-5	Polished
OFFXP-5060R10-10	50x60	10	PX	$\lambda/10$	10-5	Polished
OFFXP-5060R10-20	50x60	10	PX	$\lambda/20$	10-5	Polished
OFFXP-6080R12-1	60x80	12	PX	λ	10-5	Polished
OFFXP-6080R12-4	60x80	12	PX	$\lambda/4$	10-5	Polished
OFFXP-6080R12-10	60x80	12	PX	$\lambda/10$	10-5	Polished
OFFXP-6080R12-20	60x80	12	PX	$\lambda/20$	10-5	Polished
OFFXP-80100R15-1	80x100	15	PX	λ	10-5	Polished
OFFXP-80100R15-4	80x100	15	PX	$\lambda/4$	10-5	Polished
OFFXP-80100R15-10	80x100	15	PX	$\lambda/10$	10-5	Polished

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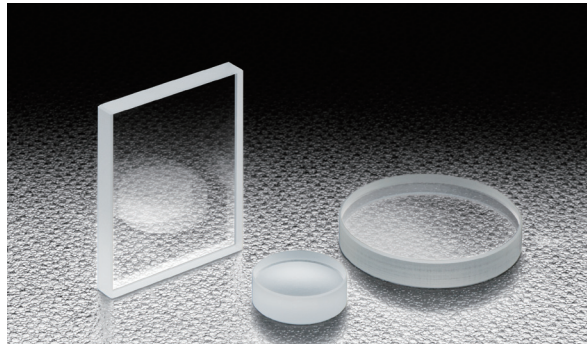
Reasonable Optical Flat

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

RoHS

Catalog Code W3215

For the illumination optical system and a simple experiment, it is the glass substrate of which high surface quality used for the optical element is not required. Surface accuracy and parallelism (tolerance of wedged) is the same as optical flats for a laser.

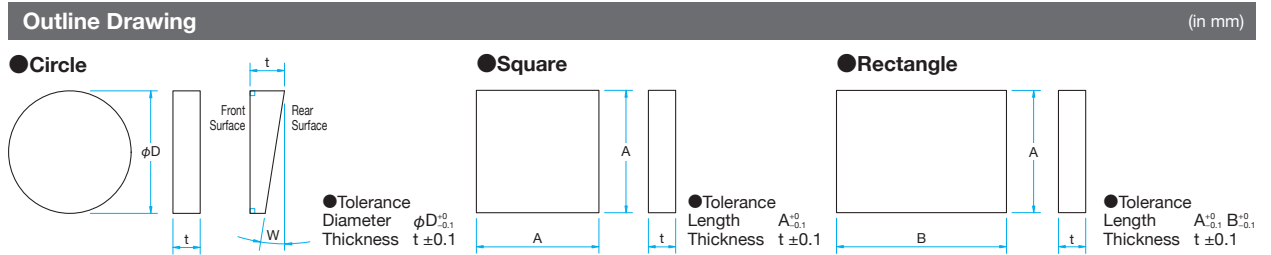
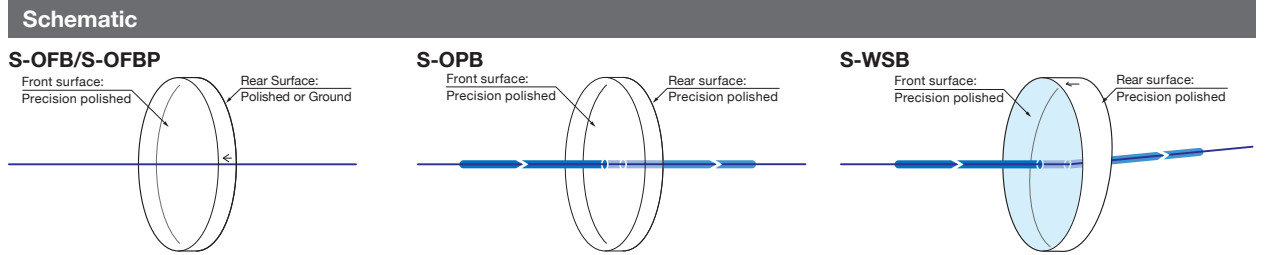
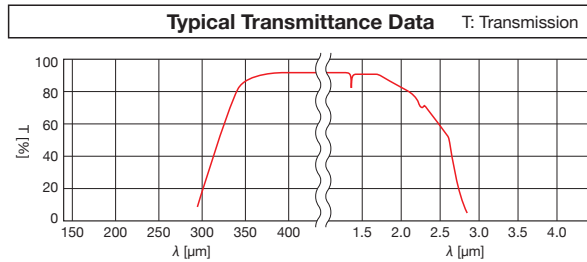


- It is also available the manufacturing with a coating as requested to the plane substrate.
- In addition to the circle, square type, rectangular type of planar substrate, it is also available a wedge substrate and the parallel planar substrate which has high surface accuracy of both sides.

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 which is the laser light scattering is less. [Reference](#) B287

Attention
 ▶ Planar substrate is not coated on both sides. There is a 3.5 to 4% reflection of the surface of the glass.
 ▶ When used in the transmission (back surface is polished) the planar substrate, there is a possibility that the transmitted beam is slightly inclined. If you want to use in transmission, please use the parallel planar substrate (S-OFB).
 ▶ Data of guarantee accuracy on surface is not attached with the product. If you need a written guarantee accuracy of the flatness data, then it will cost of data creation asked separately. Please contact our International Sales Division.



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 A x B [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

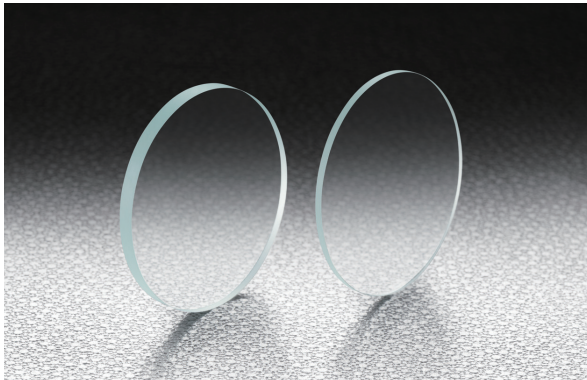
Optical parallel				
Part Number	Diameter φD [mm]	Thickness t [mm]	Parallelism	Rear Surface Surface accuracy
S-OPB-25.4C03-10-5	φ25.4	3	<5"	$\lambda/10$
S-OPB-25.4C05-10-5	φ25.4	5	<5"	$\lambda/10$
S-OPB-30C03-10-5	φ30	3	<5"	$\lambda/10$
S-OPB-30C05-10-5	φ30	5	<5"	$\lambda/10$
S-OPB-40C04-10-5	φ40	4	<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 accuracy
S-WSB-30C05-10-1	φ30	5	1°±5'	$\lambda/10$
S-WSB-50C08-10-1	φ50	8	1°±5'	$\lambda/10$

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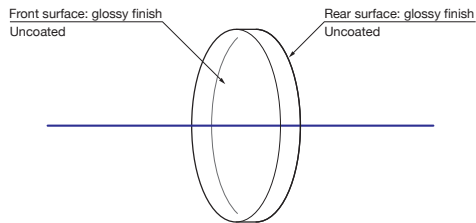
Float glass is a glass substrate made by the float process used in the production of window glass. It does not require polishing process or molding process. Therefore, it is possible to manufacture large quantities from a large plate and the cost is inexpensive.

- It is also available to manufacture in large lots with as requested coating.
- Because the corner is not chamfered, there will be some cases that small chipping occur.

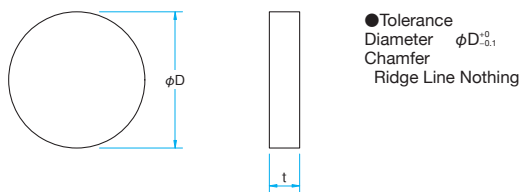


Specifications	
Material	Float glass (blue sheet)
Surface flatness	4 – 6λ
Clear aperture	90% of actual aperture
Surface Quality (Scratch-Dig)	60–40

Schematic

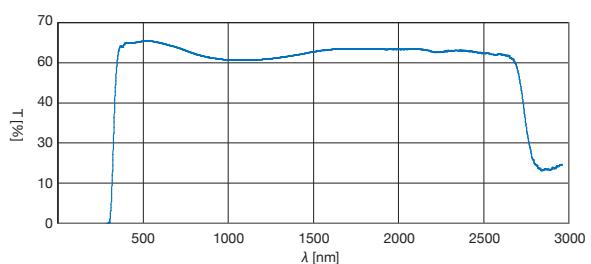


Outline Drawing (in mm)



Specifications		
Part Number	Diameter φD [mm]	Thickness t [mm]
OPFL-15C01-P	φ15	1±0.3
OPFL-15C02-P	φ15	2±0.4
OPFL-15C03-P	φ15	3±0.4
OPFL-25.4C01-P	φ15	1±0.3
OPFL-25.4C02-P	φ15	2±0.4
OPFL-25.4C03-P	φ15	3±0.4
OPFL-30C01-P	φ15	1±0.3
OPFL-30C02-P	φ15	2±0.4
OPFL-30C03-P	φ15	3±0.4

Typical Transmittance Data T: Transmission

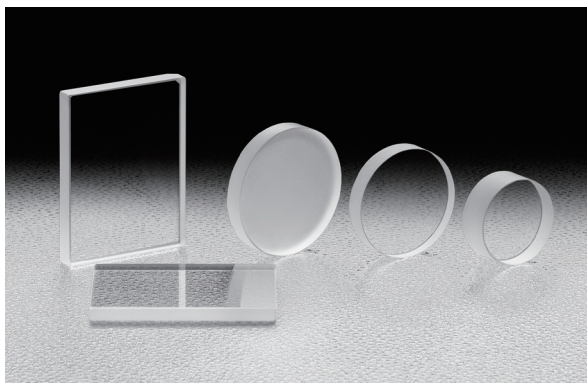


Optical Parallels | OPB/OPSQ/OPSQK

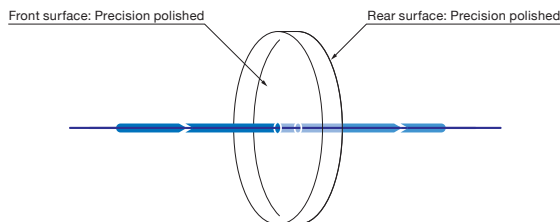
RoHS

This is a product of the substrate was polished on both sides of the glass substrate in parallel. You can use as a substrate coated with an optical thin film coating, such as custom-made windows and beam splitters.

- There are available for BK7 type for visible range and infrared wavelength range, type of synthetic fused silica to high ultraviolet transmission, and a type of synthetic fused silica for excimer laser that can be used to Kr*F excimer laser (248nm).
- A high accuracy of substrate parallel, the angle of the transmitted beam does not change when you insert a plane parallel to the substrate perpendicular to the optical path of the laser.
- The high surface precision substrates can also be used as an instead of Newton test plate.



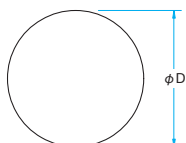
Schematic



Outline Drawing

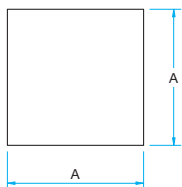
(in mm)

● Circle



- Tolerance
- $\phi D \leq \phi 50.8$
- Diameter $\phi D_{-0.1}^0$
- Thickness $t \pm 0.1$
- $\phi D \geq \phi 60$
- Diameter $\phi D_{-0.2}^0$
- Thickness $t \pm 0.2$

● Square



- Tolerance
- $A \leq 50$
- Length $A_{-0.1}^0$
- Thickness $t \pm 0.1$
- $A \geq 60$
- Length $A_{-0.2}^0$
- 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

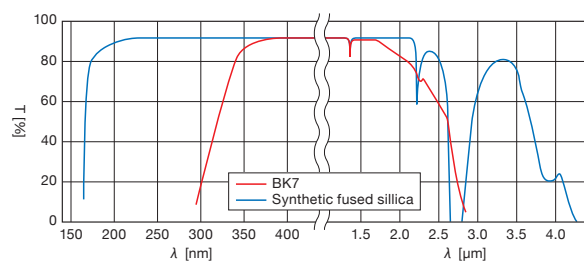
- It is also available a wedge substrate (WSB/WSSQ/WSSQK) which can prevent the influence of back reflection. [Reference](#) B300

Attention

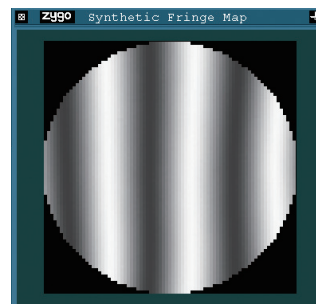
- Parallel planar substrate has a loss of 10% by the reflection of the front and back surfaces.
- A data sheet for accuracy guarantee of the surface flatness is not attached with the product. If you need a guarantee sheet of the flatness data, then it costs for data creation. Please contact our International Sales Division.

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-130S, -150S / MHAN-60M



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

* 4λ shows the surface flatness of the measurement area of φ30mm.

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	4λ*	<03'00"
OPB-25S02-1-5	□25	2	λ	<00'05"
OPB-25S02-P	□25	2	4λ*	<03'00"
OPB-25S03-10-5	□25	3	λ/10	<00'05"
OPB-25S03-4-5	□25	3	λ/4	<00'05"
OPB-25S03-1-5	□25	3	λ	<00'05"
OPB-25S03-P	□25	3	4λ*	<03'00"
OPB-25S05-20-2	□25	5	λ/20	<00'02"
OPB-25S05-10-5	□25	5	λ/10	<00'05"
OPB-25S05-4-5	□25	5	λ/4	<00'05"
OPB-25S05-1-5	□25	5	λ	<00'05"
OPB-25S05-P	□25	5	4λ*	<03'00"
OPB-30S01-1-5	□30	1	λ	<00'05"
OPB-30S01-P	□30	1	4λ*	<03'00"
OPB-30S02-1-5	□30	2	λ	<00'05"
OPB-30S02-P	□30	2	4λ*	<03'00"
OPB-30S03-10-5	□30	3	λ/10	<00'05"
OPB-30S03-4-5	□30	3	λ/4	<00'05"
OPB-30S03-1-5	□30	3	λ	<00'05"
OPB-30S03-P	□30	3	4λ*	<03'00"
OPB-30S05-20-2	□30	5	λ/20	<00'02"
OPB-30S05-10-5	□30	5	λ/10	<00'05"
OPB-30S05-4-5	□30	5	λ/4	<00'05"
OPB-30S05-1-5	□30	5	λ	<00'05"
OPB-30S05-P	□30	5	4λ*	<03'00"
OPB-40S02-1-5	□40	2	λ	<00'05"
OPB-40S02-P	□40	2	4λ*	<03'00"
OPB-40S03-1-5	□40	3	λ	<00'05"
OPB-40S03-P	□40	3	4λ*	<03'00"
OPB-40S04-10-5	□40	4	λ/10	<00'05"
OPB-40S04-4-5	□40	4	λ/4	<00'05"
OPB-40S04-1-5	□40	4	λ	<00'05"
OPB-40S04-P	□40	4	4λ*	<03'00"
OPB-40S06-20-2	□40	6	λ/20	<00'02"
OPB-40S06-10-5	□40	6	λ/10	<00'05"
OPB-40S06-4-5	□40	6	λ/4	<00'05"
OPB-40S06-1-5	□40	6	λ	<00'05"
OPB-40S06-P	□40	6	4λ*	<03'00"
OPB-50S02-1-5	□50	2	λ	<00'05"
OPB-50S02-P	□50	2	4λ*	<03'00"
OPB-50S03-1-5	□50	3	λ	<00'05"
OPB-50S03-P	□50	3	4λ*	<03'00"
OPB-50S05-10-5	□50	5	λ/10	<00'05"
OPB-50S05-4-5	□50	5	λ/4	<00'05"
OPB-50S05-1-5	□50	5	λ	<00'05"
OPB-50S05-P	□50	5	4λ*	<03'00"
OPB-50S08-20-2	□50	8	λ/20	<00'02"
OPB-50S08-10-5	□50	8	λ/10	<00'05"
OPB-50S08-4-5	□50	8	λ/4	<00'05"
OPB-50S08-1-5	□50	8	λ	<00'05"
OPB-50S08-P	□50	8	4λ*	<03'00"

* 4λ shows the surface flatness of the measurement area of φ30mm.

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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-130S, -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	λ/10	<00'05"
OPSQ-10S01-4-5	□10	1	λ/4	<00'05"
OPSQ-10S01-1-5	□10	1	λ	<00'05"
OPSQ-10S01-P	□10	1	4λ*	<03'00"
OPSQ-10S02-20-2	□10	2	λ/20	<00'02"
OPSQ-10S02-10-5	□10	2	λ/10	<00'05"
OPSQ-10S02-4-5	□10	2	λ/4	<00'05"
OPSQ-10S02-1-5	□10	2	λ	<00'05"
OPSQ-10S02-P	□10	2	4λ*	<03'00"
OPSQ-10S2.3-1-10	□10	2.3	λ	<00'10"
OPSQ-10S03-20-2	□10	3	λ/20	<00'02"
OPSQ-10S03-10-5	□10	3	λ/10	<00'05"
OPSQ-10S03-4-5	□10	3	λ/4	<00'05"
OPSQ-10S03-1-5	□10	3	λ	<00'05"
OPSQ-10S03-P	□10	3	4λ*	<03'00"
OPSQ-10S05-20-2	□10	5	λ/20	<00'02"
OPSQ-10S05-10-5	□10	5	λ/10	<00'05"
OPSQ-10S05-4-5	□10	5	λ/4	<00'05"
OPSQ-10S05-1-5	□10	5	λ	<00'05"
OPSQ-10S05-P	□10	5	4λ*	<03'00"
OPSQ-15S01-1-5	□15	1	λ	<00'05"
OPSQ-15S01-P	□15	1	4λ*	<03'00"
OPSQ-15S02-10-5	□15	2	λ/10	<00'05"
OPSQ-15S02-4-5	□15	2	λ/4	<00'05"
OPSQ-15S02-1-5	□15	2	λ	<00'05"
OPSQ-15S02-P	□15	2	4λ*	<03'00"
OPSQ-15S2.3-1-10	□15	2.3	λ	<00'10"
OPSQ-15S03-20-2	□15	3	λ/20	<00'02"
OPSQ-15S03-10-5	□15	3	λ/10	<00'05"
OPSQ-15S03-4-5	□15	3	λ/4	<00'05"
OPSQ-15S03-1-5	□15	3	λ	<00'05"
OPSQ-15S03-P	□15	3	4λ*	<03'00"
OPSQ-15S05-20-2	□15	5	λ/20	<00'02"
OPSQ-15S05-10-5	□15	5	λ/10	<00'05"
OPSQ-15S05-4-5	□15	5	λ/4	<00'05"
OPSQ-15S05-1-5	□15	5	λ	<00'05"
OPSQ-15S05-P	□15	5	4λ*	<03'00"
OPSQ-20S01-1-5	□20	1	λ	<00'05"
OPSQ-20S01-P	□20	1	4λ*	<03'00"
OPSQ-20S02-10-5	□20	2	λ/10	<00'05"
OPSQ-20S02-4-5	□20	2	λ/4	<00'05"
OPSQ-20S02-1-5	□20	2	λ	<00'05"
OPSQ-20S02-P	□20	2	4λ*	<03'00"
OPSQ-20S2.3-1-10	□20	2.3	λ	<00'10"
OPSQ-20S03-20-2	□20	3	λ/20	<00'02"
OPSQ-20S03-10-5	□20	3	λ/10	<00'05"
OPSQ-20S03-4-5	□20	3	λ/4	<00'05"
OPSQ-20S03-1-5	□20	3	λ	<00'05"
OPSQ-20S03-P	□20	3	4λ*	<03'00"
OPSQ-20S05-20-2	□20	5	λ/20	<00'02"
OPSQ-20S05-10-5	□20	5	λ/10	<00'05"
OPSQ-20S05-4-5	□20	5	λ/4	<00'05"
OPSQ-20S05-1-5	□20	5	λ	<00'05"
OPSQ-20S05-P	□20	5	4λ*	<03'00"

* 4λ shows the surface flatness of the measurement area of φ30mm.

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	4λ*	<03'00"
OPSQ-25S02-1-5	□25	2	λ	<00'05"
OPSQ-25S02-P	□25	2	4λ*	<03'00"
OPSQ-25S2.3-0.5-10	□25	2.3	2λ	<00'10"
OPSQ-25S03-10-5	□25	3	λ/10	<00'05"
OPSQ-25S03-4-5	□25	3	λ/4	<00'05"
OPSQ-25S03-1-5	□25	3	λ	<00'05"
OPSQ-25S03-P	□25	3	4λ*	<03'00"
OPSQ-25S05-20-2	□25	5	λ/20	<00'02"
OPSQ-25S05-10-5	□25	5	λ/10	<00'05"
OPSQ-25S05-4-5	□25	5	λ/4	<00'05"
OPSQ-25S05-1-5	□25	5	λ	<00'05"
OPSQ-25S05-P	□25	5	4λ*	<03'00"
OPSQ-30S01-1-5	□30	1	λ	<00'05"
OPSQ-30S01-P	□30	1	4λ*	<03'00"
OPSQ-30S02-1-5	□30	2	λ	<00'05"
OPSQ-30S02-P	□30	2	4λ*	<03'00"
OPSQ-30S2.3-0.5-10	□30	2.3	2λ	<00'10"
OPSQ-30S03-10-5	□30	3	λ/10	<00'05"
OPSQ-30S03-4-5	□30	3	λ/4	<00'05"
OPSQ-30S03-1-5	□30	3	λ	<00'05"
OPSQ-30S03-P	□30	3	4λ*	<03'00"
OPSQ-30S05-20-2	□30	5	λ/20	<00'02"
OPSQ-30S05-10-5	□30	5	λ/10	<00'05"
OPSQ-30S05-4-5	□30	5	λ/4	<00'05"
OPSQ-30S05-1-5	□30	5	λ	<00'05"
OPSQ-30S05-P	□30	5	4λ*	<03'00"
OPSQ-40S02-1-5	□40	2	λ	<00'05"
OPSQ-40S02-P	□40	2	4λ*	<03'00"
OPSQ-40S2.3-0.25-10	□40	2.3	4λ	<00'10"
OPSQ-40S03-1-5	□40	3	λ	<00'05"
OPSQ-40S03-P	□40	3	4λ*	<03'00"
OPSQ-40S04-10-5	□40	4	λ/10	<00'05"
OPSQ-40S04-4-5	□40	4	λ/4	<00'05"
OPSQ-40S04-1-5	□40	4	λ	<00'05"
OPSQ-40S04-P	□40	4	4λ*	<03'00"
OPSQ-40S06-20-2	□40	6	λ/20	<00'02"
OPSQ-40S06-10-5	□40	6	λ/10	<00'05"
OPSQ-40S06-4-5	□40	6	λ/4	<00'05"
OPSQ-40S06-1-5	□40	6	λ	<00'05"
OPSQ-40S06-P	□40	6	4λ*	<03'00"
OPSQ-50S02-1-5	□50	2	λ	<00'05"
OPSQ-50S02-P	□50	2	4λ*	<03'00"
OPSQ-50S2.3-0.25-10	□50	2.3	4λ	<00'10"
OPSQ-50S03-1-5	□50	3	λ	<00'05"
OPSQ-50S03-P	□50	3	4λ*	<03'00"
OPSQ-50S05-10-5	□50	5	λ/10	<00'05"
OPSQ-50S05-4-5	□50	5	λ/4	<00'05"
OPSQ-50S05-1-5	□50	5	λ	<00'05"
OPSQ-50S05-P	□50	5	4λ*	<03'00"
OPSQ-50S08-20-2	□50	8	λ/20	<00'02"
OPSQ-50S08-10-5	□50	8	λ/10	<00'05"
OPSQ-50S08-4-5	□50	8	λ/4	<00'05"
OPSQ-50S08-1-5	□50	8	λ	<00'05"
OPSQ-50S08-P	□50	8	4λ*	<03'00"
OPSQ-60S2.3-0.25-10	□60	2.3	4λ	<00'10"
OPSQ-70S2.3-0.2-10	□70	2.3	5λ	<00'10"
OPSQ-80S2.3-0.2-10	□80	2.3	5λ	<00'10"
OPSQ-100S2.3-0.1-10	□100	2.3	10λ	<00'10"
OPSQ-120S2.3-0.1-10	□120	2.3	10λ	<00'10"
OPSQ-127S2.3-0.1-10	□126.6	2.3	10λ	<00'10"

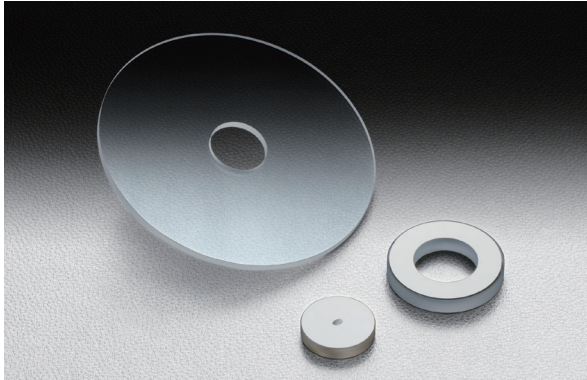
* 4λ shows the surface flatness of the measurement area of φ30mm.

Compatible Optic Mounts

CHA-25, -60, -130

We provide custom made hole on optic or window according to your requirement. We can make through-hole, counterbore hole, taper hole, inclined hole, blind hole or any type of holes.

- Ultrasonic machining system is used to avoid glass damaging.
- We can do polishing on machined hole with no crack on the inner edge of the hole.
- We can provide custom made any hole size which is not mentioned in the following list. The tooling (jig) fee may be an additional cost. Please contact our International Sales Division.



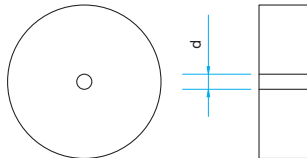
Specifications		
Possible to specify type of hole	Through-hole d (mm)	1.0, 1.5, 2.0, 2.5, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10, 12, 13, 15, 17, 18, 20, 22, 25, 28, 30
	Blind hole d (mm)	3.0, 5.0, 7.0, 10, 15, 20
Processing tolerance	Hole size (mm)	$D_{-0.15}^{+0}$
	Hole position (mm)	$X \pm 0.2$

Processing price		
Machining Type	Hole size d [mm]	Specifying system (Specify the diameter)
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

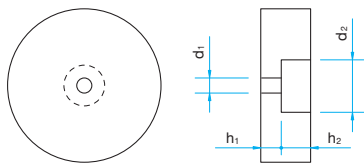
Outline Drawing (in mm)

Vertical hole type (-SH□□)



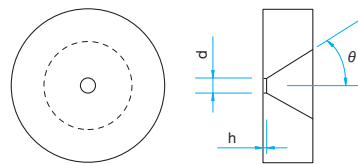
Hole size	d
Chamfering size	c (0 if no specifications)
Hole position	Center or specify the position (XY)

Counterbore hole type (-SZH□□)



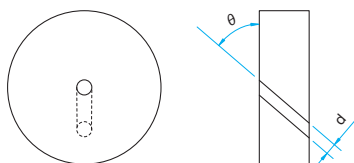
Hole size	d_1
Hole depth	h_1
Counterbore hole size	d_2
Counterbore hole depth	h_2
Chamfering size	c (0 if no specifications)
Hole position	Center or specify the position (XY)

45° taper hole type (-TH□□-45)



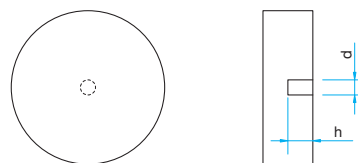
Hole size	d
Hole depth	h (h > specify as 0.15)
Taper angle	$\theta = 45^\circ$ (45° unless specify)
Chamfering size	No chamfer
Hole position	Center or specify the position (XY)

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

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

It 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 .

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

- 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

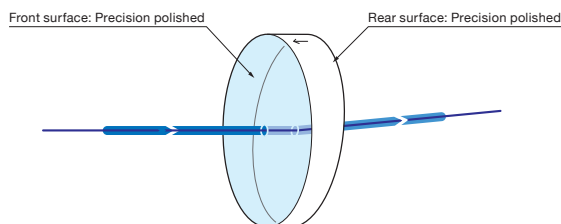
Guide

- Wedge substrates has a marking of arrows for the direction of front surface at the thickest thickness point.
- It is also available beam sampler (BS4) coated with anti-reflection coating on the back. [Reference](#) B066

Attention

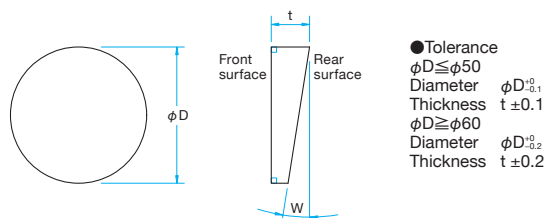
- Wedge substrates are not coated on both sides. There is a 3.5 to 4% reflection of the surface of the glass.
- If the wedged substrate is inserted in the optical path of the laser beam, the transmitted beam is inclined slightly causing the refraction.

Schematic

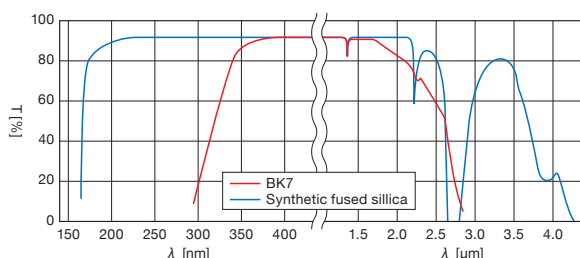


Outline Drawing

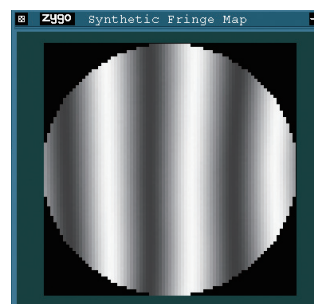
(in mm)



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

MLH-10, -15 / BSHL-15-2, -20-2 / MHG-MP25-NL, -MP30-NL / MHAN-40S / MHG-MP50-NL / MHAN-60 / MHA-80, -100



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

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

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

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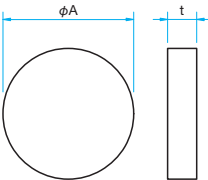
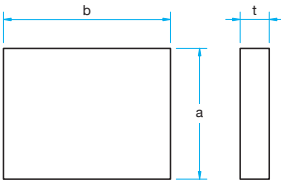
Windows

Contact sheet

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>				phi A	mm
				a	mm
				b	mm
				t	mm
Surface flatness <input type="checkbox"/> λ/10 <input type="checkbox"/> λ/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	λ= nm	Type	
		Output or Energy	W	Beam size	mm
		Incident angle	θ=	J	Pulse width s
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.
* Write more detailed specifications here. (Rough illustration is acceptable.)					
Other					

Sigma Koki Co., Ltd.

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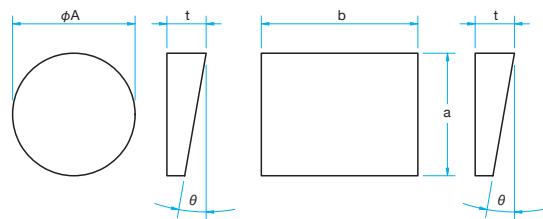
Concave Mirror Substrates

Master Optics

Windows

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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Concave Mirror Substrates/Aluminum Concave Mirror Substrates

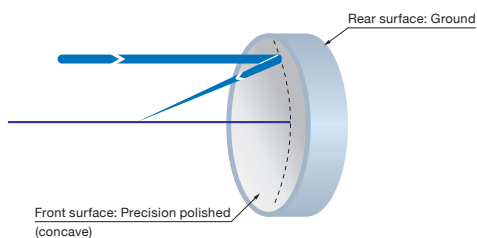
TCBS/TCA/TCAN

RoHS

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

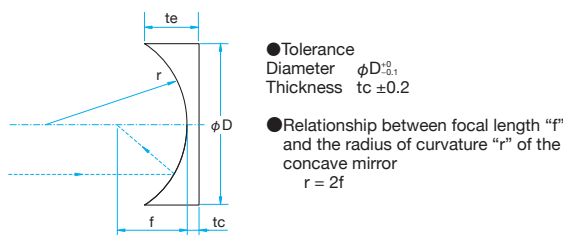


Schematic



Outline Drawing

(in mm)



- Large choice of variation from outer size to radius of curvature from our catalog.
- Providing high specifications than Plano-convex lens product.

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

► High power laser use concave substrates (LCBS) are also available for Laser resonator application. [Reference](#) B308

Attention

- The back side of the substrate is made of 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 International Sales Division for a concave mirror on the back side polished.
- Spark may occur near to focused point with high energy pulse laser incident, the wavefront may be disturbed.
- 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]	Thickness of the edge te [mm]	Thickness of the center tc [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]	Thickness of the edge te [mm]	Thickness of the center 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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φ25 – φ30								
Substrates						Mirror coating		
Part Number	Diameter φD [mm]	Thickness of the edge te [mm]	Thickness of the center tc [mm]	Radius of curvature r [mm]	Focal length f [mm]	With Protective layer Part Number	Without Protective layer Part Number	
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	
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	
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	
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	
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	
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	
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	
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	
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	
TCBS-25C05-5000	φ25	5	5.0	5000	2500	TCA-25C05-5000	TCAN-25C05-5000	
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	
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	
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	
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	
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	
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	
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	
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	
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	
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	
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	
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	
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	
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	
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	
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	
TCBS-30C05-10000	φ30	5	5.0	10000	5000	TCA-30C05-10000	TCAN-30C05-10000	
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]	Thickness of the edge te [mm]	Thickness of the center 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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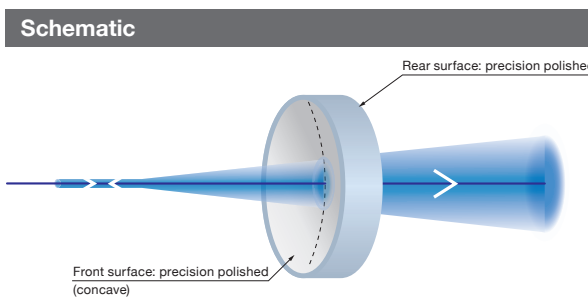
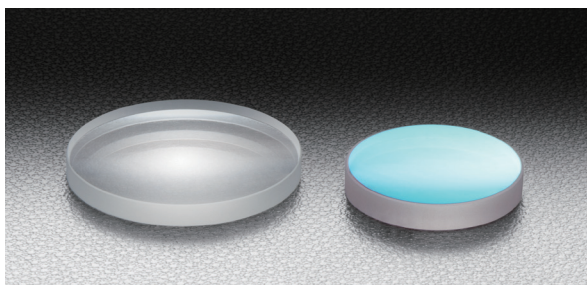
Wedge Substrates

Concave Mirror Substrates

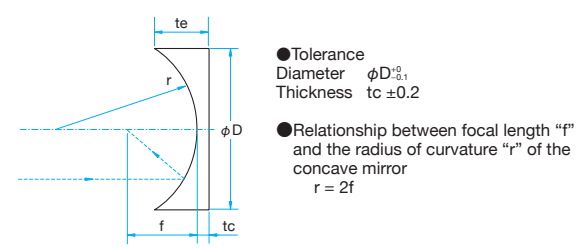
Master Optics

Windows

It is concave substrate which is used as the substrate of the mirror for the laser resonator. It is processed with high surface flatness for the front and back plane of the concave mirror. A production is also available with a dielectric multi-layer film with high laser damage threshold.



Outline Drawing (in mm)



- From among the wide variations that have been subdivided in a diameter and focal length, you can select according to the specifications.
- Because it is also polished the back side, it is possible to use for input of excitation laser or extraction of sample beam.
- It is also able to use as a test plate of Newton 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
 ▶ It is also available of the concave reflector mirror substrate (TCA) of the light source or lamp reflector telescope. [Reference](#) B304

Attention
 ▶ The outer periphery of the ridge concave is chamfered, and thickness of edge (te) may cause variations. For this reason, please use the back side as the reference plane.

φ10					
Part Number	Diameter φD [mm]	Thickness of the edge te [mm]	Thickness of the center 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]	Thickness of the edge te [mm]	Thickness of the center 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]	Thickness of the edge te [mm]	Thickness of the center 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]	Thickness of the edge te [mm]	Thickness of the center 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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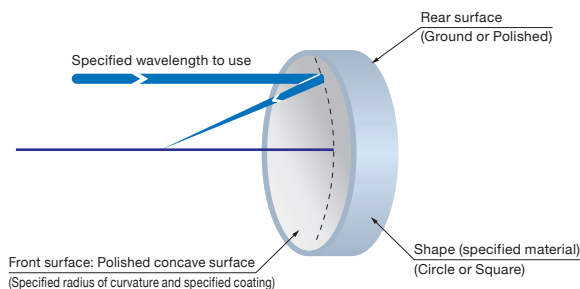
With the substrate that are listed in the catalog, we offer the production of mirror curvature and size that is not listed in the catalog and the coating of your request. Please use the "Contact Us form for custom mirror" format on the next page.



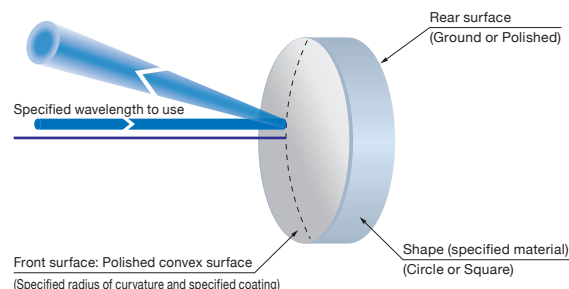
- For the specifications of the coating, please refer to the chapter of the mirror coating properties in the catalog.
- Regardless of a lot or small quantity, we offer the production of custom-made curved mirror.
- We list below the typical radius of curvature of the curved mirror. If you specify a radius of curvature not on this list, it may cost for jigs and tools other than the processing cost. For more information, please consult our International Sales Division.

Schematic

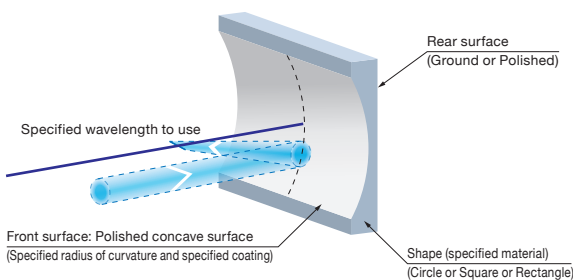
● Concave mirror



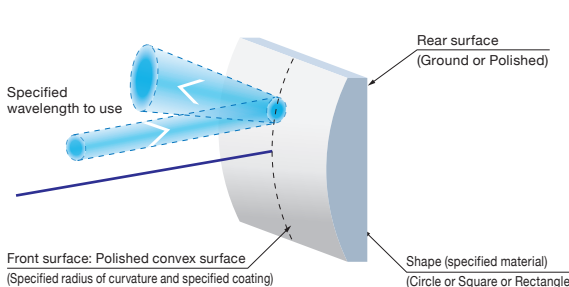
● Convex mirror



● 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		

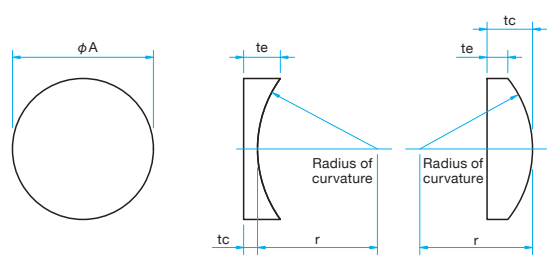
List of cylindrical radius curvature (in mm)				
6.90	10.38	32.20	103.80	460.0
7.79	11.50	36.33	115.00	519.0
9.20	12.98	36.80	129.80	
	13.80	41.52	138.00	
	15.57	46.00	155.70	
	18.40	51.90	184.00	
	20.76	59.80	207.60	
	23.00	67.47	230.00	
	25.95	69.00	259.50	
	27.60	77.85	322.00	
	31.14	92.00	363.30	

* 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▲ <small>If you do not specify a dimension tolerance is outside the standard tolerance</small>			ϕA mm
			te 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 ()		
<small>Select metallic coating or dielectric multi-layer coating.</small>	<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	Hz	
	Incident angle	$\theta =$ °	Polarization conditions <small>(If there is no specification in advance, we will process a circular polarization or a random polarization.)</small>
Other	* Write more detailed specifications here. (Rough illustration is acceptable.)		

Sigma Koki Co., Ltd.

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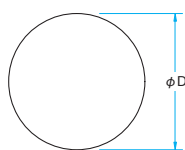
It is the substrate polished to high precision which material change of the shape is very small due to the temperature. It is available to use as test plates of the interferometer and the Newton test plate.

- Inspection data of interferometric surface accuracy is attached to the optical flats.
- You can select the required optical flat from the variations that have been subdivided in various sizes and surface accuracy.
- In the high-precision and large size optical flats, a material having a low thermal expansion than synthetic fused silica is used.
- Arrow on the side of the surface have shown is the polished surface of high surface accuracy.
- Optical flat is delivered into the case for storage.



Outline Drawing

(in mm)



● Tolerance
 $D \leq \phi 50$
 Diameter $\phi D_{-0.1}^{+0}$
 Thickness $t \pm 0.1$

$D \geq \phi 60$
 Diameter $\phi D_{-0.2}^{+0}$
 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 substrate is also available that can prevent the influence of back reflection (WSB / WSSQ / WSSQK). [Reference](#) ▶ B300

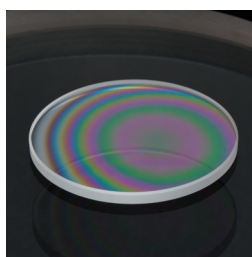
Reference

- ▶ A Newton ring is a rainbow-colored fringes that can be observed when the sample 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 for contacting on samples. If the examination of 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 International Sales Division.
- ▶ If there is a crack or chipping on the edges, on the optical flats, surface flatness may reduced. Please do not use that has cracks or chipping, replace it with a new one.

Example of use



Newton ring



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 PV
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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Windows

We will offer to make a shape and size according to the request of planar substrate with a reflected wavefront and transmitted wavefront with high precision.

Production of large-diameter optical grade polishing $\phi 300\text{mm}$ maximum is available.

It is also available to special processing, such as drilling hole or rectangular shape.

- A data of transmitted wavefront measurement or reflected wavefront by the interferometer is attached.
- According to the required accuracy and environment of use, it can be selected from the glass of various low-expansion substrate material.
- It is also available to coat the master optics. However, depending on the type of coating it may not be able to guarantee the surface flatness.



Specifications

Maximum Diameter	$\phi 300\text{mm}$
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	$\lambda/10$ (It may vary depending on the thickness and outer diameter.)

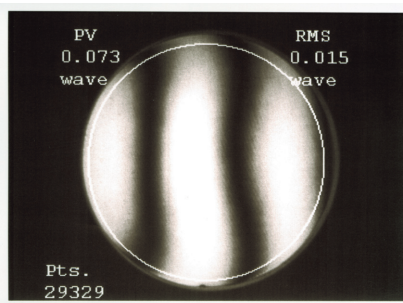
Guide

- ▶ It is also available optical flat (HMPQP / HMPZP) that has been standardized by the reflecting surface flatness. [Reference](#) B312
- ▶ It is also available planar substrate (OFPXP) with surface accuracy of $\lambda/10$ and less $\phi 150\text{mm}$. [Reference](#) B288

Attention

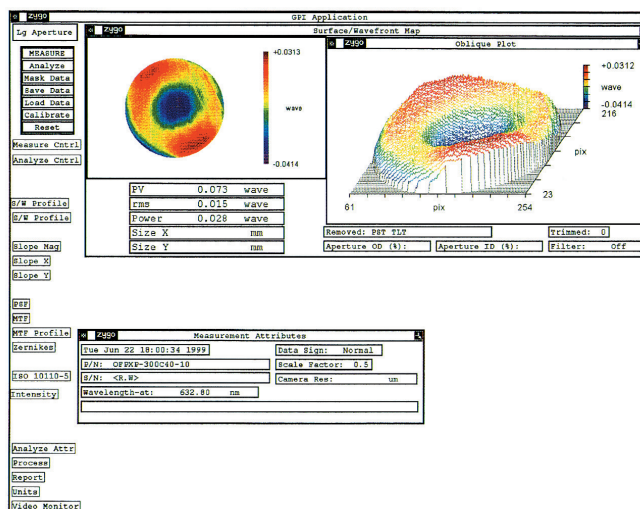
- ▶ If coated after the polishing, it may not be guaranteed surface flatness.
- ▶ Due to the difficulty in procurement of the materials and processing conditions, there is a possibilities of longer production periods. Please check with International Sales Division.
- ▶ If the holder is fixed to the master optics, and tightening too strongly the screws, or the use of curable adhesive may cause to reduce a surface flatness of 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 $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$



Analysis of three-dimensional data

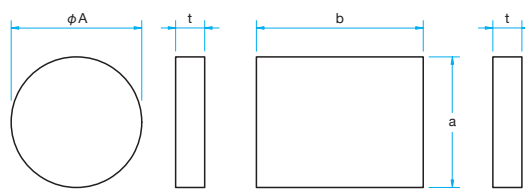
Contact sheet

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.)					

Sigma Koki Co., Ltd.

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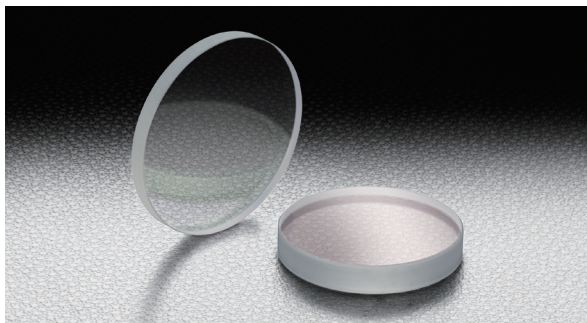
Concave Mirror Substrates

Master Optics

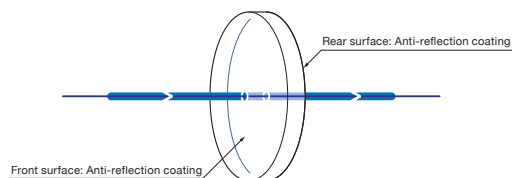
Windows

It is a high-quality window used when light is passed through the opposite side of the partition or in the vacuum chamber. Since increasing the transmittance in the anti-reflection coating, you can use 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 of 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.

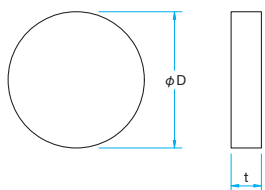


Schematic



Outline Drawing

(in mm)



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

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
 ⇒ WBMA-30C02-10-IR1

Type of AR Coat	Part Number	Wavelength Range [nm]	Transmittance [%]
Visible range	WBMA-30C20-10-550	400 – 700	> Average 99
Near-infrared	WBMA-30C20-10-IR1	633 – 1064	> Average 98.5
Infrared	WBMA-30C20-10-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

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

Guide

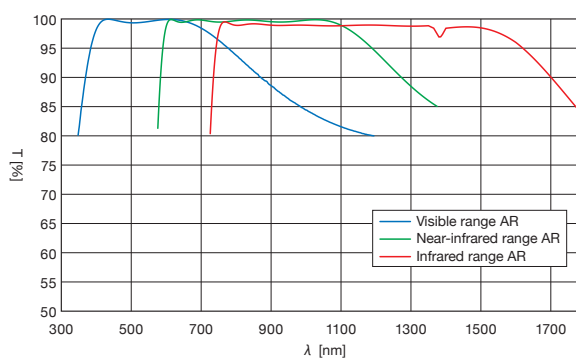
- ▶ Anti-reflection coatings are also available at your specified wavelength.
- ▶ It is also available other than the products described in the catalog in size and wedge.

Attention

- ▶ When using a laser which has a large diameter, there is a possibility that very little interference fringes can be observed in the luminance distribution of the transmitted light. To avoid this effect of the interference fringes, we provide the production of the wedged substrate.
- ▶ 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 anti-reflection coating to increase the transmittance at a particular angle of incidence.

Typical Transmittance Data

T: Transmission



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

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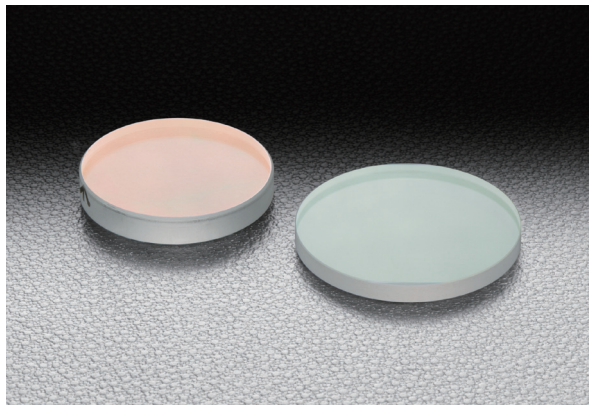
Concave Mirror Substrates

Master Optics

Windows

It is a high-quality window used when light is passed through the opposite side of the partition in the sealed container. Because it increases the transmittance according to the wavelength of the YAG laser, you can use as the laser windows.

- 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.



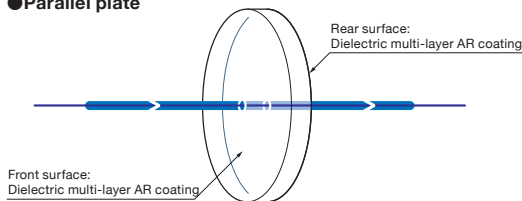
Specifications	
Material	Synthetic fused silica
Surface flatness of substrate	$\lambda/10$
Coating	Multi-layer anti-reflection coating
Transmittance	>99%
Incident angle	0°
Surface Quality (Scratch-Dig)	10-5
Clear aperture	90% of actual aperture

- Guide**
- ▶ We offer also AR coating according to your wavelength selection.
 - ▶ Product sizes and wedges which are not mentioned on this catalog, please ask our International Sales Division.

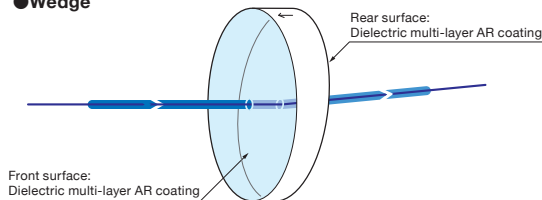
- Attention**
- ▶ When wedge type windows are inserted into the optical path of the laser beam, the beam tilt of about 0.5° is expected.
 - ▶ When used at a wavelength other than the designed wavelength, the loss of transmitted light will be higher.
 - ▶ When used in a large incident angle, the transmittance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

Schematic

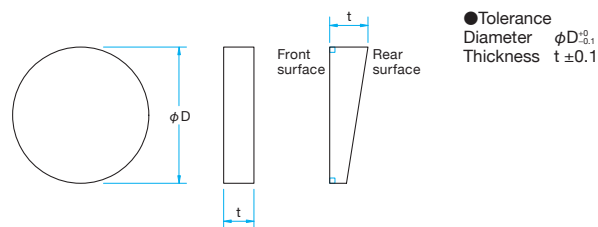
● Parallel plate



● Wedge



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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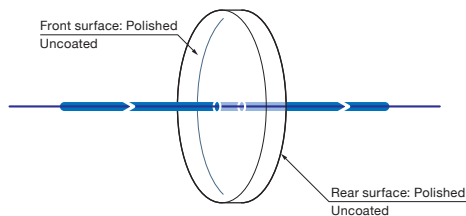
Windows

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 production method that does not absorb to the water molecules in the molecular glass; therefore there is no hydroxyl absorption at the IR region.

- Except the physical characteristics and optical properties of none hydroxyl absorption at IR region, there is not different from conventional synthetic quartz.
- Physically robust and high stability, recommend to use in vacuum and high pressure environment.

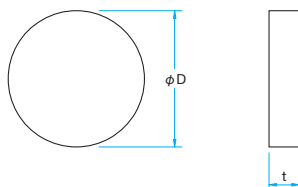


Schematic



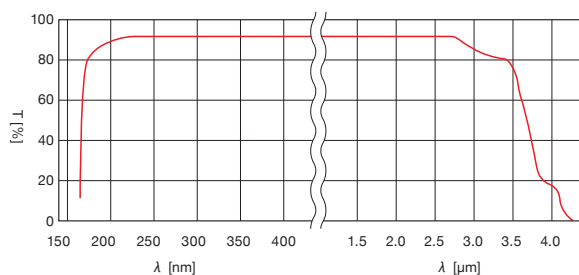
Outline Drawing

(in mm)



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

Typical Transmittance Data T: Transmission



Specifications

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

Guide

- ▶ We offer also AR coating according to your wavelength selection.
- ▶ Product sizes and wedges which are not mentioned on this catalog, please ask our International Sales Division.

Attention

- ▶ Fluorescence illuminant may happen with strong UV light exposure. For high UV application, we recommend CaF₂ Windows (OPCF) and Excimer laser use Fused silica windows (OPSQK).

Reference ▶ B320, B297

- ▶ No AR coating is possible for IR application; do expect to have power lost at 3% on 1 surface on transmittance 94% for 1 substrate.
- ▶ Wavefront reflection and transmission is not guaranteed; for interferometer and high precision optical application, please indicate your requirement on our "Contact sheet for order made optics". Reference ▶ B315

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

Specifications

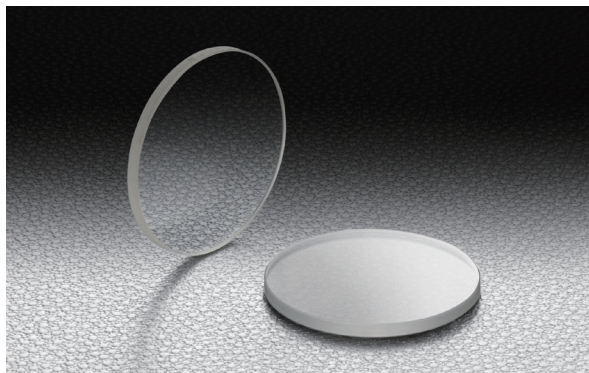
Part Number	Diameter ϕD [mm]	Thickness t [mm]
OPNQ-30C03-P	$\phi 30$	3
OPNQ-30C05-P	$\phi 30$	5
OPNQ-50C03-P	$\phi 50$	3
OPNQ-50C05-P	$\phi 50$	5

Compatible Optic Mounts

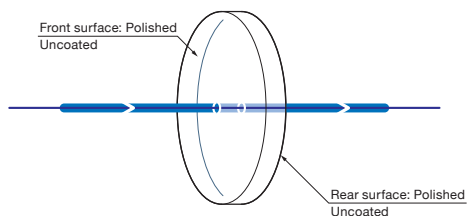
LHF -30S, -50S

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

- Also have excellent heat resistance and weather resistance. It can also be used for outdoor application or as a protective glass for optical system.
- High transmittance from visible regions to Infra-red regions spectrum, widely used as windows for detector system.

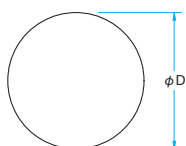


Schematic



Outline Drawing

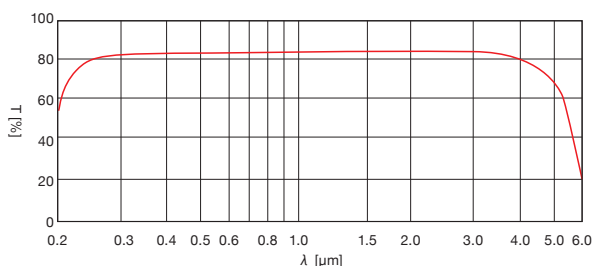
(in mm)



- 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
- ▶ Product sizes and wedges which are not mentioned on this catalog, please ask our International Sales Division.

Attention

- ▶ Fluorescence illuminant may happen with strong UV light exposure. For high UV application, we recommend CaF₂ Windows (OPCFU). [Reference](#) B320
- ▶ No AR coating is possible for IR application; do expect to have power lost at 3% on 1 surface on transmittance 94% for 1 substrate.

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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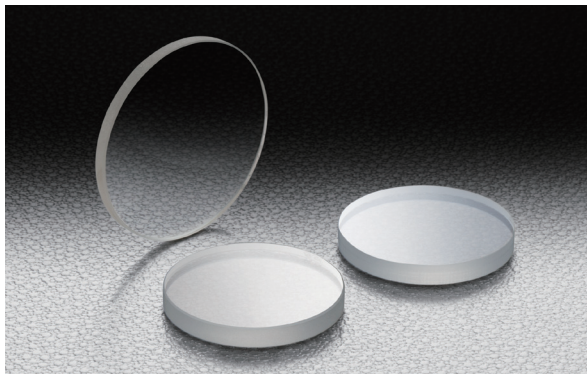
Concave Mirror Substrates

Master Optics

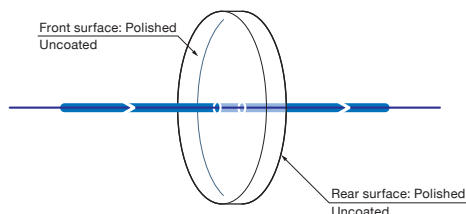
Windows

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

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

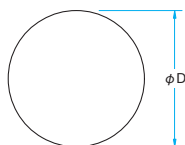


Schematic



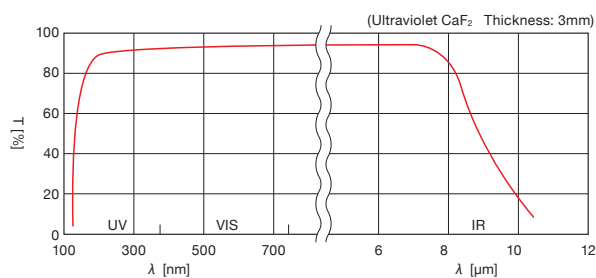
Outline Drawing

(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 can also offer AR coating and Protective layer coating on substrates.
- ▶ Product sizes and wedges which are not mentioned on this catalog, please ask our International Sales Division.

Attention

- ▶ CaF₂ are soft and susceptible to cracking as well as cleavage if subjected to rapid changes in temperature. They should be handled accordingly.
- ▶ No AR coating is possible for IR application; do expect to have power lost at 3% on 1 surface on transmittance 94% for 1 substrate.
- ▶ Wavefront reflection and transmission is not guaranteed; for interferometer and high precision optical application, please indicate your requirement on our "Contact sheet for order made optics". [Reference](#) B315

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

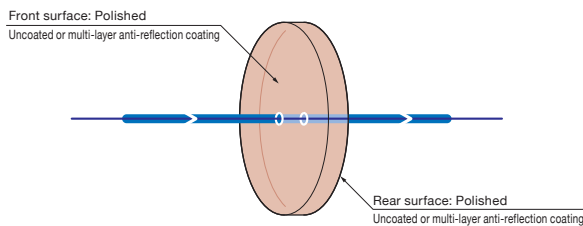
Part Number	Diameter ϕD [mm]	Thickness t [mm]	Wavelength Range [nm]
OPCF-20C01-P	$\phi 20$	1	300 – 8000
OPCF-20C02-P	$\phi 20$	2	300 – 8000
OPCF-25C02-P	$\phi 25$	2	300 – 8000
OPCF-25C03-P	$\phi 25$	3	300 – 8000
OPCF-30C02-P	$\phi 30$	2	300 – 8000
OPCF-30C03-P	$\phi 30$	3	300 – 8000
OPCF-40C03-P	$\phi 40$	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), 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.

- It is available which uncoated type (OPZS) for uniform transmittance in wide range infrared wavelength and AR coated type (WZSA) for high transmittance for wavelength of CO₂ laser.
- It is possible to transmit light with a wavelength around 600nm, so it can be used also to visible laser as a guide light along superimposed on infrared laser. enabling use of more convenient and inexpensive He-Ne lasers.
- Because ZnSe crystal has almost no hygroscopic, it can be handled in the same way as the general optical element.
- Because ZnSe crystal is crystal isotropic, it does not occur birefringence or polarization characteristics.

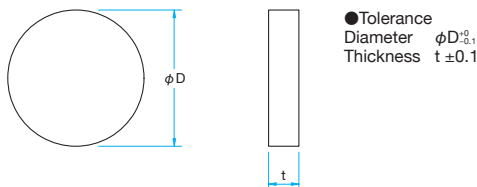


Schematic



Schematic

(in mm)



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 Deleterious Substances. In addition, it is not allowed to waste the unused ZnSe optics as a general optics. Optics that are no longer needed, please return to us. (We accept only product sold by us)
The above is a case in Japan and please ask nearby sales contact about the case outside Japan.

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

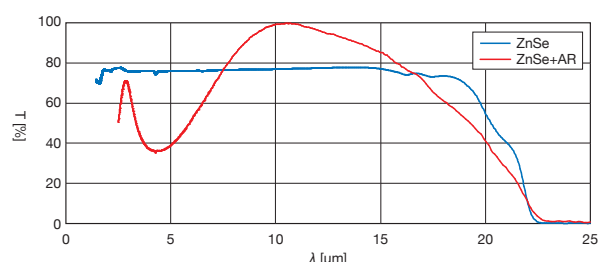
Guide

- ▶ We are also offering ZnSe lens (SLZS) for use in CO₂ Laser. [Reference](#) B164
- ▶ Product sizes and wedges which are not mentioned on this catalog, please ask our International Sales Division.

Attention

- ▶ Toxic hydrogen selenide is generated by contact with strong acids. 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 17% of reflectivity on each surface. The total of power loss at transmittance is estimated at 30%.
- ▶ The WZSQ type must be used at incident angle at 0 degree for a best transmittance.

Typical Transmittance Data T: Transmission



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

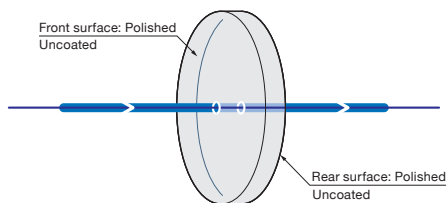
Wavelength [μm]	Refractive Index
0.59	2.625
0.63	2.594
1.0	2.489
2.2	2.444
4.0	2.433
6.0	2.426
8.0	2.417
10.6	2.403
16.0	2.356
Density	5.27g/cm ³ (25°C)
Thermal Conductivity	18W·m ⁻¹ K ⁻¹ (23°C)
Thermal Expansion Coefficient	7.1×10 ⁻⁶ /°C(0°C)

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

- These silicon windows does not transmit at 1µm region or under, therefore its main application is at IR regions.
- It is used for various experiments with these silicon windows.
- Because of its high thermal conductivity, it fits for use as high power laser mirror.

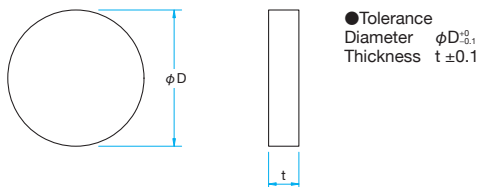


Schematic



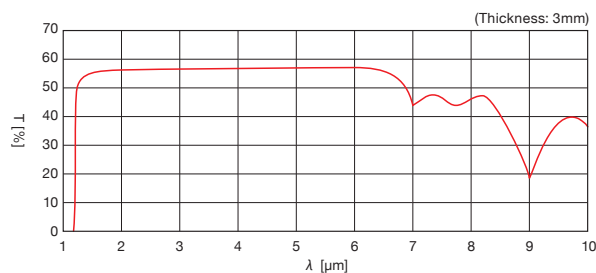
Outline Drawing

(in mm)



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
- ▶ Product sizes and wedges which are not mentioned on this catalog, please ask our International Sales Division.

Attention

- ▶ Silicon windows have a shiny metal surface; it reflects and absorbs but does not transmit at visible regions.
- ▶ Silicon windows surface reflection affects the transmittance by 53% loss. (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

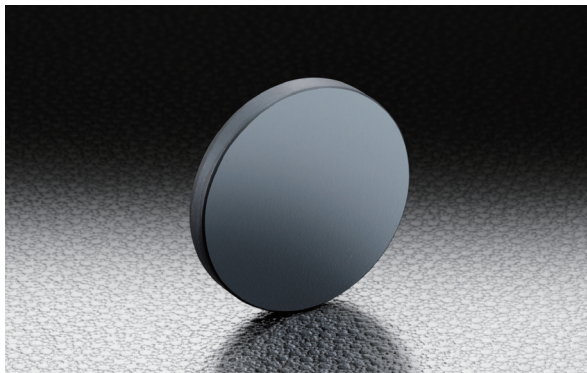
Part Number	Diameter φD [mm]	Thickness t [mm]
OPSI-30C03-2-3	φ30	3
OPSI-40C04-2-3	φ40	4
OPSI-50C05-2-3	φ50	5

Compatible Optic Mounts

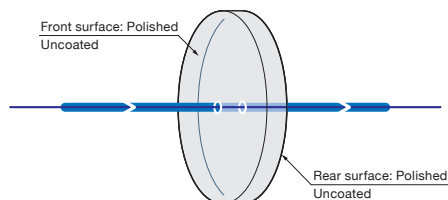
LHF-30S, -40S, -50S

The Germanium as a mono crystal primarily used in semi-conductor is non-absorptive at spectrum $2\mu\text{m}$ to $20\mu\text{m}$ IR regions. It is used here as an optical component for IR region application.

- These silicon windows does not transmit at $1.5\mu\text{m}$ region or under, therefore its main application is at IR regions.
- It is used for various experiments with these Germanium windows.

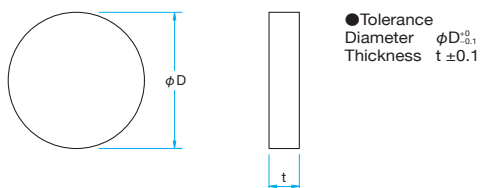


Schematic

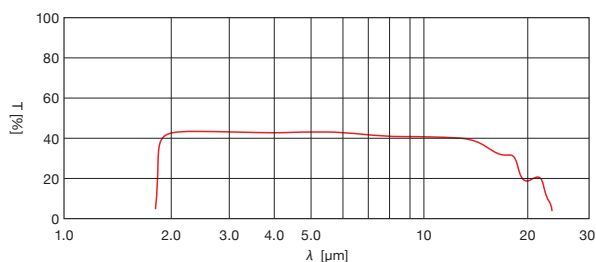


Outline Drawing

(in mm)



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
- ▶ Product sizes and wedges which are not mentioned on this catalog, please ask our International Sales Division.

Attention

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

Physics

Wavelength [μm]	Refractive Index
2	4.120
3	4.044
4	4.025
5	4.016
6	4.012
7	4.009
8	4.007
9	4.006
10	4.004
10.6	4.004
11	4.004
12	4.003
13	4.002
14	4.002
Density	5.33g/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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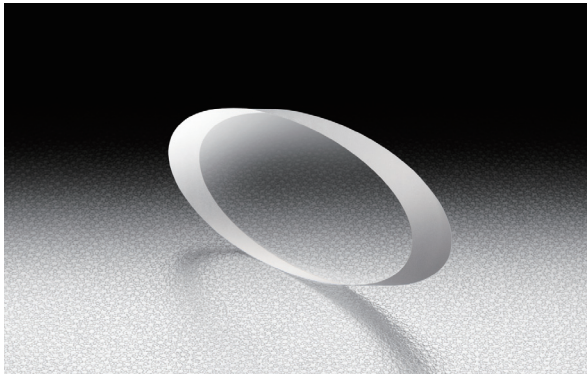
Concave Mirror Substrates

Master Optics

Windows

This window plate which transmits substantially 100% linearly polarized laser beam with a non-reflective effect of the P-polarized light at Brewster angle. Brewster window can be used as a window of the laser instruments.

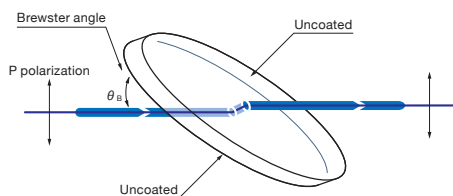
- When installed Brewster angle against the incident beam, the circular effective diameter can be obtained.
- Since both sides are not coated, it can be used with the high-energy pulse laser.
- Please specify the materials (synthetic fused silica or BK7), transmitted beam diameter, thickness, and the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



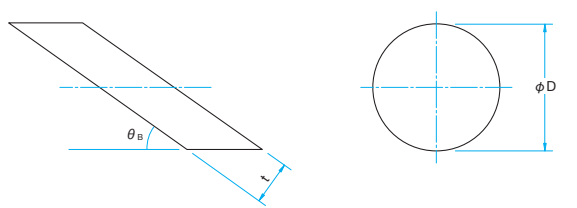
Attention

- ▶ If the incident polarization state is other than P-polarized light, the transmission losses occur due to reflection at the front and back.
- ▶ If contamination exist on the entrance surface or the exit surface, then 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.

Schematic



Outline Drawing (in mm)



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

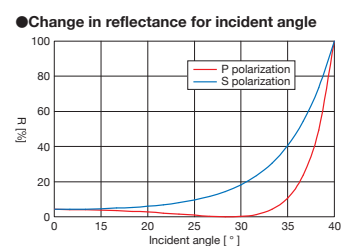
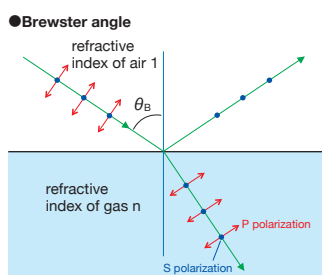
Wavelength [nm]	BK7		Synthetic fused silica	
	Refractive Index	Brewster angle θ_B [°]	Refractive Index	Brewster angle θ_B [°]
266	—	—	1.499	56.3
355	1.539	57.0	1.476	55.9
488	1.522	56.7	1.463	55.6
532	1.519	56.6	1.461	55.6
632.8	1.515	56.6	1.457	55.5
1064	1.507	56.4	1.449	55.4
1550	1.501	56.3	1.444	55.3

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.

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.



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Contact sheet

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.)						

Sigma Koki Co., Ltd.

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