

## Plane Substrate

Substrate mit planen Flächen werden in der Lasertechnik beispielsweise als Umlenkspiegel, dichroitische Spiegel oder Fenster eingesetzt. Bei Laseranwendungen werden normalerweise feinstpolierte Optiken mit einer  $\lambda/10$ -Ebenheit verwendet.

Die Politur-Spezifikation der Substrate ist abhängig von der Anwendung. Beim Einsatz als Spiegel sind die Gläser mindestens einseitig feinstpoliert. Bei Verwendung in Transmission werden beidseitig feinstpolierte Substrate eingesetzt.

Die Plansubstrate unterscheiden sich ferner in der Spezifikation des Keilwinkels und werden in verschiedenen Größen und Formen angeboten.

### Hinweis

Wichtig bei der Verwendung von Laseroptiken ist die korrekte Materialwahl. Man unterscheidet zwischen mehreren Qualitätsstufen.

Der typische Oberflächenfehler bei 1.0" Substraten aus BK7 oder Quarzglas vor der Beschichtung ist wie folgt:

- Formtreue: 3/0.2 (0.2/-) nach ISO 10110  
 $\lambda/10$  nach MIL-O-1380A
- Oberflächenfehler: 5/4x0.025 nach ISO 10110  
10-5 nach MIL-O-1380A

## Plane Substrates



Substrates with plane surfaces are used, for example, as bending mirrors, dichroic mirrors, or windows. The finest polished optics with a planarity of  $\lambda/10$  are normally used in laser applications.

The polish specification of substrates depends on the application. When used as mirrors, the glasses are finely polished on at least one side. When used in transmission, both sides of the substrate are polished to laser grade quality.

The plane substrates differ in the specification of the wedge angle and are available in different forms and sizes.

### Note

The right selection of material is important in laser optics. Furthermore, the materials can be provided with different levels of quality.

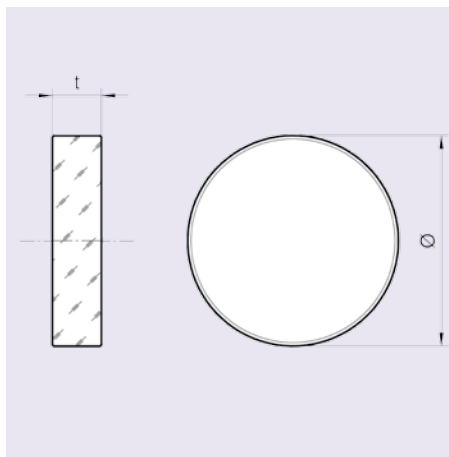
Before coating, the typical surface quality of 1.0" substrates made of BK7 or fused silica is as follows:

- Surface figure: 3/0.2 (0.2/-) according to ISO 10110  
 $\lambda/10$  according to MIL-O-1380A
- Surface quality: 5/4x0.025 according to ISO 10110  
10-5 according to MIL-O-1380A

## Runde Plansubstrate

### Planfenster – PW-Serie

Die PW-Serie (**Plane Window**) stellt die am Häufigsten eingesetzte Optik dar. Sie wird dort verwendet, wo Laserstrahlen transmittiert werden – beispielsweise als dichroitische Spiegel, Endspiegel, Strahlteiler oder Fenster.



## Round Plane Substrates

### Plane Windows – PW Series

The PW series (**Plane Window**) is the most commonly used optic. It is used where laser beams are transmitted, for example, as dichroic mirrors, end mirrors, beam splitters, or windows.



SPECS	■ <b>Material:</b>	BK7, fused silica, CaF <sub>2</sub> , sapphire	■ <b>Wedge angle:</b>	< 5 arc minutes
	■ <b>Diameter tolerance:</b>	+ 0.00 mm; - 0.20 mm	■ <b>Protective chamfer:</b>	0.2 - 0.4 mm x 45°
	■ <b>Thickness tolerance:</b>	± 0.20 mm	■ <b>Clear aperture:</b>	85 % of diameter
	■ <b>Surface quality:</b>	5/4 x 0.025 for 1.0" substrates according to ISO 10110 10-5 according to MIL-O-1380A		

#### Nomenklatur – Nomenclature

PW	05	12	UV
Product code (Plane Window)	Diameter in inches x 10	Thickness in inches x 100	Material code UV: fused silica C: BK7

#### Planfenster aus Quarzglas / BK7 – Fused Silica / BK7 Plane Windows

Part No. Fused Silica	Part No. BK7	Diameter Ø	Thickness t	Surface Figure Fused Silica	Surface Figure BK7
PW0504UV	PW0504C	0.500"	1.00 mm	λ/4	λ/4
PW0508UV	PW0508C	0.500"	2.00 mm	λ/10	λ/10
PW0512UV	PW0512C	0.500"	0.125"	λ/10	λ/10
PW0525UV	PW0525C	0.500"	0.250"	λ/10	λ/10
PW0537UV	PW0537C	0.500"	0.375"	λ/10	λ/10
PW0604UV	PW0604C	15.00 mm	1.00 mm	λ/4	λ/4
PW06308UV	PW06308C	16.00 mm	2.00 mm	λ/10	λ/4
PW0712UV	PW0712C	0.750"	0.125"	λ/10	λ/10
PW0725UV	PW0725C	0.750"	0.250"	λ/10	λ/10
PW0737UV	PW0737C	0.750"	0.375"	λ/10	λ/10
PW1012UV	PW1012C	1.000"	0.125"	λ/10	λ/4
PW1025UV	PW1025C	1.000"	0.250"	λ/10	λ/10
PW1037UV	PW1037C	1.000"	0.375"	λ/10	λ/10
PW1512UV	PW1512C	1.500"	0.125"	λ/4	λ/4
PW1525UV	PW1525C	1.500"	0.250"	λ/10	λ/10
PW1537UV	PW1537C	1.500"	0.375"	λ/10	λ/10
PW1619UV	PW1619C	40.00 mm	5.00 mm	λ/10	λ/4
PW2025UV	PW2025C	2.000"	0.250"	λ/10	λ/4
PW2037UV	PW2037C	2.000"	0.375"	λ/10	λ/10
PW2050UV	PW2050C	2.000"	0.500"	λ/10	λ/10

**Most items are available from stock. Other sizes and materials are available upon request.**



### Planfenster aus Quarzglas / BK7 – Fused Silica / BK7 Plane Windows

Part No. Fused Silica	Part No. BK7	Diameter Ø	Thickness t	Surface Figure Fused Silica	Surface Figure BK7
PW3037UV	PW3037C	3.000"	0.375"	λ/10	λ/10
PW3050UV	PW3050C	3.000"	0.500"	λ/10	λ/10
PW4037UV	PW4037C	4.000"	0.375"	λ/10	λ/10

**Most items are available from stock. Other sizes and materials are available upon request.**

### Planfenster aus Saphir – Sapphire Plane Windows

Part No.	Diameter Ø	Thickness t	Surface Figure	Material
<b>PW0511SA*</b>	<b>0.500"</b>	<b>3.00 mm</b>	λ/4	<b>Sapphire</b>
<b>PW0708SA*</b>	<b>0.750"</b>	<b>2.00 mm</b>	λ/4	<b>Sapphire</b>
PW0711SA*	0.750"	3.00 mm	λ/4	Sapphire
<b>PW1011SA*</b>	<b>1.000"</b>	<b>3.00 mm</b>	λ/2	<b>Sapphire</b>
PW1524SA*	1.500"	6.00 mm	λ/2	Sapphire
PW2012SA*	2.000"	0.125"	λ	Sapphire

\* Surface quality is 5/4x0.063, 20-10  
**Bold type indicates items available from stock. Other sizes are available upon request.**

### Planfenster aus CaF<sub>2</sub> – CaF<sub>2</sub> Plane Windows

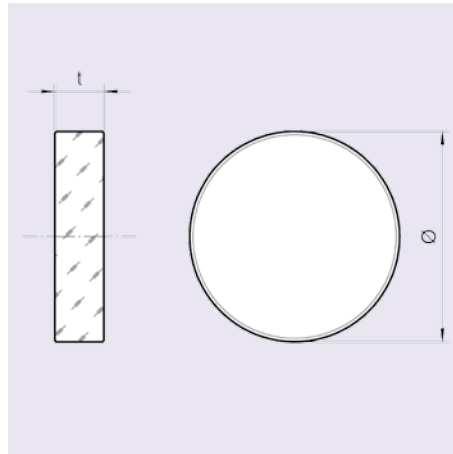
Part No.	Diameter Ø	Thickness t	Surface Figure	Material
<b>PW0511CF*</b>	<b>0.500"</b>	<b>3.00 mm</b>	λ/4	<b>CaF<sub>2</sub>-IR</b>
PW0525CF*	0.500"	0.250"	λ/10	CaF <sub>2</sub> -IR
<b>PW1011CF*</b>	<b>1.000"</b>	<b>3.00 mm</b>	λ/4	<b>CaF<sub>2</sub>-IR</b>
PW1025CF*	1.000"	0.250"	λ/4	CaF <sub>2</sub> -IR
PW1512CF*	1.500"	0.125"	λ/4	CaF <sub>2</sub> -IR
PW2019CF*	2.000"	5.00 mm	λ/4	CaF <sub>2</sub> -IR

\* Surface quality is 5/4x0.063, 20-10  
**Bold type indicates items available from stock. Other sizes are available upon request.**  
**CaF<sub>2</sub> in UV quality is available upon request.**



## Planparallelfenster – PP-Serie

Die PP-Serie (Plane Parallel Window) besteht durch einen geringen Keilwinkel. Sie wird dort verwendet, wo die Winkelablenkung des transmittierenden Strahls ausschlaggebend ist – beispielsweise bei Auskopplern oder Strahlteilern. Die planparallelen Fenster können hier ausgetauscht werden, ohne eine erneute Justage des Systems durchführen zu müssen.



## Plane Parallel Windows – PP Series

The PP series (Plane Parallel Window) features a low wedge angle. It is used where the angle of deflection of the transmitted beam is crucial – for example, in output couplers or beam splitters. The plane parallel windows can be exchanged without having to readjust the system.

SPECS	■ <b>Material:</b>	BK7, fused silica	■ <b>Wedge angle:</b>	< 20 arc seconds
	■ <b>Diameter tolerance:</b>	+ 0.00 mm; - 0.20 mm	■ <b>Protective chamfer:</b>	0.2 - 0.4 mm x 45°
	■ <b>Thickness tolerance:</b>	± 0.20 mm	■ <b>Clear aperture:</b>	85 % of diameter
	■ <b>Surface quality:</b>	5/4 x 0.025 for 1.0" substrates according to ISO 10110 10-5 according to MIL-O-1380A		

### Nomenklatur – Nomenclature

PP	05	12	UV
Product code (Plane Parallel Window)	Diameter in inches x 10	Thickness in inches x 100	Material code UV: fused silica C: BK7

### Planparallelfenster aus Quarzglas / BK7 – Fused Silica / BK7 Plane Parallel Windows

Part No. Fused Silica	Part No. BK7	Diameter Ø	Thickness t	Surface Figure Fused Silica	Surface Figure BK7
PP0512UV	PP0512C	0.500"	0.125"	λ/10	λ/10
PP0625UV	PP0625C	15.00 mm	0.250"	λ/10	λ/10
PP0725UV	PP0725C	0.750"	0.250"	λ/10	λ/10
PP0737UV	PP0737C	0.750"	0.375"	λ/10	λ/10
PP1012UV	PP1012C	1.000"	0.125"	λ/10	λ/4
PP1025UV	PP1025C	1.000"	0.250"	λ/10	λ/10
PP1037UV	PP1037C	1.000"	0.375"	λ/10	λ/10
PP1512UV	PP1512C	1.500"	0.125"	λ/10	λ/4

Most items are available from stock. Other sizes and materials are available upon request.



## Planparallelfenster aus Quarzglas / BK7 – Fused Silica / BK7 Plane Parallel Windows

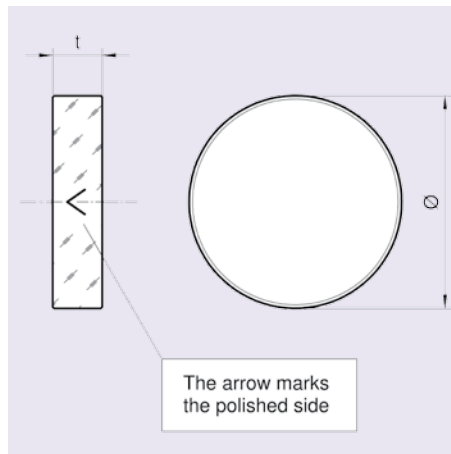
Part No. Fused Silica	Part No. BK7	Diameter Ø	Thickness t	Surface Figure Fused Silica	Surface Figure BK7
PP1537UV	PP1537C	1.500"	0.375"	$\lambda/10$	$\lambda/10$
PP2037UV	PP2037C	2.000"	0.375"	$\lambda/10$	$\lambda/10$
PP3037UV	PP3037C	3.000"	0.375"	$\lambda/10$	$\lambda/10$
PP3050UV	PP3050C	3.000"	0.500"	$\lambda/10$	$\lambda/10$
PP4037UV	PP4037C	4.000"	0.375"	$\lambda/10$	$\lambda/10$
PP4050UV	PP4050C	4.000"	0.500"	$\lambda/10$	$\lambda/10$

Most items are available from stock. Other sizes and materials are available upon request.

## Plane Spiegelsubstrate – PS-Serie

Die PS-Serie (Plane Spiegelsubstrate) wird eingesetzt, wenn lediglich eine Substratfläche in hochwertiger Laserqualität benötigt wird. Diese hat die üblichen Spezifikationen währenddessen die Rückseite nur rohpoliert ist.

Die kostengünstigen planen Spiegelsubstrate werden in der Regel als Endspiegel im Resonator oder als Umlenkspiegel eingesetzt.



## Plane Mirror Substrates – PS Series

The PS series (Plane Mirror Substrate) is used when only one high quality substrate surface is required. This surface has the standard specifications while the backside is commercially polished.

Reasonably-priced plane mirror substrates are generally used as end mirrors in resonators or as bending mirrors.

### Hinweis

#### ■ Mattierte Rückseite

Für spezielle Anwendungen kann es notwendig sein, dass die Rückseite des Substrates mattiert ist. LASER COMPONENTS bietet hierfür spezielle Substrate mit der Bezeichnung PU an.

#### ■ Substratart

Für die meisten Anwendungen ist die Substratart BK7 ausreichend, da bei Spiegeln die Absorption des Materials unkritisch ist. In manchen Fällen ist es jedoch sinnvoll, Quarz einzusetzen.

### Note

#### ■ Fine grind (matt) backside

In special applications, it can become necessary for the backside of the substrate to be fine grind. LASER COMPONENTS has special substrates with the indication PU available for this purpose.

#### ■ Type of substrate

For the majority of applications, the substrate material BK7 is sufficient, mostly because the absorption of material is uncritical in mirrors. In some cases, however, it makes more sense to use fused silica.

SPECS	Material:	BK7, fused silica	Clear aperture:	85 % of diameter
	Diameter tolerance:	+ 0.00 mm; - 0.20 mm	Surface quality:	
Thickness tolerance:	± 0.20 mm	Front Side:	5/4 x 0.025 for 1.0" substrates according to ISO 10110	
Wedge angle:	< 5 arc minutes		10-5 according to MIL-O-1380A	
Protective chamfer:	0.2 - 0.4 mm x 45°	Rear side:	Commercial polish	



## Nomenklatur – Nomenclature

PS	05	25	UV
Product code (Plane Mirror Substrate)	Diameter in inches x 10	Thickness in inches x 100	Material code UV: fused silica C: BK7

## Planspiegel Substrate aus Quarzglas / BK7 – Fused Silica / BK7 Plane Mirror Blanks

Part No. Fused Silica	Part No. BK7	Diameter Ø	Thickness t	Surface Figure Fused Silica	Surface Figure BK7
PS0525UV	PS0525C	0.500"	0.250"	λ/10	λ/10
PS0711UV	PS0711C	0.750"	3.00 mm	λ/10	λ/10
PS0725UV	PS0725C	0.750"	0.250"	λ/10	λ/10
PS0737UV	PS0737C	0.750"	0.375"	λ/10	λ/10
PS0911UV	PS0911C	25.00 mm	3.00 mm	λ/10	λ/4
PS1012UV	PS1012C	1.000"	0.125"	λ/10	λ/4
PS1025UV	PS1025C	1.000"	0.250"	λ/10	λ/10
PS1037UV	PS1037C	1.000"	0.375"	λ/10	λ/10
PS1537UV	PS1537C	1.500"	0.375"	λ/10	λ/10
PS2025UV	PS2025C	2.000"	0.250"	λ/10	λ/4
PS2037UV	PS2037C	2.000"	0.375"	λ/10	λ/10

**Most items are available from stock. Other sizes and materials are available upon request.**

## Brewster Fenster – BW-Serie Elliptische Fenster – ELW-Serie

Bei der BW-Serie (**B**rewster **W**indow) handelt es sich um planparallele Platten, die unter dem Brewster Winkel  $\theta_B$  geschnitten sind. Die ELW-Serie (**E**lliptical **W**indow) hat einen Schnitt von 45°. Vor allem Brewster-Fenster zeichnen sich durch geringste Keilwinkel aus.

## Brewster Windows – BW Series Elliptical Windows – ELW Series

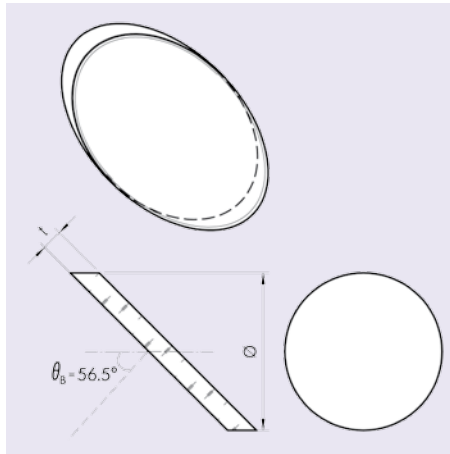
The BW series (**B**rewster **W**indow) is a series of plane parallel plates that are cut at the Brewster angle. The ELW series (**E**lliptical **W**indow) is cut at an angle of 45°. Especially Brewster windows feature the smallest wedge angles.

SPECS	■ <b>Material:</b>	BK7, fused silica	■ <b>Wedge angle:</b>	
	■ <b>Diameter tolerance:</b>	+ 0.00 mm; - 0.20 mm	BW-Series:	< 10 arc seconds
	■ <b>Thickness tolerance:</b>	± 0.20 mm	ELW-Series:	< 5 arc minutes
	■ <b>Surface quality:</b>	5/4 x 0.025 for 1.0" substrates according to ISO 10110 10-5 according to MIL-O-1380A	■ <b>Protective chamfer:</b>	0.2 - 0.4 mm x 45°
			■ <b>Clear aperture:</b>	85 % of diameter



### Brewster Fenster

Bei Brewster Fenstern wird als Substrat normalerweise Quarz eingesetzt. Der Wellenfrontfehler bei Fenstern gleicher Dicke ist bei Quarz geringer als bei BK7.



### Brewster Windows

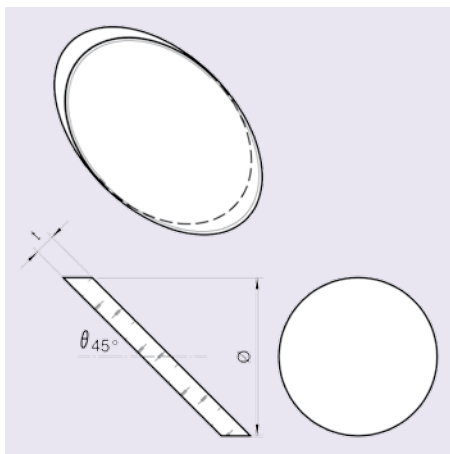
Normally, fused silica is used as substrate material for Brewster windows. The wavefront error in windows of the same thickness is less for fused silica than for BK7 substrates.

### Nomenklatur – Nomenclature

<b>BW</b>	<b>8.0</b>	<b>-2.0</b>	<b>UV</b>
Product code (Brewster <b>W</b> indow)	Diameter in mm	Thickness in mm	Material code UV: fused silica

### Elliptische Fenster

Elliptische Fenster werden sowohl aus BK7 als auch aus Quarzglas angeboten. Einsatz finden die aufwändig gefertigten Fenster als Umlenkspiegel.



### Elliptical Windows

Elliptical windows are produced from both BK7 and fused silica glass. These complex windows are used as bending mirrors.

### Nomenklatur – Nomenclature

<b>ELW</b>	<b>25.4</b>	<b>-6.35</b>	<b>UV</b>
Product code (Elliptical <b>W</b> indow)	Diameter in mm	Thickness in mm	Material code UV: fused silica C: BK7

