Standard Catalog 2020/21

High-quality Optics from Stock

LAYERTEC®
OPTICAL COATINGS · OPTICS

Dear Customer,

LAYERTEC is a German one-stop shop for high-performance laser components. The company's objective is to design and manufacture high-quality optics that meet complex customer requirements. This Standard Catalog bundles the most frequently requested laser optics. The LAYERTEC Standard Items are pre-produced, optimizing cost, availability and shipping time while guaranteeing the well-known LAYERTEC quality.

The LAYERTEC Standard Items are kept in stock for you and will be shipped by return. You can order the components through our webshop at www.layertec.de or by e-mail.

Please do not hesitate to contact us for a quotation or a discussion regarding your special requirements, especially if they are not mentioned in this catalog. We are looking forward to complex tasks. Simply contact us at info@layertec.de.

Sincerely yours,
The LAYERTEC team

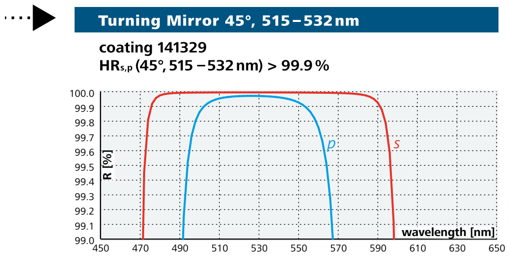
How this Catalog works

1

Choose type of laser
See table of contents at page 3.

2

Choose optical element / coating



3

Choose size of substrate
Please see fold-out cover pages for more details.

Plane substrates | Curved substrates

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Curved Substrates, page 49

In this digital Version of the Standard Catalog, please see page 48 for plane substrates and page 49 for curved substrates.

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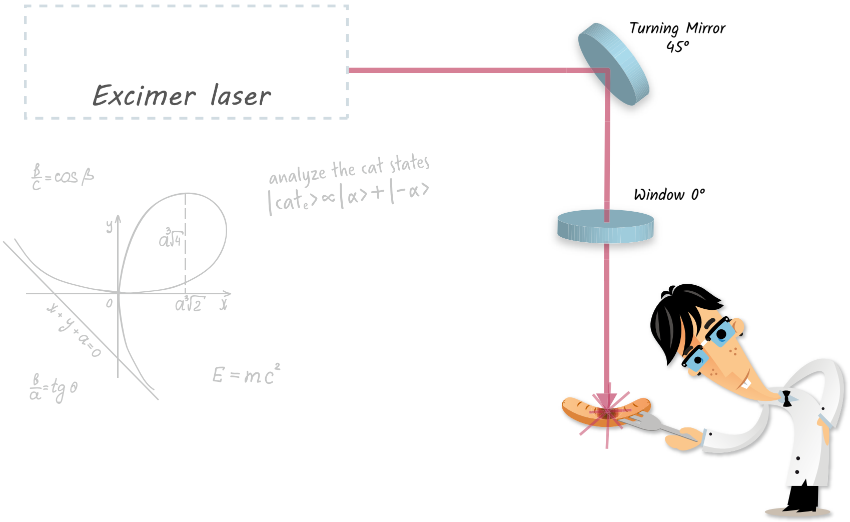
Order online at www.layertec.de

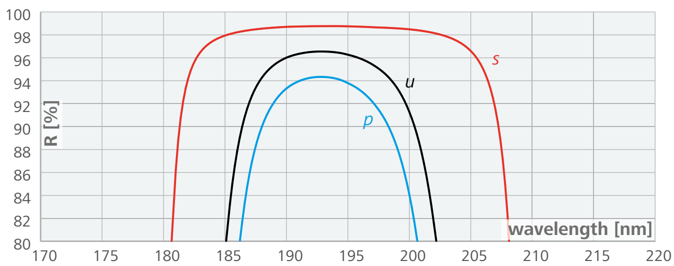
Excimer Lasers [193 nm, 248 nm, 308 nm]



For optics not specified here, please visit www.layertec.de, contact us at info@layertec.de or call us at +49 (0)36453 744 0.

Turning Mirror 45°, 193 nm

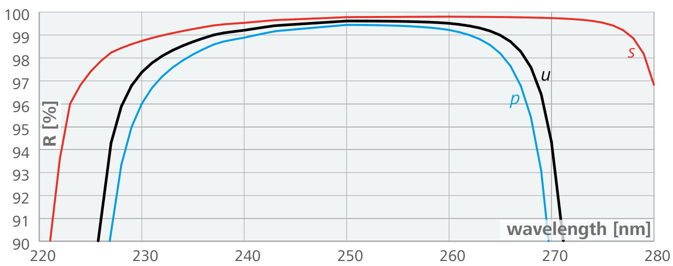
Coating 113257 *on CaF_2 UV-grade*
HR_u (45°, 193 nm) > 95 %
HR_s (45°, 193 nm) > 97 %
HR_p (45°, 193 nm) > 93 %



Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 6.35 mm	B4 f	5/ 4 x 0.063	107229	378 €
Ø 50.0 mm | t 5.0 mm	C1 f	5/ 5 x 0.063	160821	755 €
50 × 27 mm | t 3.0 mm	O1 f	5/ 5 x 0.063	160820	640 €

Turning Mirror 45°, 248 nm

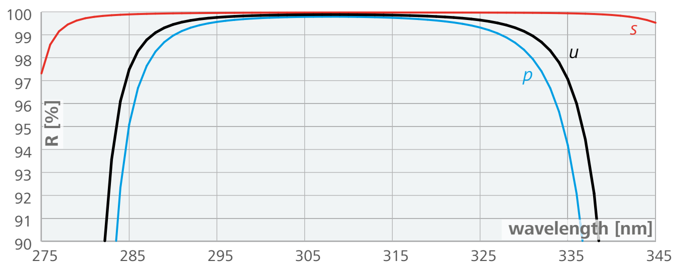
Coating 159573
HR_u (45°, 248 nm) > 99.5 %
HR_s (45°, 248 nm) > 99.7 %
HR_p (45°, 248 nm) > 99.0 %



Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 6.35 mm	B4	5/ 2 x 0.04	160804	235 €
Ø 50.0 mm | t 6.35 mm	C2	5/ 3 x 0.063	160803	643 €
50 × 27 mm | t 6.35 mm	O2	5/ 2 x 0.063	160806	487 €

Turning Mirror 45°, 308 nm

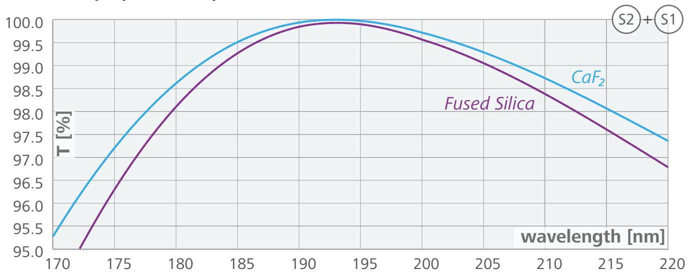
Coating 159576
HR_u (45°, 308 nm) > 99.5 %
HR_s (45°, 308 nm) > 99.9 %
HR_p (45°, 308 nm) > 99.5 %



Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 6.35 mm	B4	5/ 2 x 0.04	160801	235 €
Ø 50.0 mm | t 6.35 mm	C2	5/ 3 x 0.063	160802	643 €
50 × 27 mm | t 6.35 mm	O2	5/ 2 x 0.063	160807	487 €

Window 0°, 193 nm

S2+S1: Coating 113604 *on CaF_2 193 nm excimer grade*
S2+S1: Coating 120805 *on Fused Silica 193 nm excimer grade*
AR (0°, 193 nm) < 0.25 %

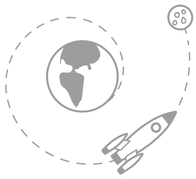


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 3.0 mm	B3 f	5/ 2 x 0.063	160702	352 €

Coating on CaF_2

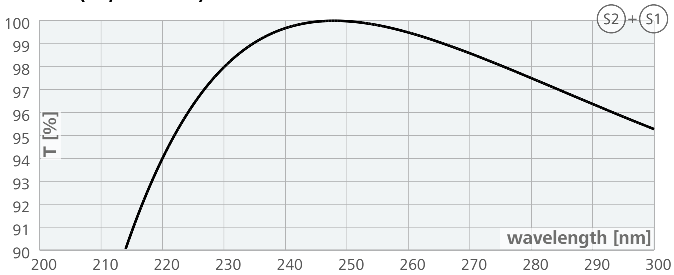
Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 3.0 mm	B3 d	5/ 2 x 0.063	160701	250 €

Coating on Fused Silica



Window 0°, 248 nm

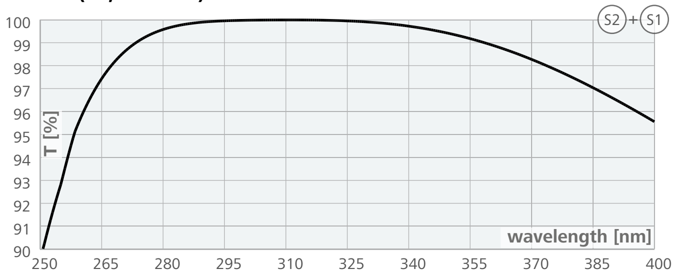
S2+S1: Coating 127980 *on Fused Silica 248 nm excimer grade*
AR (0°, 248 nm) < 0.25 %



Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 3.05 mm	B3 c	5/ 1 x 0.04	160700	220 €

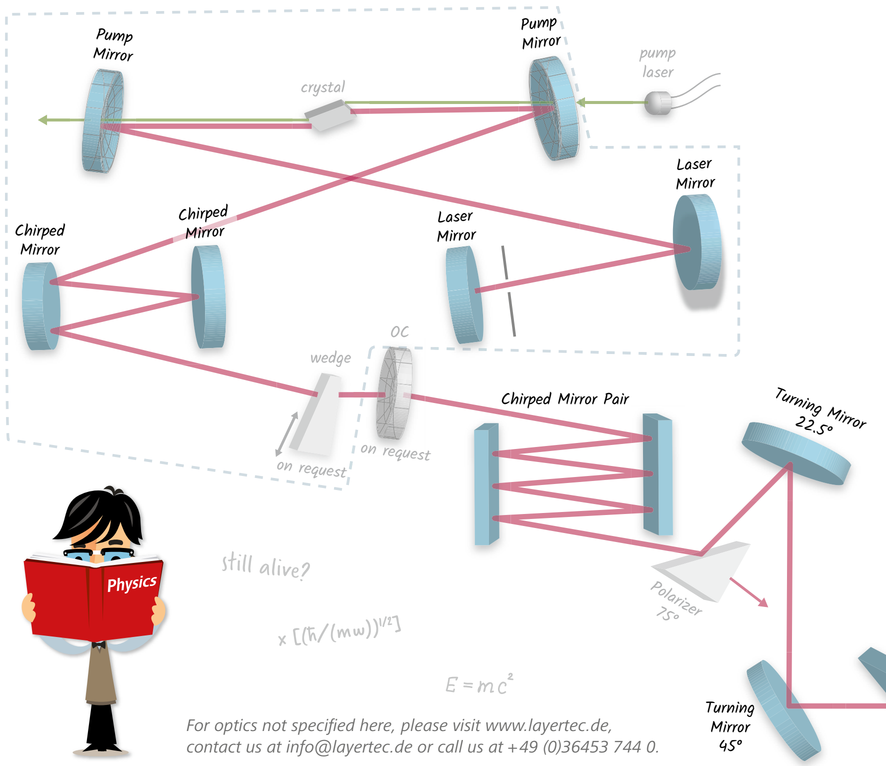
Window 0°, 308 nm

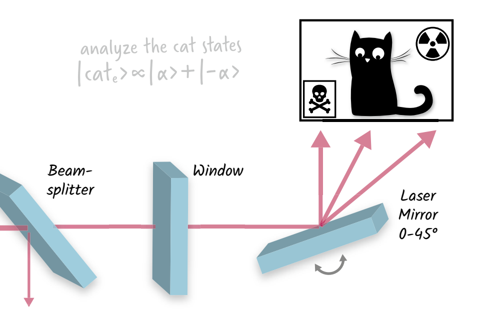
S2+S1: Coating 120555 *on Fused Silica 248 nm excimer grade*
AR (0°, 308 nm) < 0.25 %



Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 3.05 mm	B3 c	5/ 1 x 0.04	160699	220 €

fs-Laser [TiSa, up to 150 nm bandwidth]





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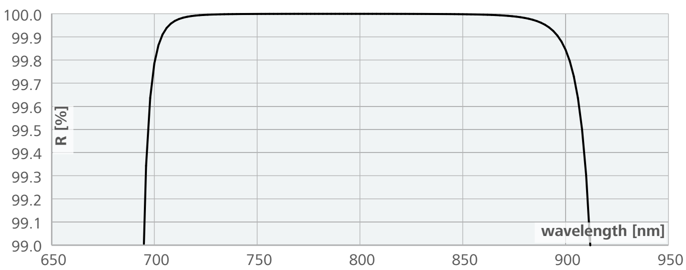
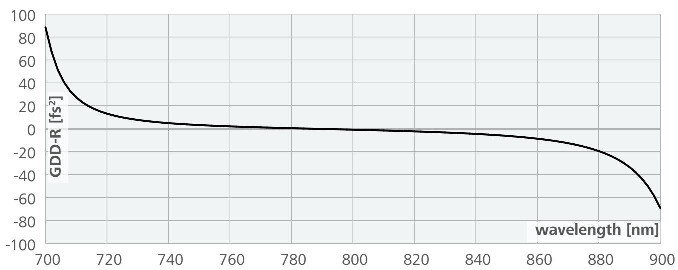
Laser Mirror 0°

Coating 139691
$HR_{s,p}$(0 – 10°, 725 – 875 nm) > 99.9 %
|GDD-$R_{s,p}$(0 – 10°, 725 – 875 nm)| < 50 fs²





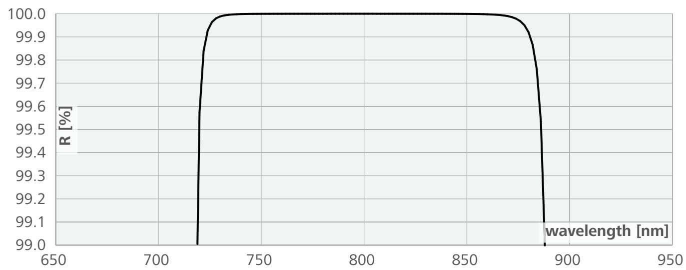
LIDT

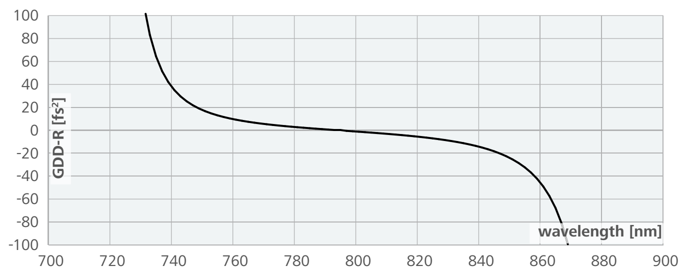
6/ 0.4 J/cm²; 800 nm; 40 fs; 1 kHz; Ø 80 µm	WRCP Budapest
6/ 2 J/cm²; 800 nm; 70 fs; 10 Hz; Ø 700 µm	HZDR Dresden

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 1 x 0.04	140189	85 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 3 x 0.04	140136	115 €
Ø 50.0 mm | t 9.5 mm	C3	5/ 4 x 0.063	140188	390 €

Laser Mirror 0°, high power

Coating 140876
$HR_{s,p}$(0 – 10°, 750 – 850 nm) > 99.5%
|GDD-$R_{s,p}$(0 – 10°, 750 – 850 nm)| < 60 fs²





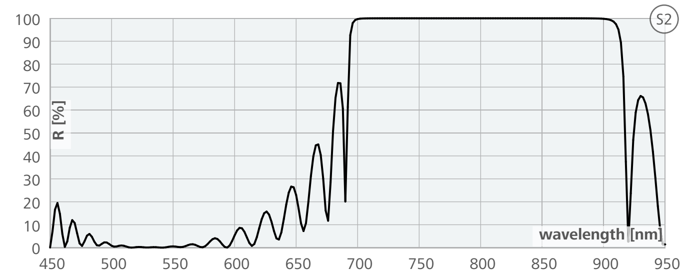
LIDT

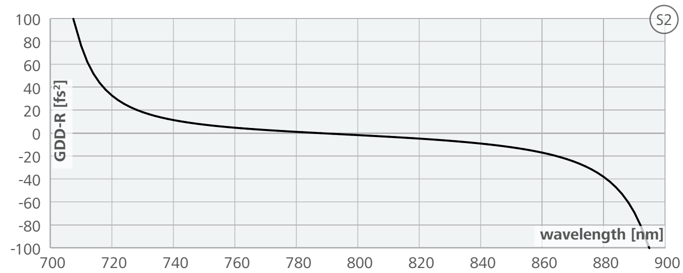
6/ 1 J/cm²; 800 nm; 40 fs; 1 kHz; Ø 80 µm	WRCP Budapest
6/ 2 J/cm²; 800 nm; 30 fs; 10 Hz; Ø 700 µm	HZDR Dresden

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 2 x 0.025	141855	70 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 1 x 0.063	141856	95 €
Ø 50.0 mm | t 9.5 mm	C3	5/ 3 x 0.063	141857	330 €
25 x 25 mm | t 6.35 mm	K2	5/ 1 x 0.063	141861	120 €

Pump Mirror 5°

S2: Coating 140872
$HR_{s,p}$ (0 – 10°, 725 – 875 nm) > 99.9 %
$R_{s,p}$ (0 – 10°, 500 – 545 nm) < 2 %
|GDD-$R_{s,p}$ (0 – 10°, 725 – 875 nm)| < 40 fs²
S1: Coating 140875
$AR_{s,p}$ (0 – 10°, 500 – 545 nm) < 0.2 %



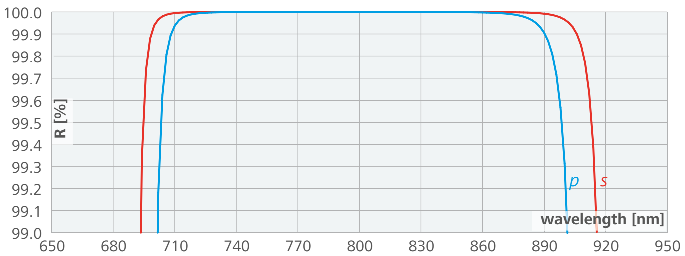


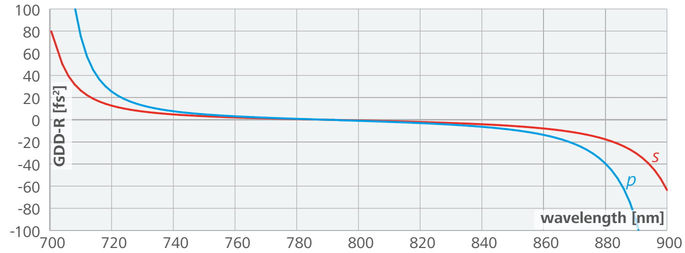
LIDT
6/ 0.4 J/cm²; 800 nm; 40 fs; 1 kHz; Ø 80 µm WRCP Budapest

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 | t 6.35 | CC 38	R2	5/ 1 x 0.04	142340	162 €
Ø 12.7 | t 6.35 | CC 50	R3	5/ 1 x 0.04	142341	146 €
Ø 12.7 | t 6.35 | CC 75	R4	5/ 1 x 0.04	142342	146 €
Ø 12.7 | t 6.35 | CC 100	R5	5/ 1 x 0.04	142343	135 €
Ø 12.7 | t 6.35 | CC 125	R6	5/ 1 x 0.04	142345	135 €

Turning Mirror 22.5°

Coating 139710
$HR_{s,p}$ (22.5°, 725 – 875 nm) > 99.9 %
|GDD-$R_{s,p}$ (22.5°, 725 – 875 nm)| < 75 fs²



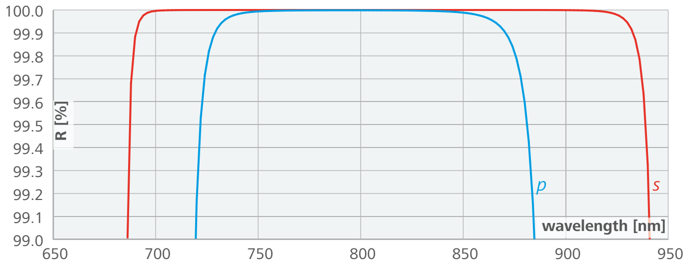


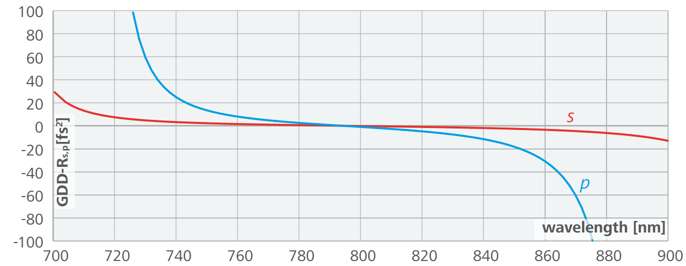
LIDT
6/ 2 J/cm2; 800 nm; 70 fs; 10 Hz; Ø 700 µm HZDR Dresden
6/ 0.4 J/cm2; 800 nm; 40 fs; 1 kHz; Ø 80 µm WRCP Budapest

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 1 x 0.04	140190	90 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 3 x 0.04	140191	125 €
Ø 50.0 mm | t 9.5 mm	C3	5/ 4 x 0.063	140192	415 €

Turning Mirror 45°

Coating 139693
$HR_{s,p}$ (45°, 740 – 860 nm) > 99.9 %
|GDD-$R_{s,p}$ (45°, 740 – 860 nm)| < 75 fs²



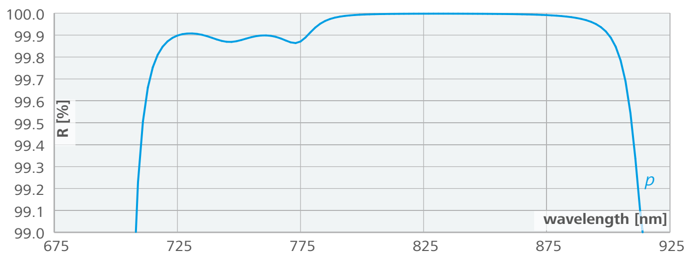


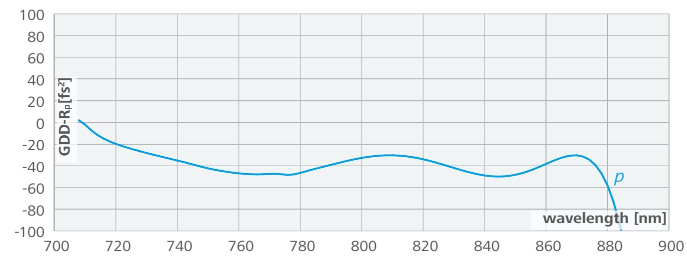
LIDT
6/ 0.4 J/cm²; 800 nm; 40 fs; 1 kHz; Ø 80 µm WRCP Budapest

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 1 x 0.04	140193	85 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 3 x 0.04	140194	115 €
Ø 50.0 mm | t 9.5 mm	C3	5/ 4 x 0.063	140195	390 €
Ø 76.2 mm | t 12.5 mm	D1	5/ 7 x 0.063	146559	820 €
25 x 25 mm | t 6.35 mm	K2	5/ 3 x 0.04	141876	145 €

Turning Mirror 45°, p-pol.

Coating 139711
HR_p (45°, 725 – 875 nm) > 99.8 %
GDD-R_p (45°, 725 – 875 nm) = -40 (±30) fs²



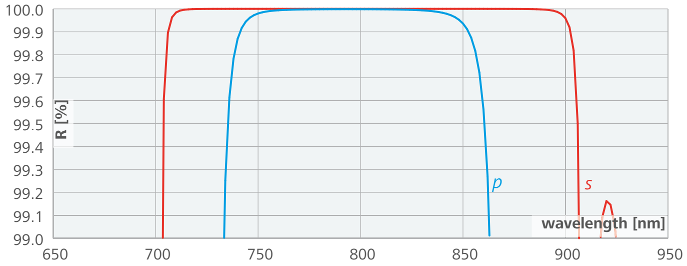


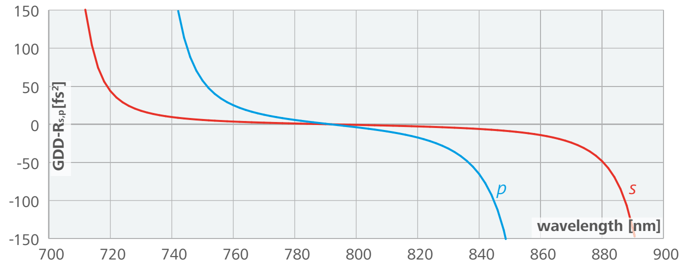
LIDT
6/ 0.4 J/cm2; 800 nm; 40 fs; 1 kHz; Ø 15 µm WRCP Budapest
6/ 0.1 J/cm2; 800 nm; 128 fs; 4.3 MHz; Ø 15 µm WRCP Budapest

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 1 x 0.04	140208	115 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 3 x 0.04	140209	205 €
Ø 50.0 mm | t 9.5 mm	C3	5/ 4 x 0.063	146565	610 €
Ø 76.2 mm | t 12.5 mm	D1	5/ 7 x 0.063	146566	1240 €

Turning Mirror 45°, high power

Coating 140881
HR_s (45°, 730–870 nm) > 99.8 %
HR_p (45°, 760–840 nm) > 99.5 %
|GDD-$R_{s,p}$ (45°, 760–840 nm)| < 80 fs²





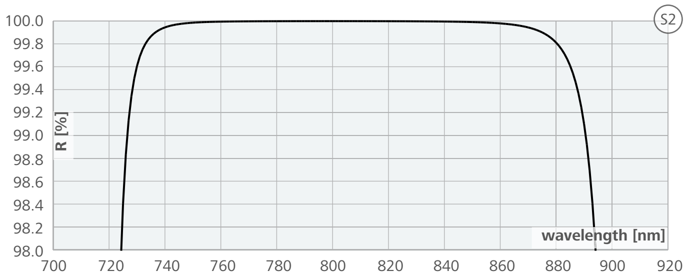
LIDT

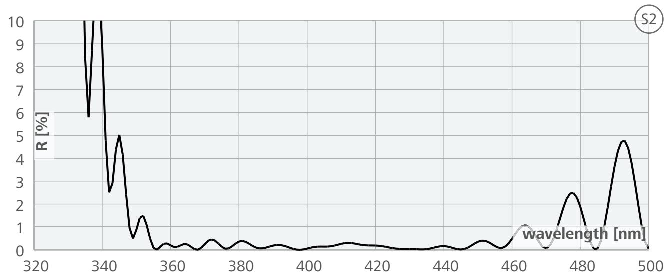
6/ 1 J/cm²; 800 nm; 40 fs; 1 kHz; Ø 80 µm	WRCP Budapest
6/ 1.3 J/cm²; 800 nm; 128 fs; 1 kHz; Ø 15 µm	WRCP Budapest
6/ 3 J/cm²; 800 nm; 30 fs; 10 Hz; Ø 830 µm	HZDR Dresden

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 2 x 0.025	140963	70 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 1 x 0.063	141238	95 €
Ø 50.0 mm | t 9.5 mm	C3	5/ 3 x 0.063	141239	330 €
Ø 76.2 mm | t 12.5 mm	D1	5/ 3 x 0.1	146567	720 €
25 x 25 mm | t 6.35 mm	K2	5/ 1 x 0.063	141870	120 €

Separator 0°, 750–850 / 360–450 nm

S2: Coating 160927
HR (0°, 750–850 nm) > 99.9 %
R (0°, 360–440 nm) < 5 %
|GDD-R (0°, 750–850 nm)| < 40 fs²
S1: Coating 160929
AR (0°, 360–440 nm) < 0.5 %

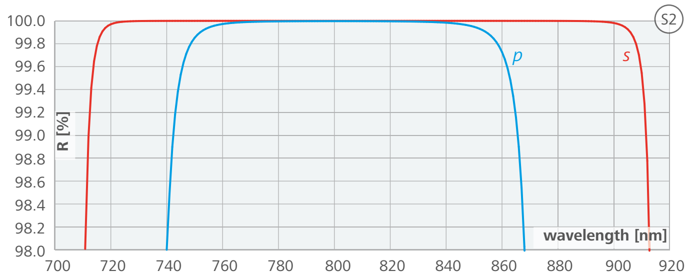


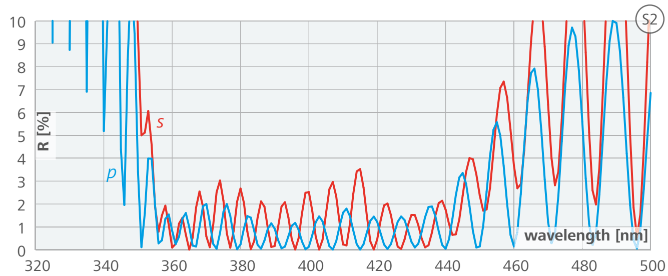


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 3.05 mm	B3	5/ 2 x 0.04	160934	285 €

Separator 45°, 760–850 / 350–450 nm

S2: Coating 113728
HR_u (45°, (760–850 nm) ±5 nm) > 99.9 %
R_u (45°, (360–440 nm) ±5 nm) < 2 %
|GDD-R_u (45°, 760–850 nm)| < 40 fs²
|GDD-T_u (45°, 360–440 nm)| < 40 fs²
S1: Coating 124879
AR_u (45°, 350–450 nm) < 0.7 %

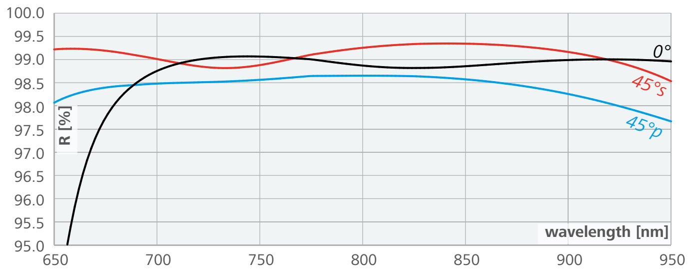


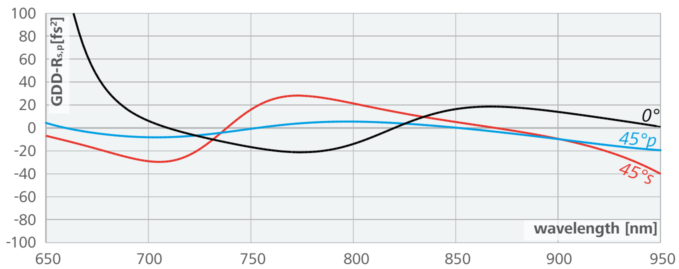


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 3.05 mm	B3	5/ 2 x 0.04	104991	295 €

Laser Mirror 0–45°

Coating 139943
Ag + Multilayer
$HR_{s,p}$ (0–45°, 725–875 nm) > 98 %
|GDD-$R_{s,p}$ (45°, 725–875 nm)| < 40 fs²





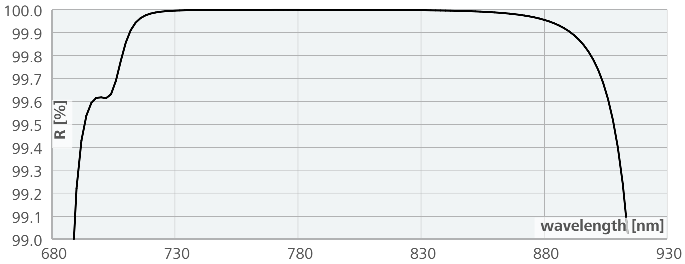
LIDT

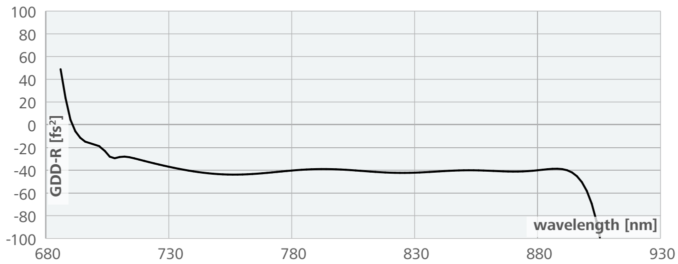
6/ 0.9 J/cm²; 800 nm; 40 fs; 1 kHz; Ø 80 µm; AOI 0° WRCP Budapest

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 1 x 0.04	140211	83 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 3 x 0.04	140213	110 €
Ø 50.0 mm | t 9.5 mm	C3	5/ 4 x 0.063	140214	370 €
25 x 25 mm | t 6.35 mm	K2	5/ 3 x 0.04	141878	140 €

Chirped Mirror 5°

Coating 140884
HR$_{s,p}$ (0–10°, 725–875 nm) > 99.9 %
GDD-R$_{s,p}$ (0–10°, 725–875 nm) = -40 (±10) fs^2





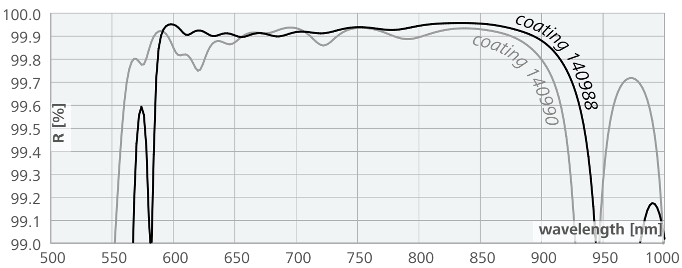
LIDT

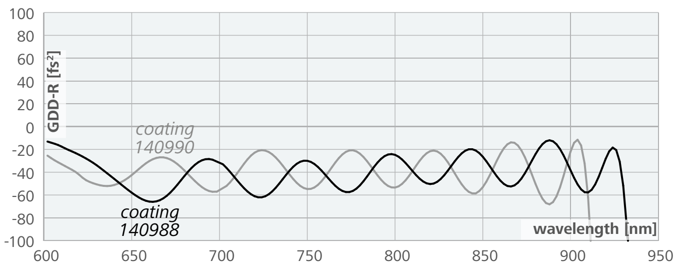
6/ 0.2 J/cm^2; 800 nm; 40 fs; 1 kHz Ø 80 µm	WRCP Budapest
6/ 0.25 J/cm^2; 800 nm; 128 fs; 1 kHz; Ø 15 µm	WRCP Budapest

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 1 x 0.04	141243	305 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 4 x 0.04	141245	475 €

Chirped Mirror Pair 5°, -40 fs^2

Coating 140988 + 140990
HR$_{s,p}$ (0–10°, 725–875 nm) > 99.8 %
GDD-R$_{s,p}$ (0–10°, 725–875 nm) = -40 (±20) fs^2
to compensate 1 mm Fused Silica per bounce (average)





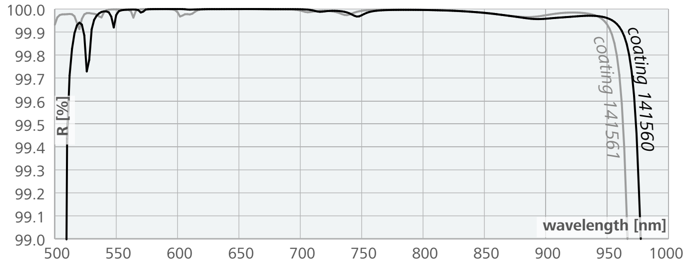
LIDT

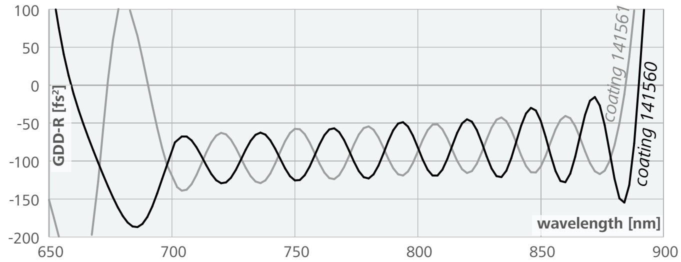
6/ 0.2 J/cm^2; 800 nm; 40 fs; 1 kHz; Ø 15 µm	WRCP Budapest
6/ 0.25 J/cm^2; 800 nm; 128 fs; 1 kHz; Ø 15 µm	WRCP Budapest

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 1 x 0.04	141882	670 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 4 x 0.04	141884	980 €
40 x 10 mm^2 | t 12.5 mm	N1	5/ 3 x 0.04	141886	1 390 €

Chirped Mirror Pair 5°, -80 fs^2

Coating 141560 + 141561
HR$_{s,p}$ (0–10°, 725–875 nm) > 99.9 %
GDD-R$_{s,p}$ (0–10°, 725–875 nm) = -80 (±40) fs^2
to compensate 2.35 mm Fused Silica per bounce (average)





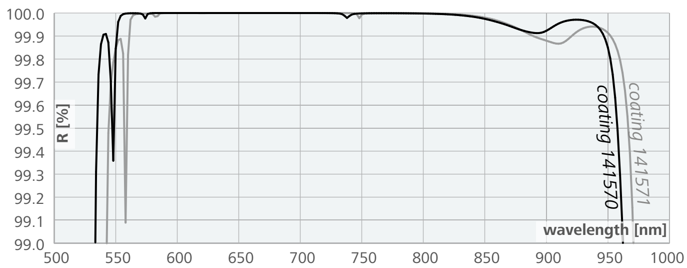
LIDT

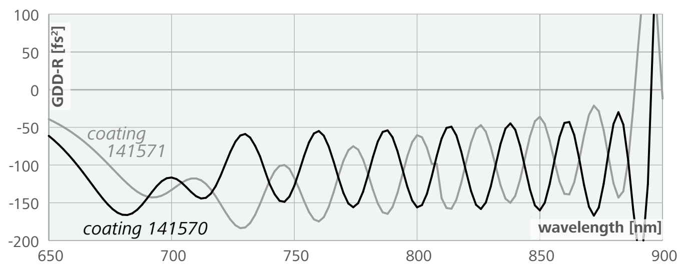
6/ 0.1 J/cm^2; 800 nm; 40 fs; 1 kHz; Ø 15 µm	WRCP Budapest
6/ 0.25 J/cm^2; 800 nm; 128 fs; 1 kHz; Ø 15 µm	WRCP Budapest

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 1 x 0.04	141887	695 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 4 x 0.04	141888	1 010 €
40 x 10 mm^2 | t 12.5 mm	N1	5/ 3 x 0.04	141891	1 440 €

Chirped Mirror Pair 5°, -110 fs^2

Coating 141570 + 141571
HR$_{s,p}$ (0–10°, 725–875 nm) > 99.8 %
GDD-R$_{s,p}$ (0–10°, 725–875 nm) = -110 (±50) fs^2
to compensate 3 mm Fused Silica per bounce (average)





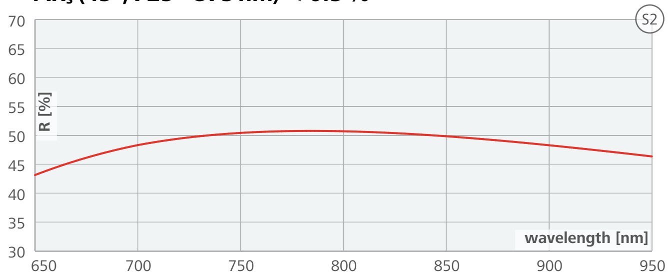
LIDT

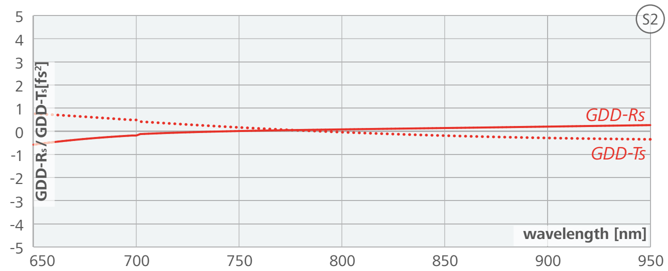
6/ 0.1 J/cm^2; 800 nm; 40 fs; 1 kHz; Ø 15 µm	WRCP Budapest
6/ 0.25 J/cm^2; 800 nm; 128 fs; 1 kHz; Ø 15 µm	WRCP Budapest

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 1 x 0.04	141920	720 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 4 x 0.04	141919	1 040 €
40 x 10 mm^2 | t 12.5 mm	N1	5/ 3 x 0.04	141918	1 490 €

Beamsplitter 45°, s-pol.

S2: Coating 141113
PR_s (45°, 725 – 875 nm) = 50 (±2) %
|GDD-R_s (725 – 875 nm)| < 5 fs²
S1: Coating 141114
AR_s (45°, 725 – 875 nm) < 0.5 %

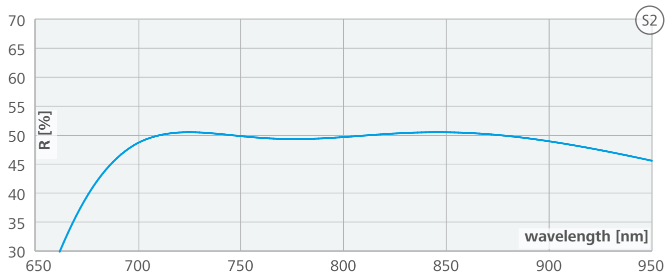


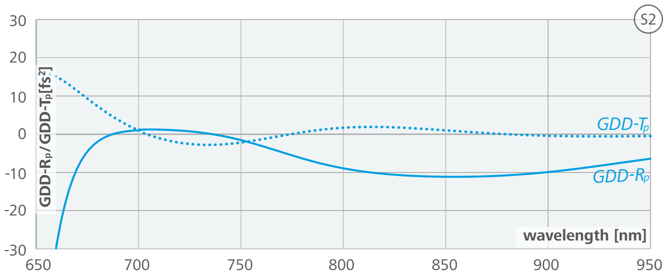


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 0.5 mm	B1	5/ 4 x 0.04	141512	290 €
Ø 25.0 mm | t 1.0 mm	B2	5/ 3 x 0.04	141511	270 €
Ø 25.0 mm | t 3.05 mm	B3	5/ 3 x 0.04	141502	220 €

Beamsplitter 45°, p-pol.

S2: Coating 141122
PR_p (45°, 725 – 875 nm) = 50 (±2) %
|GDD-R_p (45°, 725 – 875 nm)| < 20 fs²
S1: Coating 141121
AR_p (45°, 725 – 875 nm) < 0.2 %

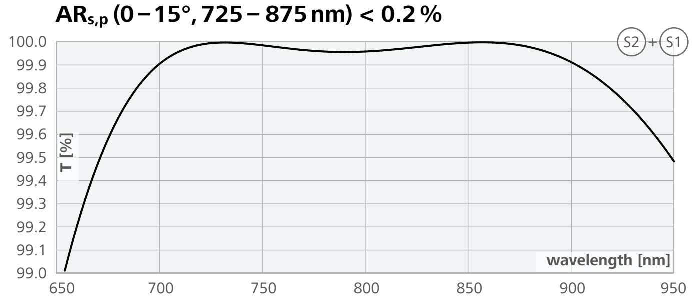




Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 0.5 mm	B1	5/ 4 x 0.04	141513	290 €
Ø 25.0 mm | t 1.0 mm	B2	5/ 3 x 0.04	141509	270 €
Ø 25.0 mm | t 3.05 mm	B3	5/ 3 x 0.04	141506	220 €

Window 0°

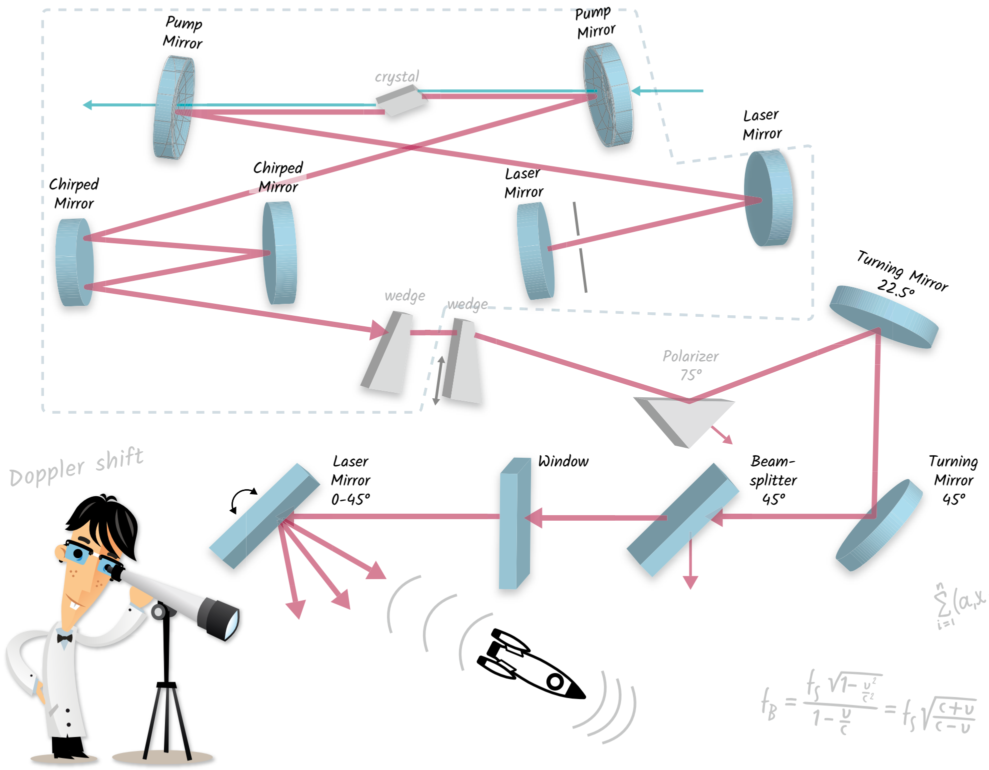
S2+S1: Coating 140890
$AR_{s,p}$ (0 – 15°, 725 – 875 nm) < 0.2 %

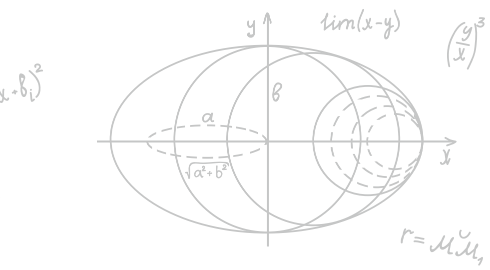


LIDT
6/ 0.4 J/cm²; 800 nm; 40 fs; 1 kHz; Ø 15 µm — WRCP Budapest
6/ 0.5 J/cm²; 800 nm; 128 fs; 1 kHz; Ø 15 µm — WRCP Budapest

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 1.0 mm	B2	5/ 3 x 0.04	141514	180 €
Ø 25.0 mm | t 3.05 mm	B3	5/ 3 x 0.04	141519	130 €

fs-Laser [TiSa, 300 nm bandwidth]

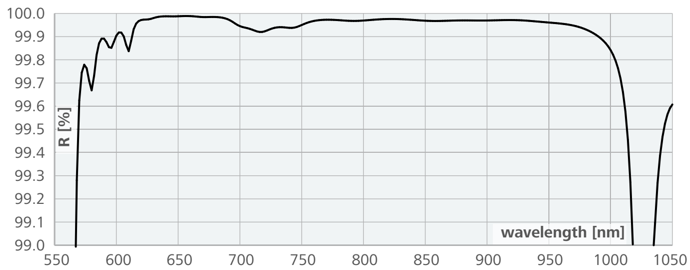


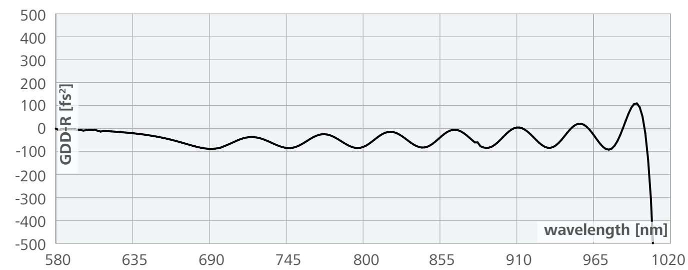


For optics not specified here, please visit www.layertec.de, contact us at info@layertec.de or call us at +49 (0)36453 744 0.

Laser Mirror 0°

Coating 141318
$HR_{s,p}$ (0 – 10°, 670 – 970 nm) > 99.9 %
GDD-$R_{s,p}$ (0 – 10°, 670 – 970 nm) = -50 (±75) fs²
to compensate 1.4 mm Fused Silica per bounce (average)



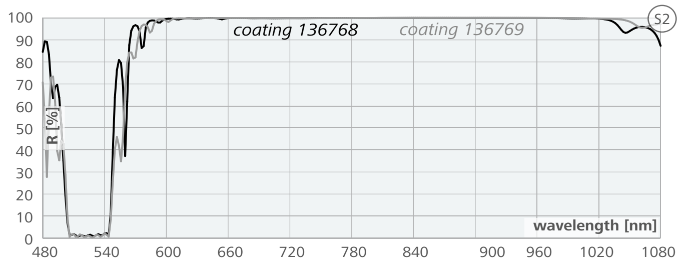


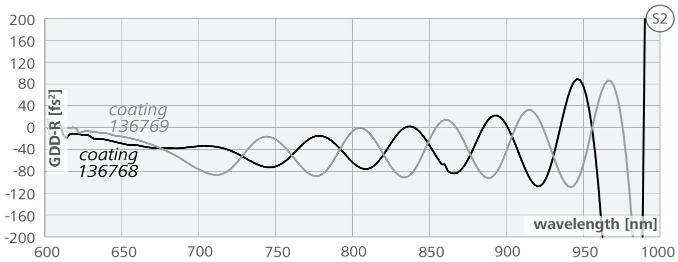
LIDT
6/ 0.1 J/cm²; 800 nm; 40 fs; 1 kHz; Ø 15 µm — WRCP Budapest
6/ 0.25 J/cm²; 800 nm; 128 fs; 1 kHz; Ø 15 µm — WRCP Budapest

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 1 x 0.04	142010	290 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 4 x 0.04	142012	460 €

Pump Mirror Pair 0°

S2: Coating 136768 + 136769
$HR_{s,p}$ (0 – 10°, 670 – 970 nm) > 99.8%
$R_{s,p}$ (0 – 10°, 510 – 535 nm) < 10 %
GDD-$R_{s,p}$ (0 – 10°, 680 – 960 nm) = -50 (±150) fs²
to compensate 1.2 mm Fused Silica per bounce (average)
S1: Coating 140875
$AR_{s,p}$ (0 – 10°, 500 – 545 nm) < 0.2 %



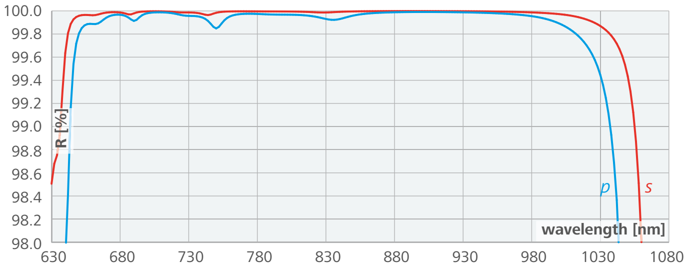


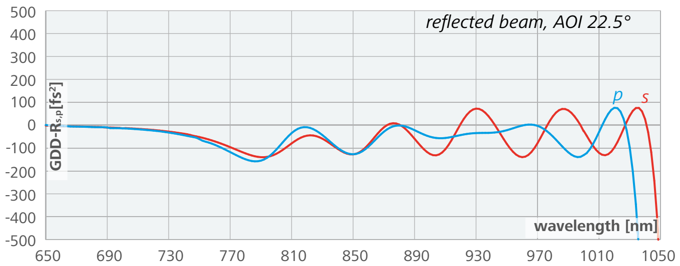
LIDT
6/ 0.1 J/cm²; 800 nm; 40 fs; 1 kHz; Ø 15 µm — WRCP Budapest
6/ 0.25 J/cm²; 800 nm; 128 fs; 1 kHz; Ø 15 µm — WRCP Budapest

Substrate Dimensions [mm]	No.	Imperfections	Item #	Price
Ø 12.7 | t 6.35 | CC 38	R2	5/ 1 x 0.04	142351	774 €
Ø 12.7 | t 6.35 | CC 50	R3	5/ 1 x 0.04	142350	742 €
Ø 12.7 | t 6.35 | CC 75	R4	5/ 1 x 0.04	142349	742 €
Ø 12.7 | t 6.35 | CC 100	R5	5/ 1 x 0.04	142348	720 €
Ø 12.7 | t 6.35 | CC 125	R6	5/ 1 x 0.04	142347	720 €

Turning Mirror 22.5°

Coating 141503
$HR_{s,p}$ (22.5°, 670–970 nm) > 99.8 %
$GDD\text{-}R_{s,p}$ (22.5°, 670–970 nm) = -200 … + 200 fs²



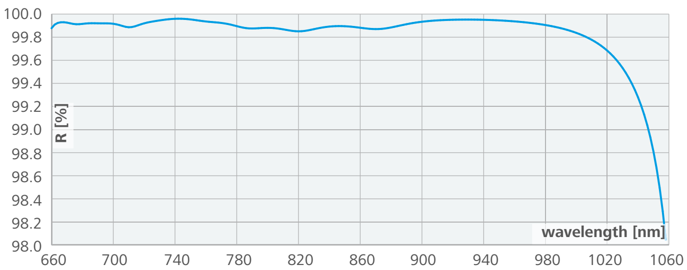


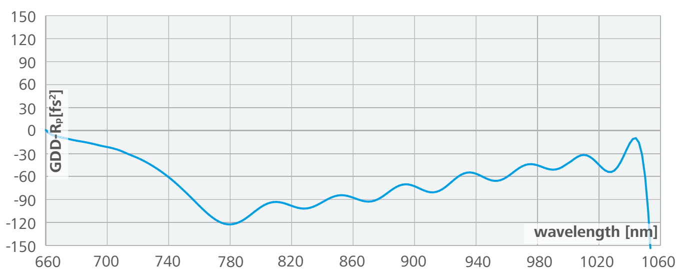
LIDT
6/ 0.1 J/cm²; 800 nm; 40 fs; 1 kHz; Ø 15 µm WRCP Budapest
6/ 0.25 J/cm²; 800 nm; 128 fs; 1 kHz; Ø 15 µm WRCP Budapest

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5 / 1 x 0.04	141584	125 €
Ø 25.0 mm | t 6.35 mm	B4	5 / 3 x 0.04	141567	230 €
Ø 50.0 mm | t 9.5 mm	C3	5 / 4 x 0.063	141925	660 €

Turning Mirror 45°, p-pol.

Coating 141520
HR_p (45°, 670–970 nm) > 99.8 %
$GDD\text{-}R_p$ (45°, 670–970 nm) = -200 … 0 fs²



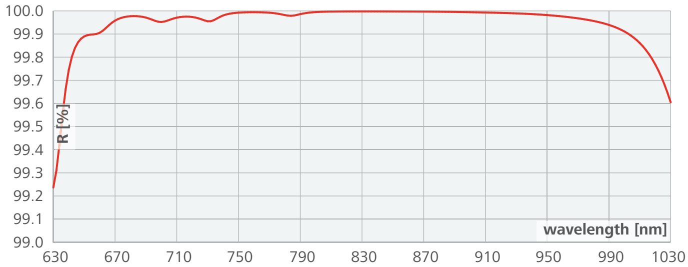


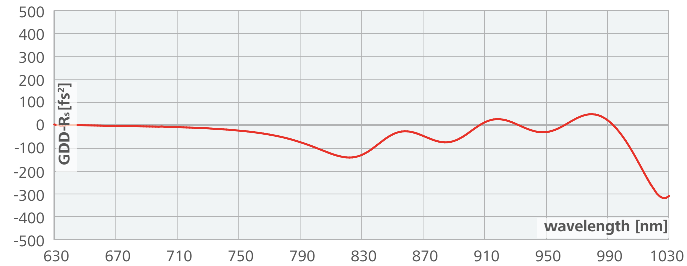
LIDT
6/ 0.1 J/cm²; 800 nm; 40 fs; 1 kHz; Ø 15 µm WRCP Budapest
6/ 0.25 J/cm²; 800 nm; 128 fs; 1 kHz; Ø 15 µm WRCP Budapest

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5 / 1 x 0.04	141585	125 €
Ø 25.0 mm | t 6.35 mm	B4	5 / 3 x 0.04	141568	230 €
Ø 50.0 mm | t 9.5 mm	C3	5 / 4 x 0.063	141926	660 €
Ø 76.2 mm | t 12.5 mm	D1	5 / 7 x 0.063	146569	1350 €

Turning Mirror 45°, s-pol.

Coating 141507
HR_s (45°, 670–970 nm) > 99.9 %
$GDD\text{-}R_s$ (45°, 670–970 nm) = -200 … + 200 fs²



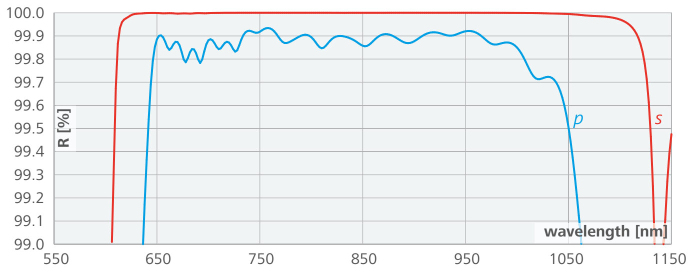


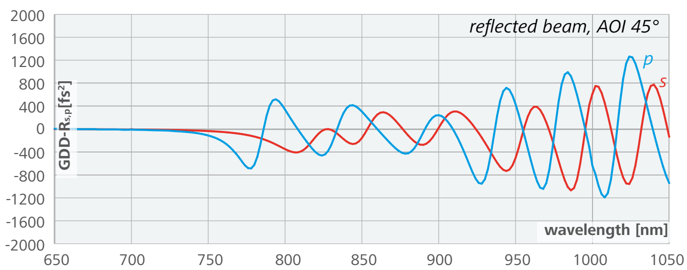
LIDT
6/ 0.1 J/cm²; 800 nm; 40 fs; 1 kHz; Ø 15 µm WRCP Budapest
6/ 0.25 J/cm²; 800 nm; 128 fs; 1 kHz; Ø 15 µm WRCP Budapest

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5 / 1 x 0.04	141586	120 €
Ø 25.0 mm | t 6.35 mm	B4	5 / 3 x 0.04	141578	220 €
Ø 50.0 mm | t 9.5 mm	C3	5 / 4 x 0.063	141928	640 €
Ø 76.2 mm | t 12.5 mm	D1	5 / 7 x 0.063	146570	1320 €

Turning Mirror 45°

Coating 141522
$HR_{s,p}$ (45°, 670–970 nm) > 99.7 %
$|GDD\text{-}R_{s,p}$ (45°, 670–970 nm)$|$ < 1 500 fs²



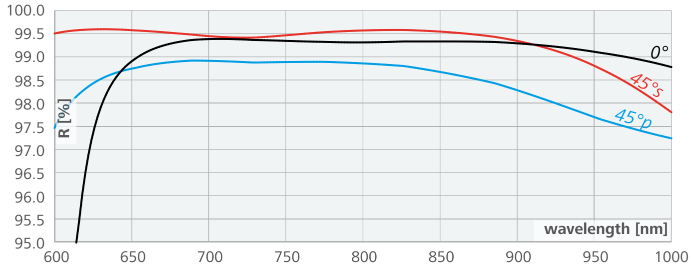


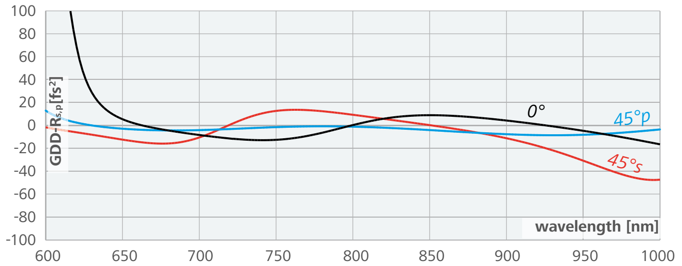
LIDT
6/ 0.1 J/cm²; 800 nm; 40 fs; 1 kHz; Ø 15 µm WRCP Budapest
6/ 0.25 J/cm²; 800 nm; 128 fs; 1 kHz; Ø 15 µm WRCP Budapest

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5 / 1 x 0.04	141587	125 €
Ø 25.0 mm | t 6.35 mm	B4	5 / 3 x 0.04	141579	230 €
Ø 50.0 mm | t 9.5 mm	C3	5 / 4 x 0.063	141930	660 €

Laser Mirror 0–45°

Coating 141523
Ag + Multilayer
$HR_{s,p}$ (0–45°, 670–970 nm) > 97 %
|GDD-$R_{s,p}$ (0–45°, 670–970 nm)| < 50 fs²
for application outside the resonator

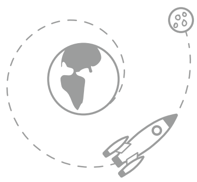




LIDT

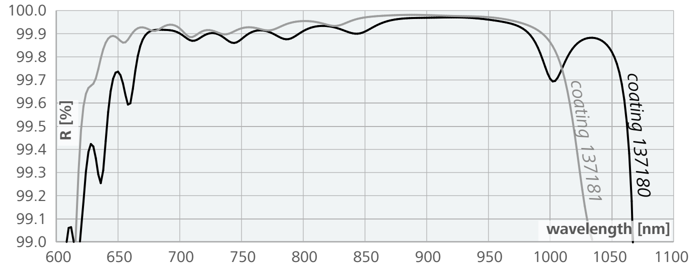
6/ 0.4 J/cm²; 800 nm; 40 fs; 1 kHz; Ø 15 µm	WRCP Budapest
6/ 1.5 J/cm²; 800 nm; 30 fs; 10 kHz; Ø 700 µm	HZDR Dresden

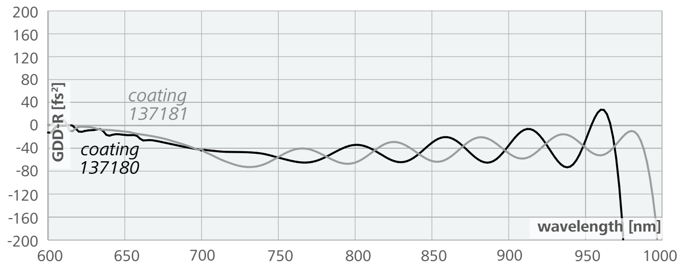
Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5 / 1 x 0.04	142001	86 €
Ø 25.0 mm | t 6.35 mm	B4	5 / 3 x 0.04	142002	115 €
Ø 50.0 mm | t 9.5 mm	C3	5 / 4 x 0.063	142003	385 €
25 × 25 mm | t 6.35 mm	K2	5 / 3 x 0.04	142005	147 €



Chirped Mirror Pair 5°

Coating 137180 + 137181
$HR_{s,p}$ (0–10°, 670–970 nm) > 99.8 %
GDD-$R_{s,p}$ (0–10°, 680–960 nm) = -50 (±150) fs²
to compensate 1.4 mm Fused Silica per bounce (average)





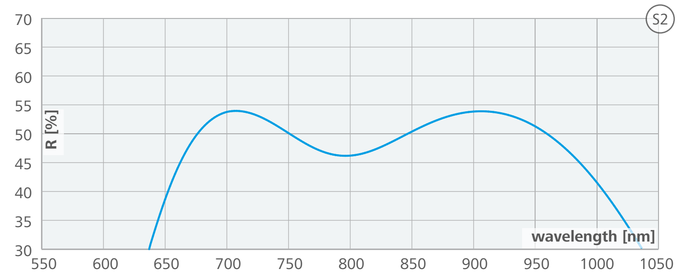
LIDT

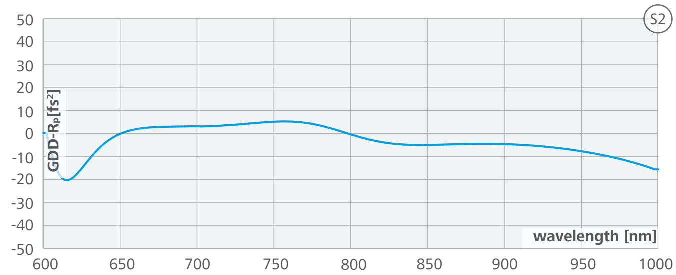
6/ 0.1 J/cm²; 800 nm; 40 fs; 1 kHz; Ø 15 µm	WRCP Budapest
6/ 0.25 J/cm²; 800 nm; 128 fs; 1 kHz; Ø 15 µm	WRCP Budapest

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 1 x 0.04	141931	695 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 4 x 0.04	141933	1 010 €
40 x 10 mm² | t 12.5 mm	N1	5/ 3 x 0.04	141934	1 440 €

Beamsplitter 45°, p-pol.

S2: Coating 141555
PR_p (45°, 670–970 nm) = 50 (±5) %
|GDD-R_p (45°, 670–970 nm)| < 10 fs²
S1: Coating 141556
AR_p (45°, 670–970 nm) < 0.2 %





Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 1 mm	B2	5 / 3 x 0.04	141975	290 €
Ø 25.0 mm | t 3.05 mm	B3	5 / 3 x 0.04	141978	240 €

Beamsplitter 45°, s-pol.

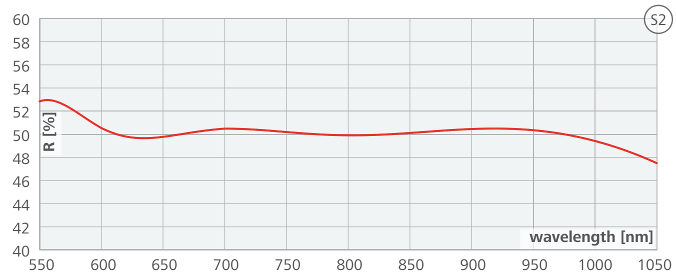
S2: Coating 141558

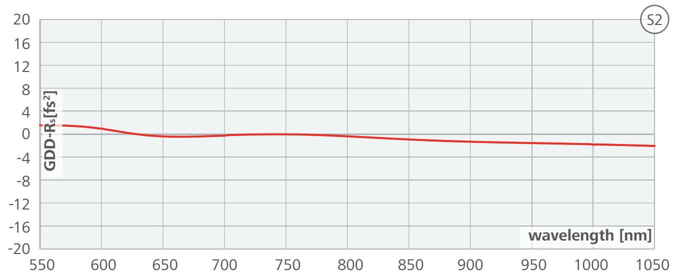
PR_s (45°, 670−970 nm) = 50 (±5) %

|GDD-R_s (45°, 670−970 nm)| < 5 fs^2

S1: Coating 141557

AR_s (45°, 670−970 nm) < 0.7 %





Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 1 mm	B2	5 / 3 x 0.04	141977	290 €
Ø 25.0 mm | t 3.05 mm	B3	5 / 3 x 0.04	141979	240 €

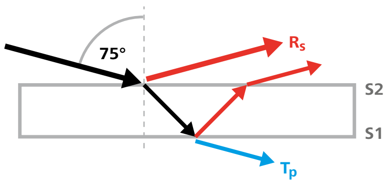
Polarizer 75°

S2+S1: Coating 141529

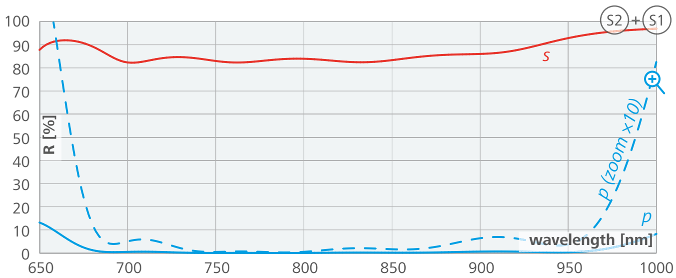
TFP (75°, 670−970 nm) R_s > 80 % R_p < 1 %

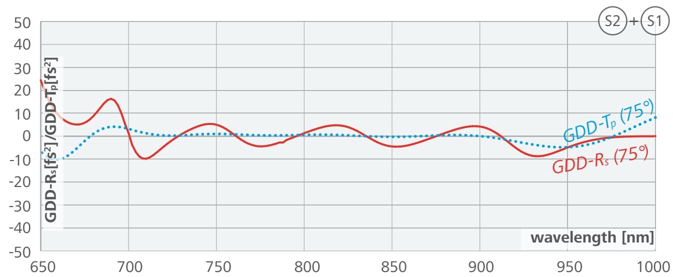
|GDD-R_s (75°, 670−970 nm)| < 20 fs^2

|GDD-T_p (75°, 680−960 nm)| < 5 fs^2



Polarizer
Special item for clean separation of p-pol. light.



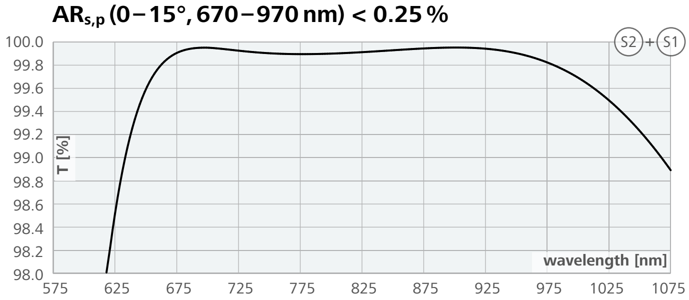


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 1 mm	B2	5 / 3 x 0.04	142013	365 €
Ø 25.0 mm | t 3.05 mm	B3	5 / 3 x 0.04	142014	315 €

Window 0°

S2+S1: Coating 141528

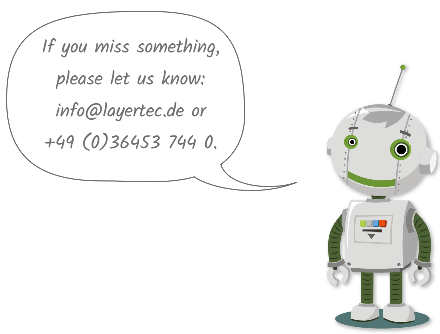
$AR_{s,p}$ (0−15°, 670−970 nm) < 0.25 %



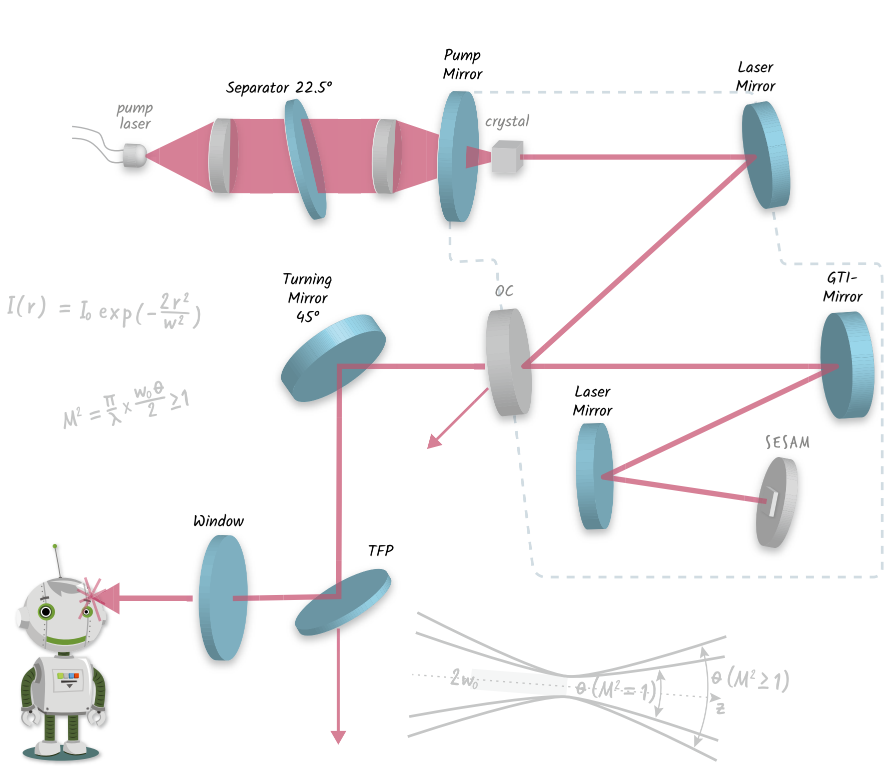
LIDT

6/ 0.4 J/cm²; 800 nm; 40 fs; 1 kHz; Ø 15 µm	WRCP Budapest
6/ 0.5 J/cm²; 800 nm; 128 fs; 1 kHz; Ø 15 µm	WRCP Budapest

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 1 mm	B2	5 / 3 x 0.04	141588	195 €
Ø 25.0 mm | t 3.05 mm	B3	5 / 3 x 0.04	141590	145 €

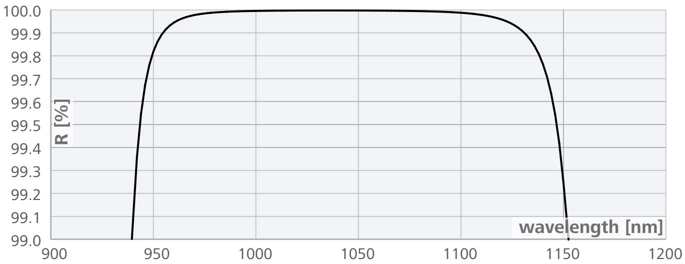


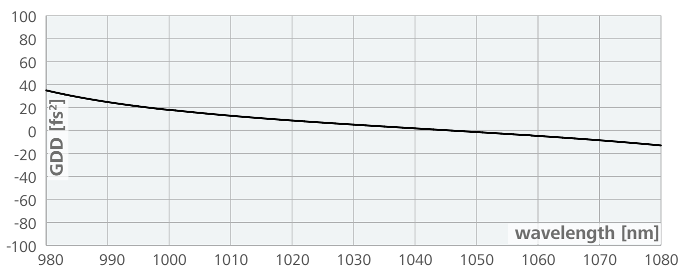
ps/fs-Laser [1030–1040 nm]



Laser Mirror 0°

Coating 139374
$HR_{s,p}$ (0 – 10°, 1 030 – 1 042 nm) > 99.99 %
|GDD-$R_{s,p}$ (0 – 10°, 1 030 – 1 042 nm)| < 20 fs²



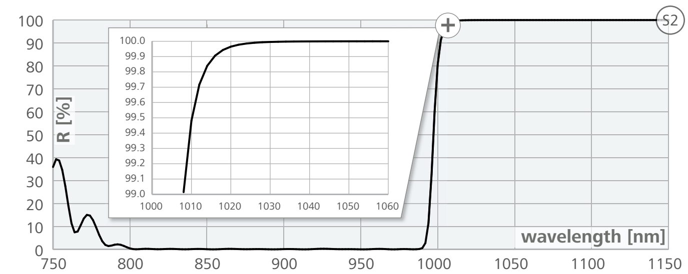


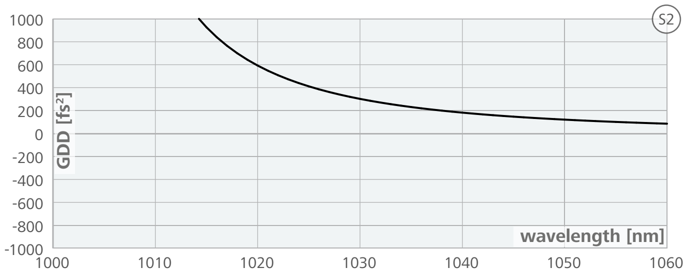
LIDT
6/ 3 J/cm²; 1030 nm; 10 ps; 1 kHz; Ø 50 µm — LIDARIS Vilnius

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5 / 1 x 0.04	141246	105 €
Ø 25.0 mm | t 6.35 mm	B4	5 / 3 x 0.04	141248	170 €
Ø 50.0 mm | t 9.5 mm	C3	5 / 4 x 0.063	141249	550 €
25 x 25 mm | t 6.35 mm	K2	5 / 3 x 0.04	139564	225 €

Pump Mirror 0°, 800 – 982 nm

S2: Coating 141171
HR (0°, 1 030 – 1 040 nm) > 99.9 %
R (0°, 800 – 982 nm) < 5 %
GDD-R (0°, 1 030 – 1 040 nm) = 300 (±300) fs²
cut on/off R (0°) = T (0°) = 50 % at 995 (±10) nm
AOI 0° → 10°: shift cut on/off-wavelength -5 nm
S1: Coating 141174
AR (0°, 800 – 1 000 nm) < 0.5 %

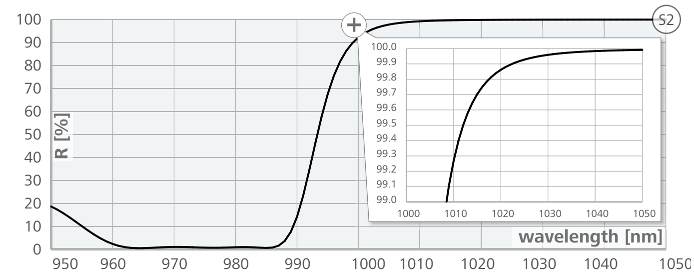


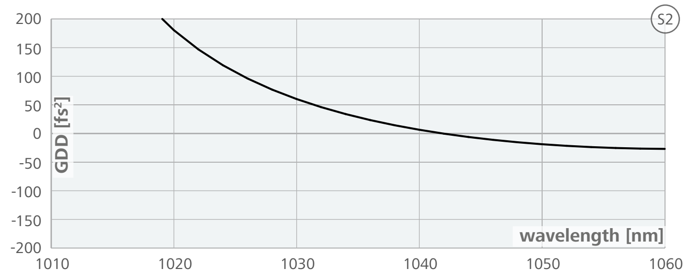


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5 / 1 x 0.04	141951	315 €
Ø 25.0 mm | t 6.35 mm	B4	5 / 4 x 0.04	141530	460 €

Pump Mirror 0°, 960–982 nm

S2: Coating 141181
HR (0°, 1 030–1 040 nm) > 99.9 %
R (0°, 960–982 nm) < 5 %
|GDD-R (0°, 1 030–1 040 nm)| < 100 fs²
cut on/off R (0°) = T (0°) = 50 % at 994 (±5) nm
AOI 0° → 10°: shift cut/off-wavelength -5 nm
S1: Coating 141184
AR (0°, 950–1 050 nm) < 0.2 %

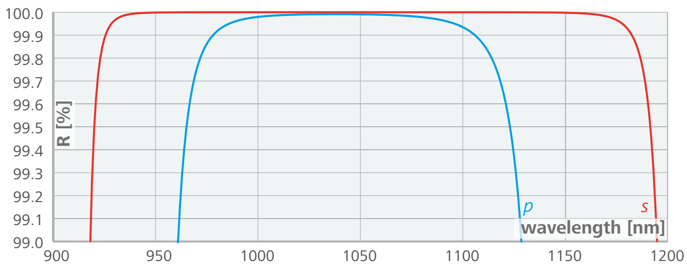


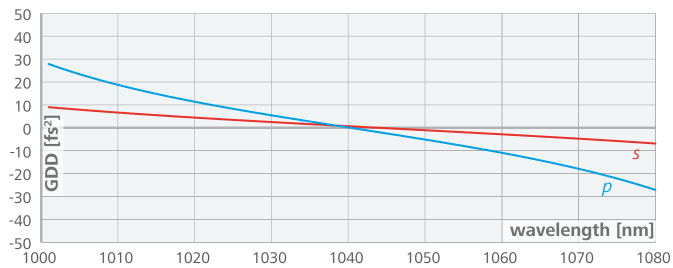


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 1 x 0.04	141952	345 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 4 x 0.04	141525	510 €

Turning Mirror 45°

Coating 141317
$HR_{s,p}$ (45°, 1 030–1 040 nm) > 99.9 %
|$GDD\text{-}R_{s,p}$ (45°, 1 030–1 040 nm)| < 20 fs²

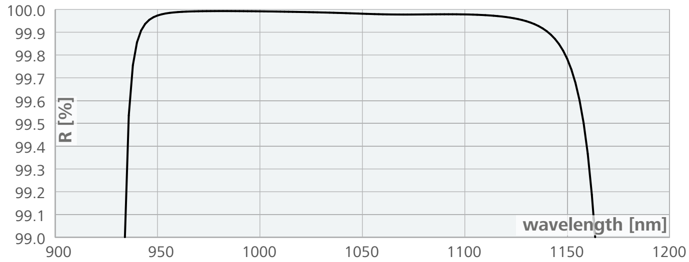


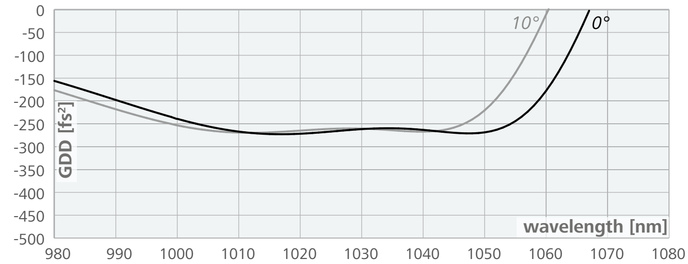


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 1 x 0.04	141569	85 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 3 x 0.04	141501	118 €
Ø 50.0 mm | t 9.5 mm	C3	5/ 4 x 0.063	141572	430 €
25 x 25 mm | t 6.35 mm	K2	5/ 3 x 0.04	141573	150 €

GTI-Mirror 5°, 1 030 nm, -250 fs²

Coating 141126
$HR_{s,p}$ (0–10°, 1 030 nm) > 99.95 %
$GDD\text{-}R_p$ (0–10°, 1 030 nm) = -250 (±50) fs²

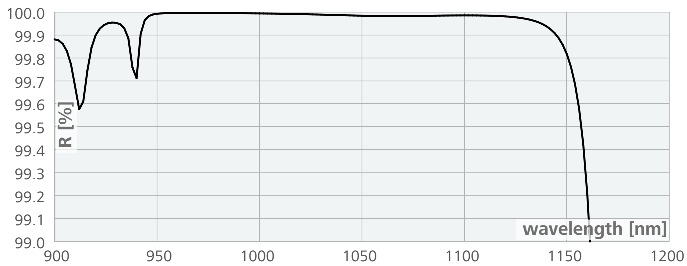


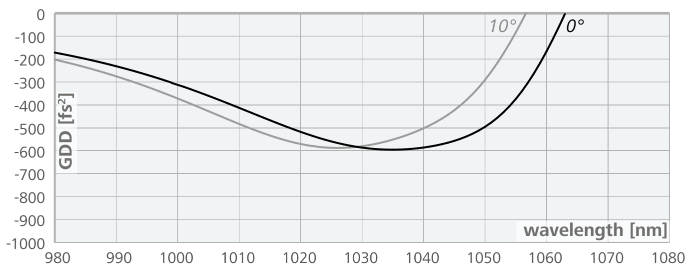


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 1 x 0.04	141250	310 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 4 x 0.04	141251	480 €

GTI-Mirror 5°, 1 030 nm, -550 fs²

Coating 141149
$HR_{s,p}$ (0–10°, 1 030 nm) > 99.95 %
$GDD\text{-}R_p$ (0–10°, 1 030 nm) = -550 (±100) fs²

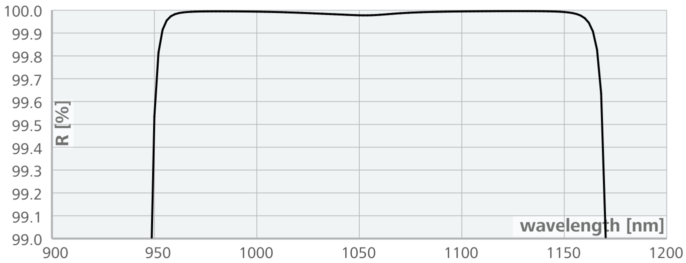


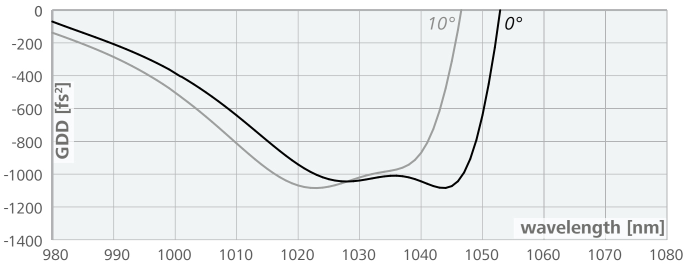


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 1 x 0.04	141255	325 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 4 x 0.04	141257	500 €

GTI-Mirror 5°, 1 030 nm, -1 000 fs^2

Coating 141151
$HR_{s,p}$ (0 – 10°, 1 030 nm) > 99.95 %
GDD-R_p (0 – 10°, 1 030 nm) = -1 000 (±200) fs^2

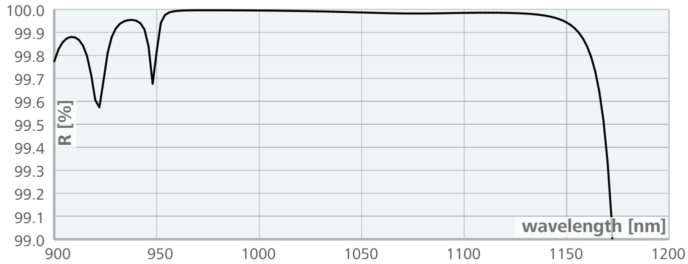


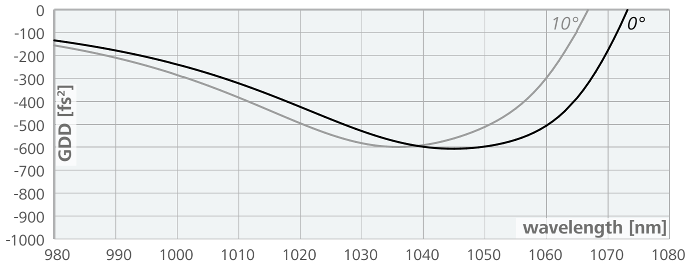


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 1 x 0.04	141260	340 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 4 x 0.04	141261	520 €

GTI-Mirror 5°, 1 040 nm, -550 fs^2

Coating 141150
$HR_{s,p}$ (0 – 10°, 1 040 nm) > 99.95 %
GDD-R_p (0 – 10°, 1 040 nm) = -550 (±100) fs^2

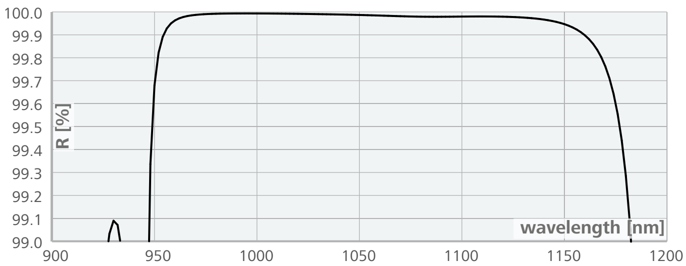


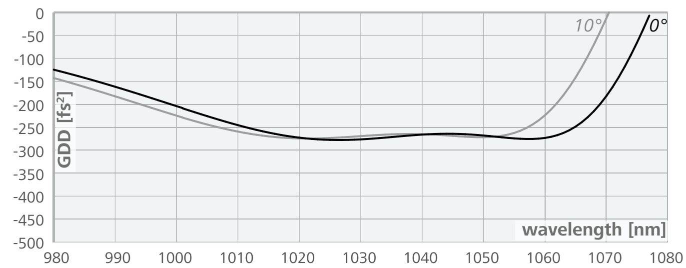


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 1 x 0.04	141269	325 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 4 x 0.04	141270	500 €

GTI-Mirror 5°, 1 040 nm, -250 fs^2

Coating 141148
$HR_{s,p}$ (0 – 10°, 1 040 nm) > 99.95 %
GDD-R_p (0 – 10°, 1 040 nm) = -250 (±50) fs^2

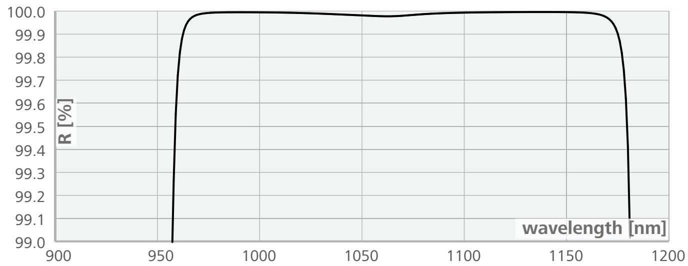


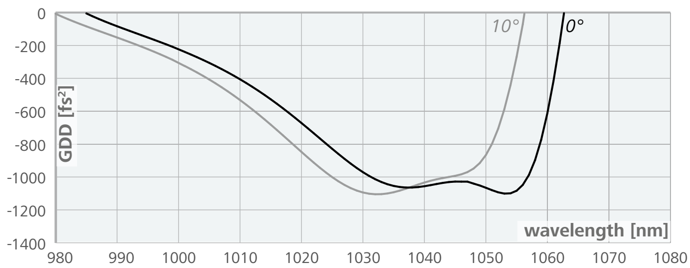


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 1 x 0.04	141263	310 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 4 x 0.04	141266	480 €

GTI-Mirror 5°, 1 040 nm, -1 000 fs^2

Coating 141152
$HR_{s,p}$ (0 – 10°, 1 040 nm) > 99.95 %
GDD-R_p (0 – 10°, 1 040 nm) = -1 000 (±200) fs^2

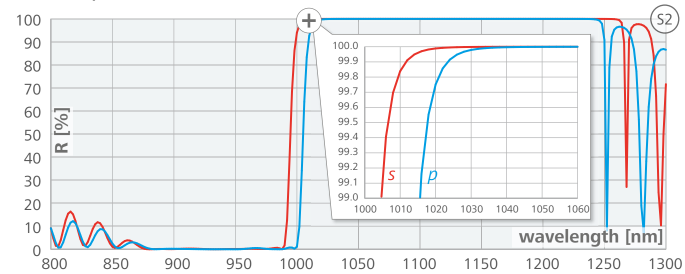


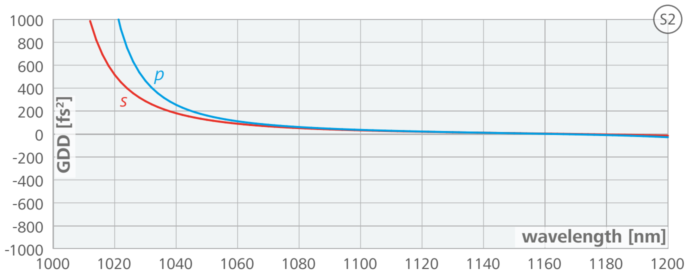


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 1 x 0.04	141273	340 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 4 x 0.04	141274	520 €

Separator 22.5°

S2: Coating 141303
$HR_{s,p}$ (22.5°, 1 030 – 1 050 nm) > 99.8 %
$R_{s,p}$ (22.5°, 900 – 980 nm) < 5 %
S1: Coating 141306
$AR_{s,p}$ (22.5°, 900 – 1 000 nm) < 0.2 %

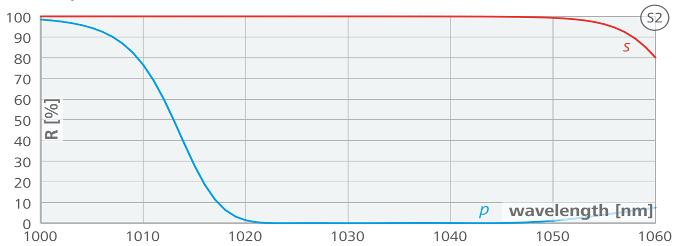




Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 3.05 mm	A3	5/ 1 x 0.04	142321	215 €
Ø 25.0 mm | t 3.05 mm	B3	5/ 3 x 0.04	142320	485 €

Thin Film Polarizer 45°, 1 030 nm

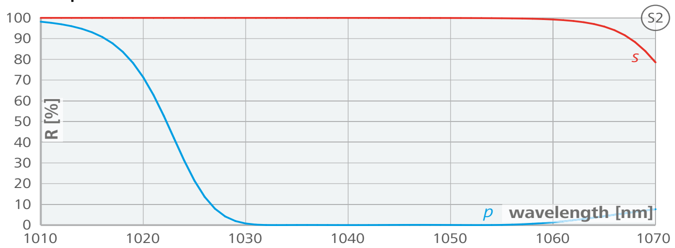
S2: Coating 141254
TFP (45° *, 1 030 nm) R_s > 99.9 % R_p < 2 %
**specifications will be achieved by ±2° angle adjustment*
S1: Coating 141268
AR_p (45°, 1 020 – 1 050 nm) < 0.1 %



Substrate Dimensions	No.	Imperfections	Item #	Price
Ø25.0 mm | t 3.05 mm	B3	5/ 3 x 0.04	141531	339 €

Thin Film Polarizer 45°, 1 042 nm

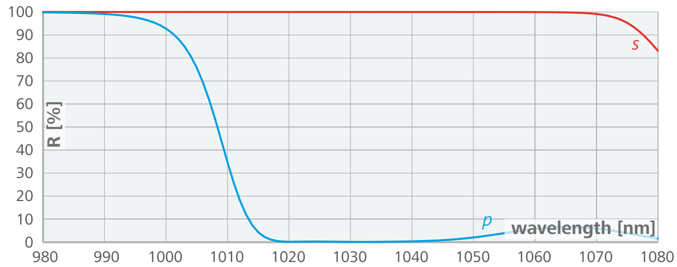
S2: Coating 141259
TFP (45° *, 1 042 nm) R_s > 99.9 % R_p < 2 %
**specifications will be achieved by ±2° angle adjustment*
S1: Coating 141268
AR_p (45°, 1 020 – 1 050 nm) < 0.1 %



Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 3.05 mm	B3	5/ 3 x 0.04	141532	339 €

Thin Film Polarizer 56°, 1 030 nm

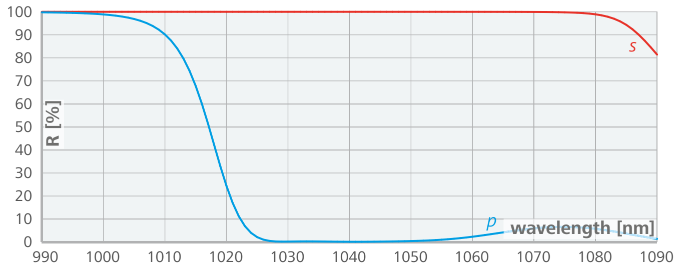
S2: Coating 141262
TFP (56° *, 1 030 nm) R_s > 99.9% R_p < 2 %
**specifications will be achieved by ±2° angle adjustment*
S1: Uncoated; Brewster angle → R_p (56°) ~ 0 %



Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 3.05 mm	B3	5/ 3 x 0.04	141533	287 €

Thin Film Polarizer 56°, 1 042 nm

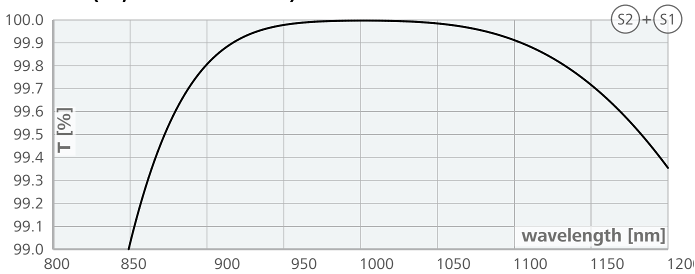
S2: Coating 141264
TFP (56° *, 1 042 nm) R_s > 99.9% R_p < 2 %
**specifications will be achieved by ±2° angle adjustment*
S1: Uncoated; Brewster angle → R_p (56°) ~ 0 %



Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 3.05 mm	B3	5/ 3 x 0.04	141534	287 €

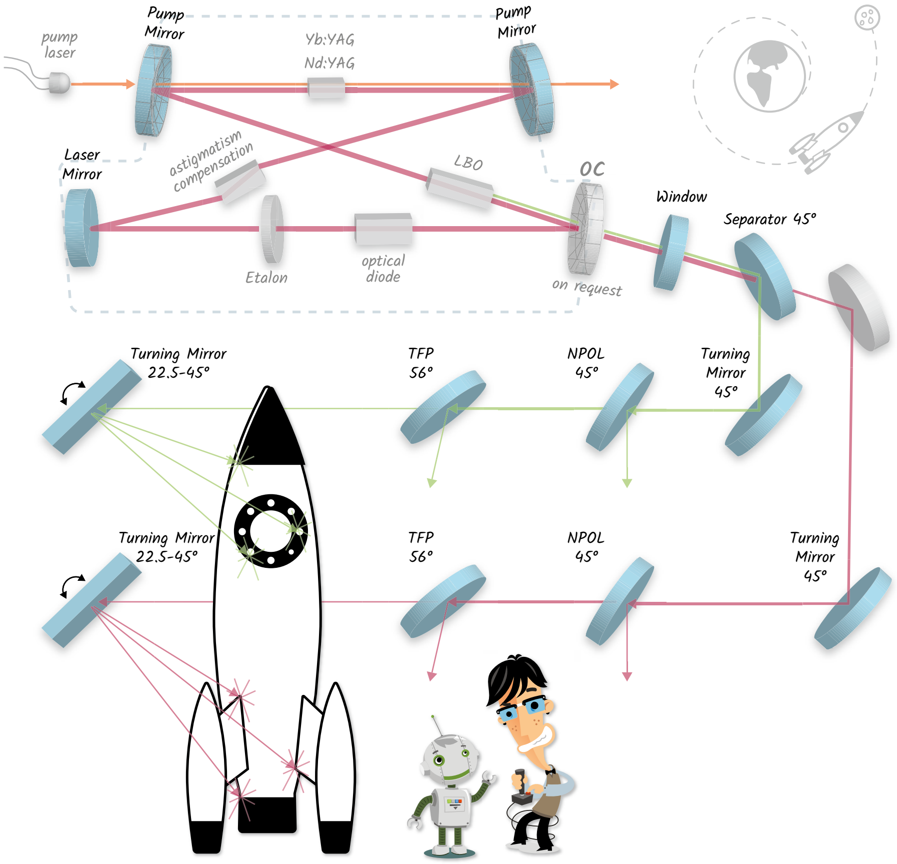
Window 0°

S2+S1: Coating 141184
AR (0°, 950 – 1 050 nm) < 0.2%



Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 1 mm	A2	5/ 1 x 0.04	141932	103 €
Ø 25.0 mm | t 1 mm	B2	5/ 3 x 0.04	141935	192 €

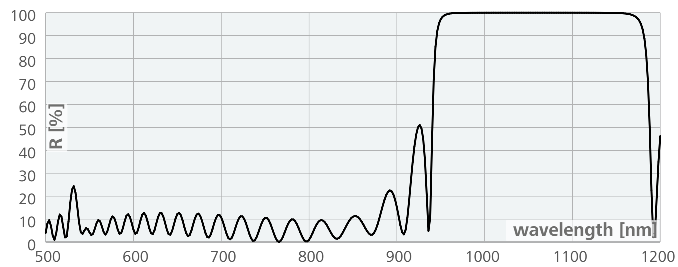
cw/ns-Laser [1030–1064 nm]

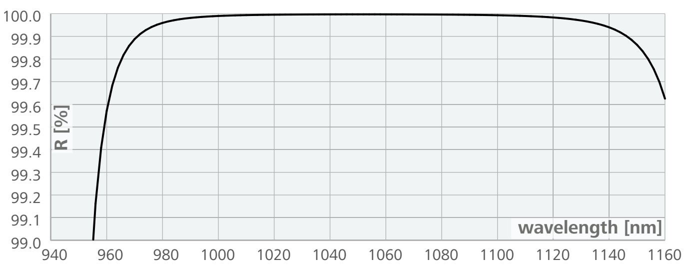


For optics not specified here, please visit www.layertec.de, contact us at info@layertec.de or call us at +49 (0)36453 744 0.

Laser Mirror 0°

Coating 141321
$HR_{s,p}$ (0 – 10°, 1030 – 1064 nm) > 99.95 %



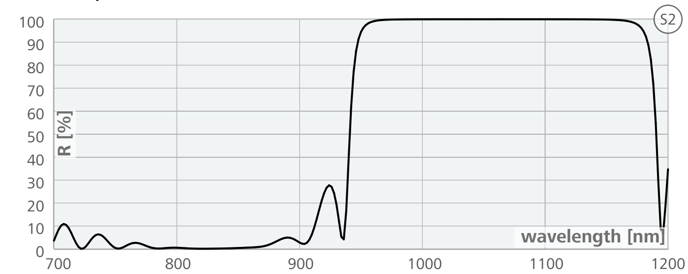


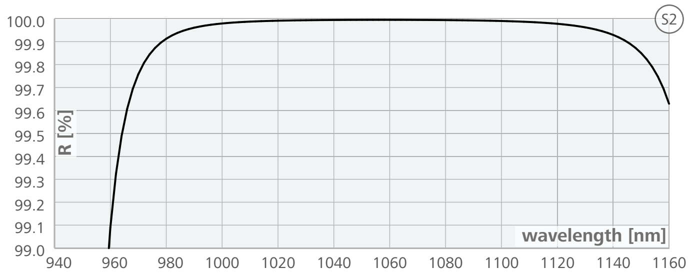
LIDT
6/ 50 J/cm²; 1064 nm; 7 ns; Ø 270 µm — LAYERTEC

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 1 x 0.04	141864	86 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 3 x 0.04	141868	119 €
Ø 50.0 mm | t 9.5 mm	C3	5/ 4 x 0.063	141866	435 €

Pump Mirror 0°

S2: Coating 141325
$HR_{s,p}$ (0 – 10°, 1030 – 1064 nm) > 99.95 %
$R_{s,p}$ (0 – 10°, 808 nm) < 2 %
S1: Coating 141355
$AR_{s,p}$ (0 – 10°, 808 nm) < 0.2 %



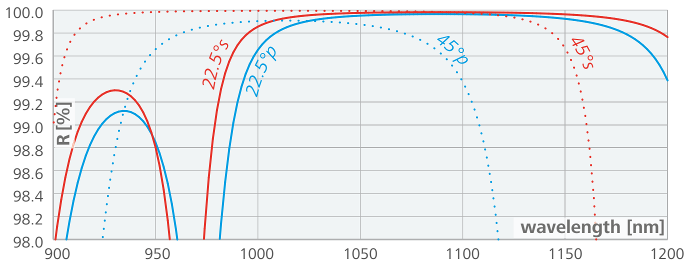


LIDT
6/ 30 J/cm²; 1064 nm; 7 ns; Ø 270 µm — LAYERTEC

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 1 x 0.04	141877	121 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 3 x 0.04	141881	185 €

Turning Mirror 22.5 – 45°, 1 030 – 1 064 nm

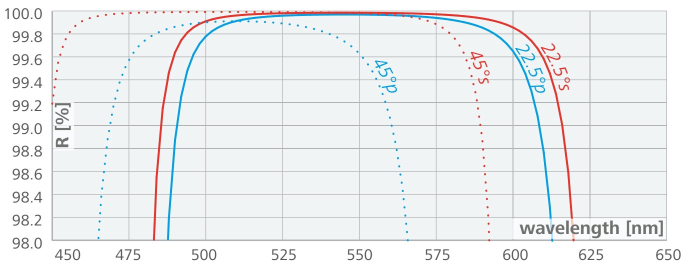
Coating 141496
Ag + multilayer
$HR_{s,p}$ (22.5 – 45°, 1 030 – 1 064 nm) > 99.7 %
for application outside the resonator
no transmission @ VIS / NIR



Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 6.35 mm	B4	5/ 3 x 0.04	141942	115 €
Ø 50.0 mm | t 9.5 mm	C3	5/ 4 x 0.063	141945	420 €
25 × 25 mm | t 6.35 mm	K2	5/ 3 x 0.04	141954	145 €

Turning Mirror 22.5 – 45°, 515 – 532 nm

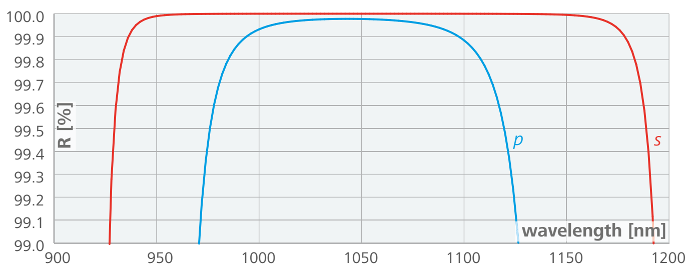
Coating 141497
Ag + multilayer
$HR_{s,p}$ (22.5 – 45°, 515 – 532 nm) > 99.7 %
for application outside the resonator
no transmission @ VIS / NIR



Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 6.35 mm	B4	5/ 3 x 0.04	141949	115 €
25 × 25 mm | t 6.35 mm	K2	5/ 3 x 0.04	141956	145 €

Turning Mirror 45°, 1 030 – 1 064 nm

Coating 141327
$HR_{s,p}$ (45°, 1 030 – 1 064 nm) > 99.95 %

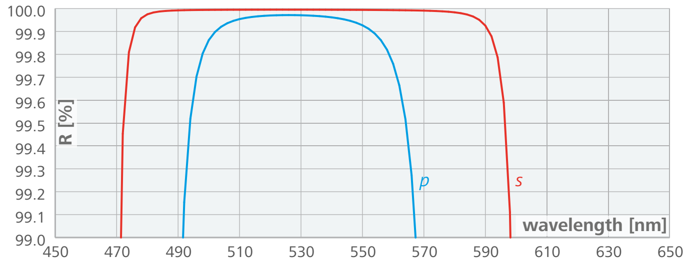


LIDT
6/ 50 J/cm²; 1064 nm; 7 ns; Ø 270 µm — LAYERTEC

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5/ 1 x 0.04	141896	86 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 3 x 0.04	141500	119 €
Ø 50.0 mm | t 9.5 mm	C3	5/ 4 x 0.063	141904	435 €
25 × 25 mm | t 6.35 mm	K2	5/ 3 x 0.04	141953	152 €

Turning Mirror 45°, 515 – 532 nm

Coating 141329
$HR_{s,p}$ (45°, 515 – 532 nm) > 99.9 %

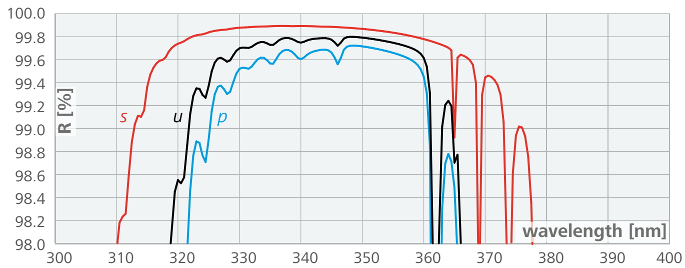


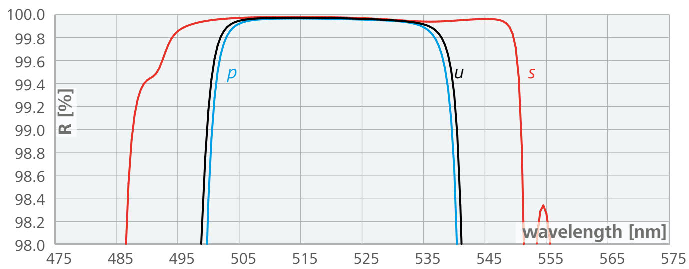
LIDT
6/ 10 J/cm²; 532 nm; 7 ns; 10Hz; Ø 270 µm — LAYERTEC

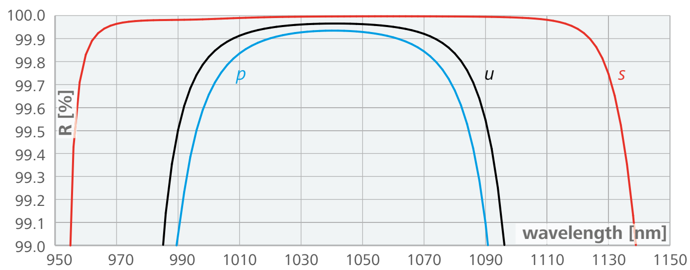
Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 6.35 mm	B4	5/ 3 x 0.04	141946	115 €
25 × 25 mm | t 6.35 mm	K2	5/ 3 x 0.04	141955	145 €

Turning Mirror 45°, 343+515+1 030 nm

Coating 128809
HR_u (45°, 343 nm) > 99.4 %
HR_u (45°, 515 nm) > 99.8 %
HR_u (45°, 1 030 nm) > 99.9 %



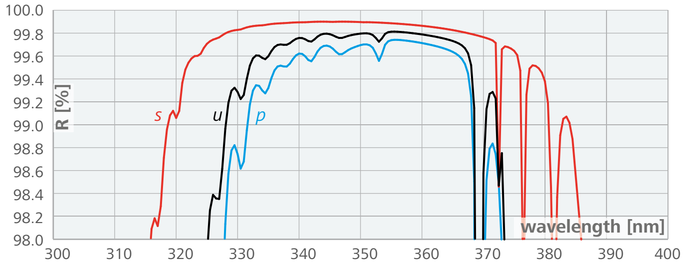


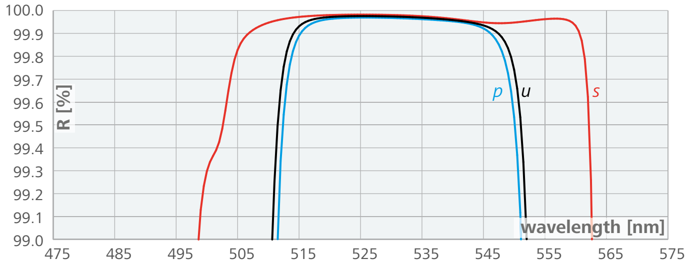


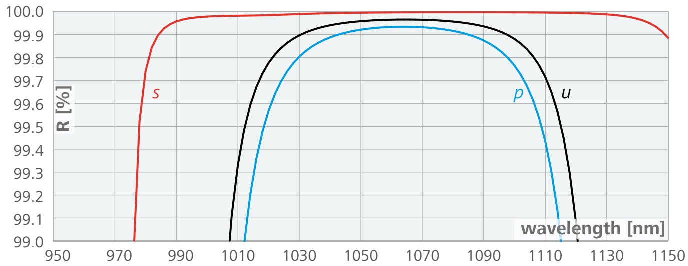
Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 6.35 mm	B4	5/ 2 x 0.04	128931	389 €

Turning Mirror 45°, 355+532+1 064 nm

Coating 115420
HR_u (45°, 355 nm) > 99.4 %
HR_u (45°, 532 nm) > 99.8 %
HR_u (45°, 1 064 nm) > 99.8 %



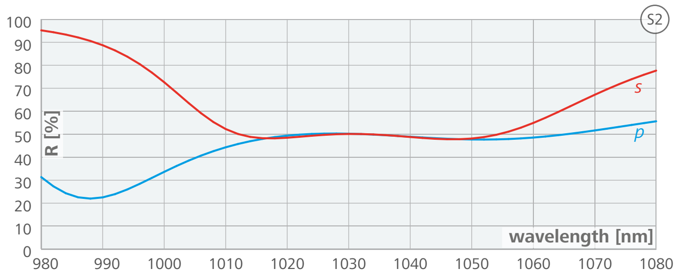


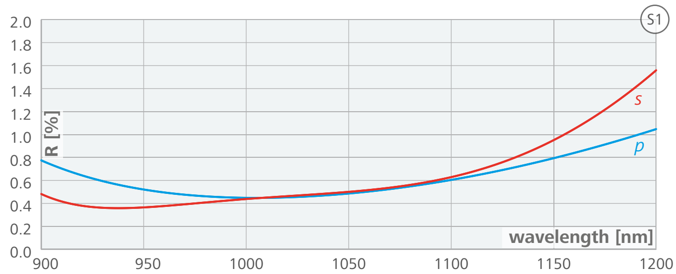


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 6.35 mm	B4	5/ 2 x 0.04	110837	389 €

Non-Polarizing Beamsplitter 45°, 1 030 nm

S2: Coating 141335
$PR_{s,p}$ (45°, 1 030 nm) = 50 (±3) %
$|R_s - R_p| < 4\,\%$
S1: Coating 141331
$AR_{s,p}$ (45°, 1 030 – 1 064 nm) < 0.7 %
$|R_s - R_p| < 0.2\,\%$

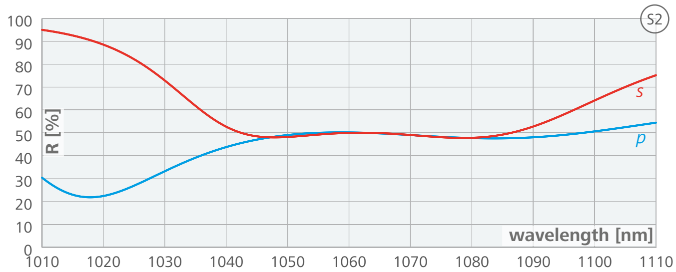


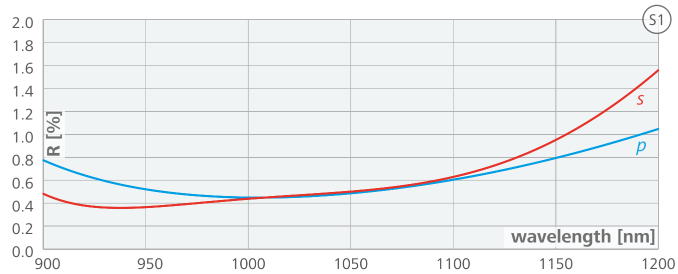


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 3.05 mm	B3	5/ 3 x 0.04	141604	225 €

Non-Polarizing Beamsplitter 45°, 1 064 nm

S2: Coating 141338
$PR_{s,p}$ (45°, 1 064 nm) = 50 (±3) %
$|R_s - R_p| < 4\,\%$
S1: Coating 141331
$AR_{s,p}$ (45°, 1 030 – 1 064 nm) < 0.7 %
$|R_s - R_p| < 0.2\,\%$

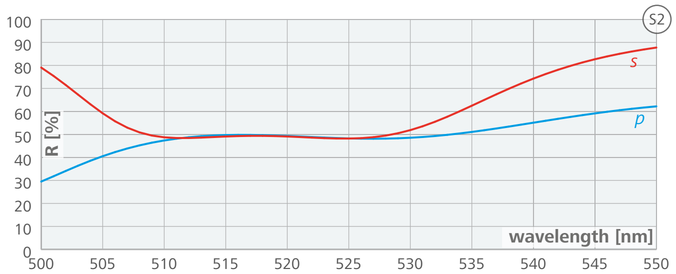


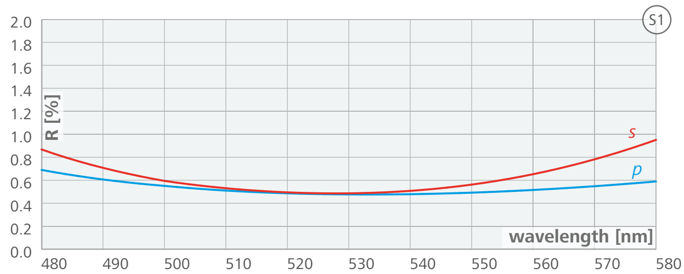


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 3.05 mm	B3	5/ 3 x 0.04	141607	225 €

Non-Polarizing Beamsplitter 45°, 515 nm

S2: Coating 141344
$PR_{s,p}$ (45°, 515 nm) = 50 (±3) %
$|R_s - R_p| < 4\,\%$
S1: Coating 141341
$AR_{s,p}$ (45°, 515 – 532 nm) < 0.7 %
$|R_s - R_p| < 0.2\,\%$

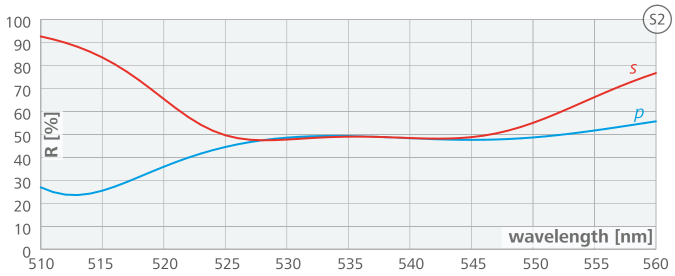


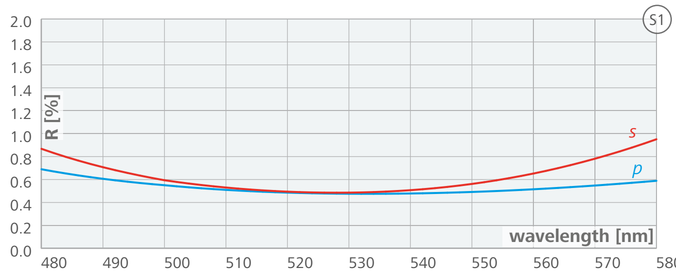


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 3.05 mm	B3	5/ 3 x 0.04	141608	225 €

Non-Polarizing Beamsplitter 45°, 532 nm

S2: Coating 141346
$PR_{s,p}$ (45°, 532 nm) = 50 (±3) %
$|R_s - R_p|$ < 4 %
S1: Coating 141341
$AR_{s,p}$ (45°, 515 – 532 nm) < 0.7 %
$|R_s - R_p|$ < 0.2 %

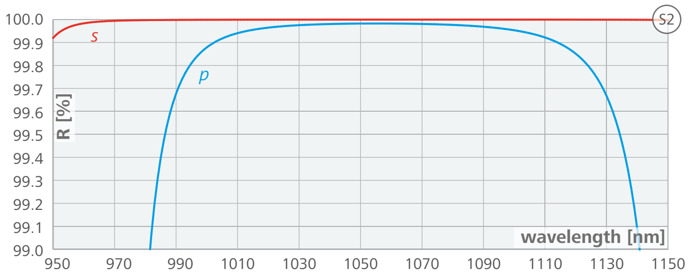


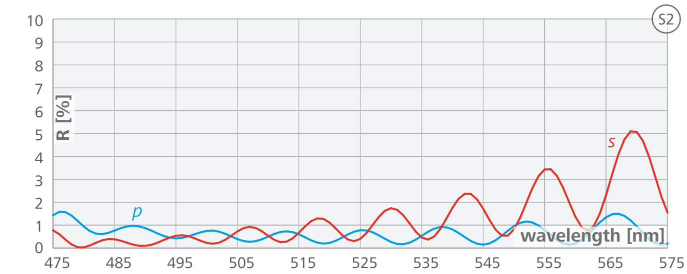


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 3.05 mm	B3	5/ 3 x 0.04	141609	225 €

Separator 45°, 1 030 / 515 nm

S2: Coating 159375
$HR_{s,p}$ (45°, 1 030 nm) > 99.9 %
$R_{s,p}$ (45°, 515 nm) < 3 %
S1: Coating 141341
$AR_{s,p}$ (45°, 515 nm) < 0.7%
$|R_s - R_p|$ < 0.2%

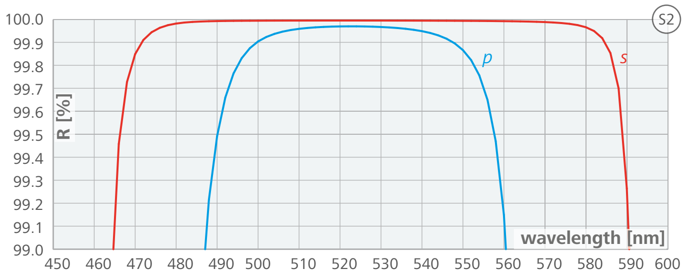


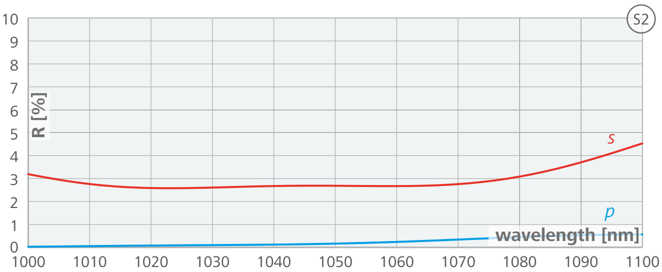


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 6.35 mm	B4	5/ 2 x 0.04	160937	325 €

Separator 45°, 515 – 532 / 1 030 – 1 064 nm

S2: Coating 141359
$HR_{s,p}$ (45°, 515 – 532 nm) > 99.8 %
R_s (45°, 1 030 – 1 064 nm) < 5 %
R_p (45°, 1 030 – 1064 nm) < 2 %
S1: Coating 141377
$AR_{s,p}$ (45°, 1 030 – 1 064 nm) < 0.7 %

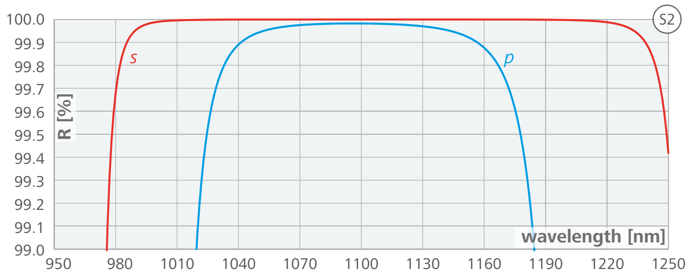


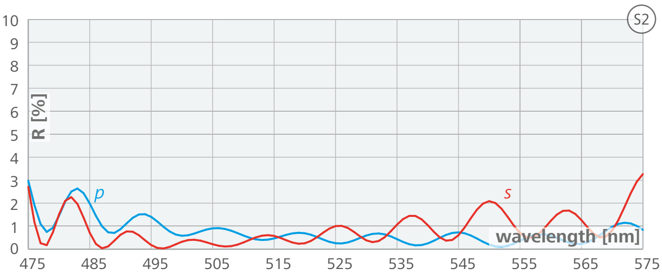


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 3.05 mm	B3	5/ 3 x 0.04	141892	180 €
Ø 25.0 mm | t 6.35 mm	B4	5/ 3 x 0.04	141895	165 €

Separator 45°, 1 064 / 532 nm

S2: Coating 159374
$HR_{s,p}$ (45°, 1 064 nm) > 99.9 %
$R_{s,p}$ (45°, 532 nm) < 3 %
S1: Coating 141341
$AR_{s,p}$ (45°, 532 nm) < 0.7%
$|R_s - R_p|$ < 0.2%

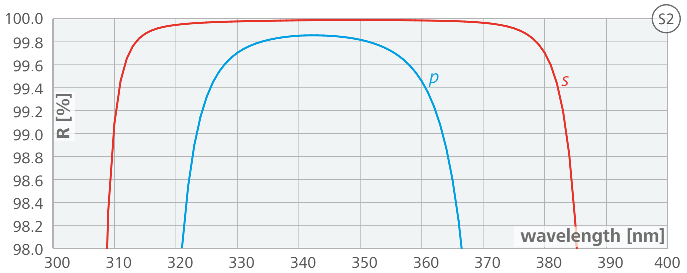


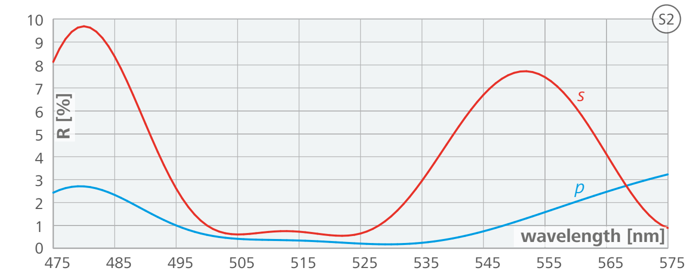


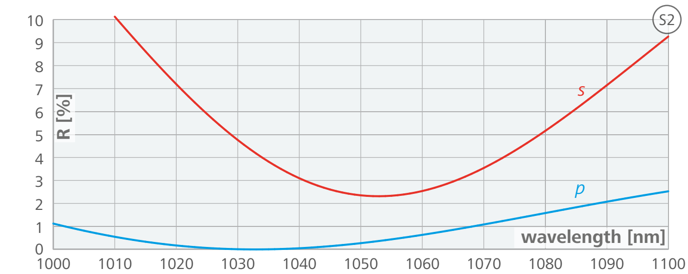
Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 6.35 mm	B4	5/ 2 x 0.04	160936	325 €

Separator 45°, p-pol. 343 / 515 / 1 030 nm

S2: Coating 122334
HR_p (45°, 343 nm) > 99.0 %
R_s (45°, 515 nm) < 3 %
R_p (45°, 1 030 nm) < 2%
S1: Coating 122335
AR_s (45°, 515 nm) < 0.5%
AR_p (45°, 1 030 nm) < 0.5%



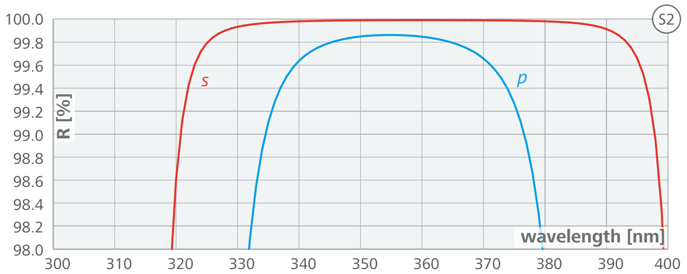


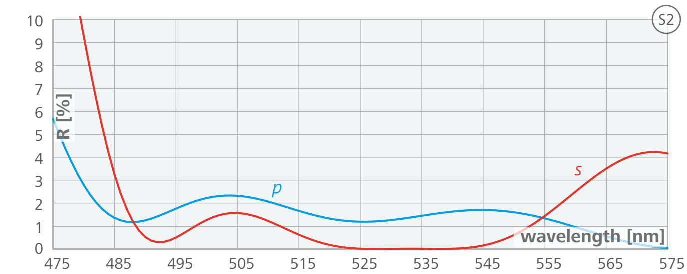


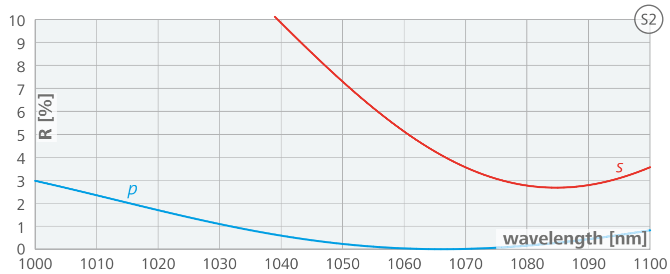
Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 3.05 mm	B3	5/ 2 x 0.04	160935	307 €

Separator 45°, p-pol. 355 / 532 / 1 064 nm

S2: Coating 115203
HR_p (45°, 355 nm) > 99.5 %
R_s (45°, 532 nm) < 5 %
R_p (45°, 1 064 nm) < 5%
S1: Coating 128506
AR_s (45°, 535 nm) < 0.5%
AR_p (45°, 1 064 nm) < 0.5%



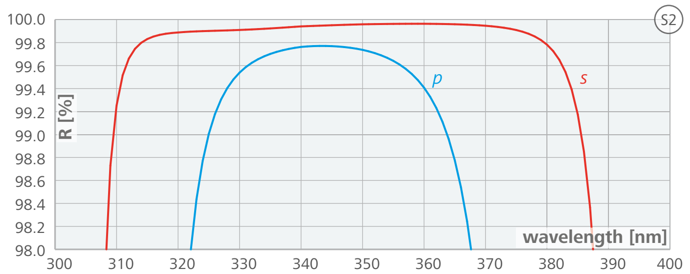


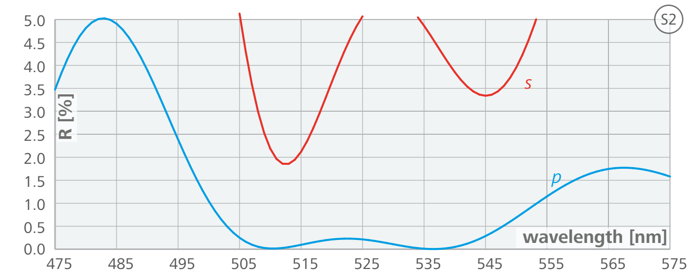


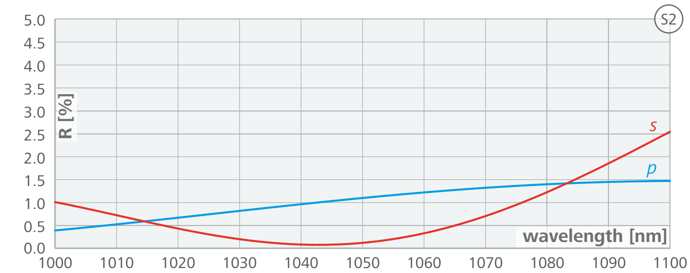
Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 3.05 mm	B3	5/ 2 x 0.04	109816	307 €

Separator 45°, s-pol. 343–355 / 515–532 / 1 030–1 064 nm

S2: Coating 115258
HR_s (45°, 343–358 nm) > 99.9 %
R_p (45°, 515–532 nm) < 1 %
R_s (45°, 1 030–1 064 nm) < 1%
S1: Coating 116338
AR_p (45°, 515–535 nm) < 0.3%
AR_s (45°, 1 030–1 064 nm) < 0.2%



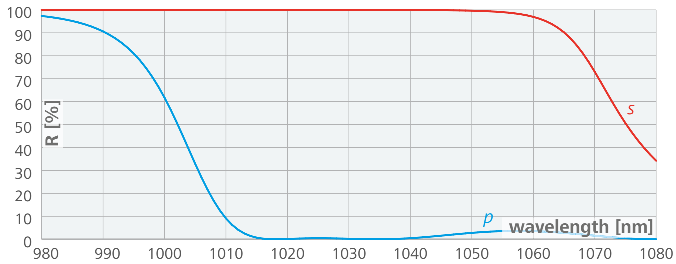




Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 6.35 mm	B4	5/ 2 x 0.04	116540	368 €

Thin Film Polarizer 56°, 1030 nm

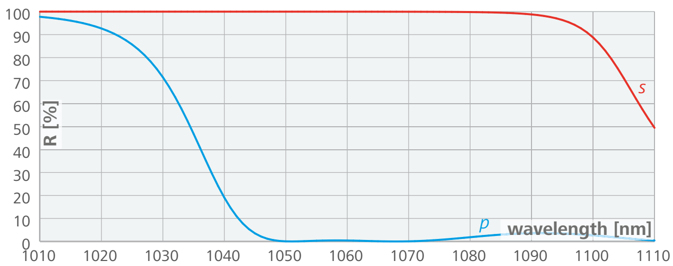
S2: Coating 141352
TFP (56°*, 1030 nm) R_s > 99.9 % R_p < 2 %
**specifications will be achieved by ±2° angle adjustment*
S1: Uncoated; Brewster angle → R_p (56°) ~0 %



Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 3.05 mm	B3	5/ 3 x 0.04	141535	287 €

Thin Film Polarizer 56°, 1064 nm

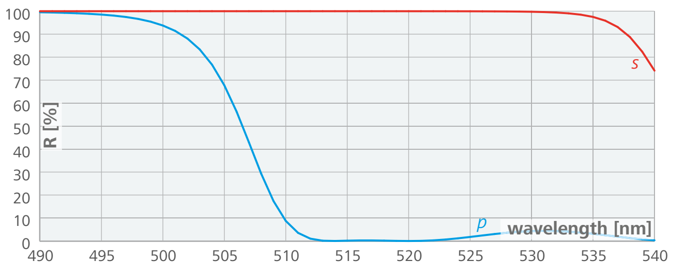
S2: Coating 141353
TFP (56°*, 1064 nm) R_s > 99.9 % R_p < 2 %
**specifications will be achieved by ±2° angle adjustment*
S1: Uncoated; Brewster angle → R_p (56°) ~0 %



Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 3.05 mm	B3	5/ 3 x 0.04	141536	287 €

Thin Film Polarizer 56°, 515 nm

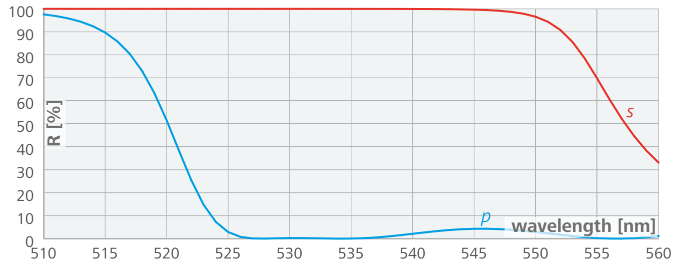
S2: Coating 141350
TFP (56°*, 515 nm) R_s > 99.9 % R_p < 2 %
**specifications will be achieved by ±2° angle adjustment*
S1: Uncoated; Brewster angle → R_p (56°) ~0 %



Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 3.05 mm	B3	5/ 3 x 0.04	141537	287 €

Thin Film Polarizer 56°, 532 nm

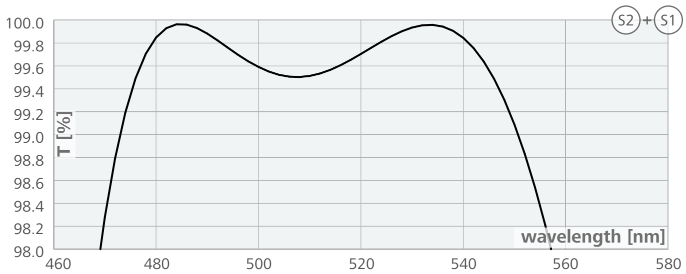
S2: Coating 141351
TFP (56° *, 532 nm) R_s > 99.9 % R_p < 2 %
**specifications will be achieved by ±2° angle adjustment*
S1: Uncoated; Brewster angle → R_p (56°) ~0 %

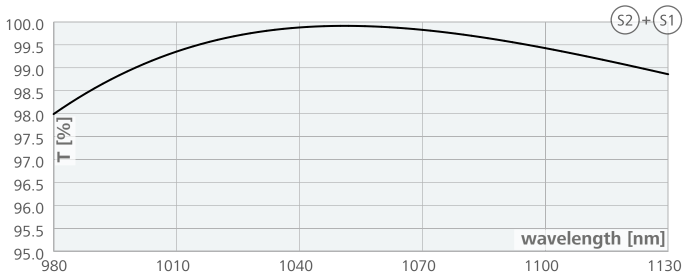


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 3.05 mm	B3	5/ 3 x 0.04	141539	287 €

Window 0°

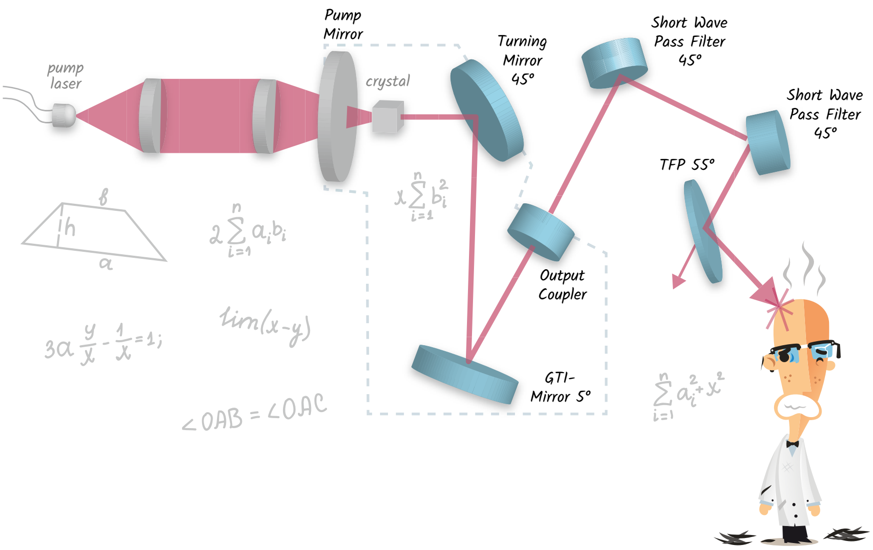
S2+S1: Coating 141348
AR (0°, 515–532 nm) < 0.5 %
AR (0°, 1030–1064 nm) < 0.3 %





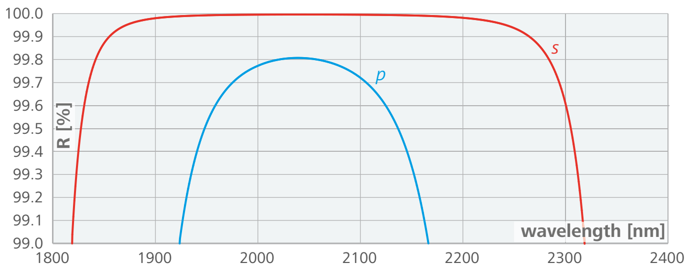
Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 1 mm	A2	5/ 1 x 0.04	141890	105 €
Ø 25.0 mm | t 3.05 mm	B3	5/ 3 x 0.04	141885	130 €

2 µm [Ho:YAG|Tm:YAG]



Turning Mirror 45°

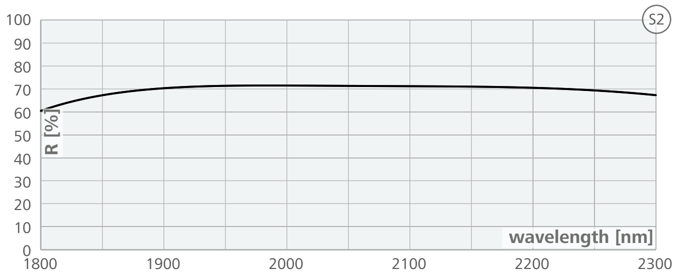
Coating 160406 *on Fused Silica IR grade*
HR_s (45°, 2 090 nm) > 99.9 %

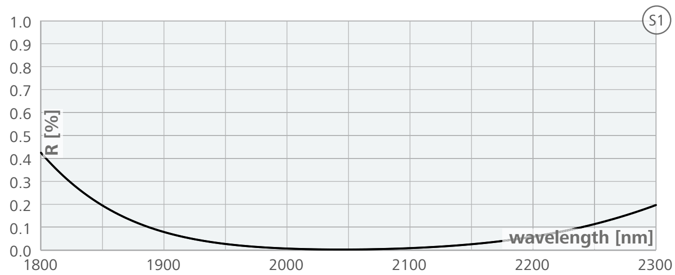


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4 b	5/ 2 x 0.025	103180	140 €
Ø 25.0 mm | t 6.35 mm	B4 b	5/ 2 x 0.04	160659	299 €

Output Coupler 70 %

S2: Coating 113886 *on Fused Silica IR grade*
PR (0°, 2 010 – 2 100 nm) = 70 (±2) %
S1: Coating 116213
AR (0°, 2 010 – 2 100 nm) < 0.25 %

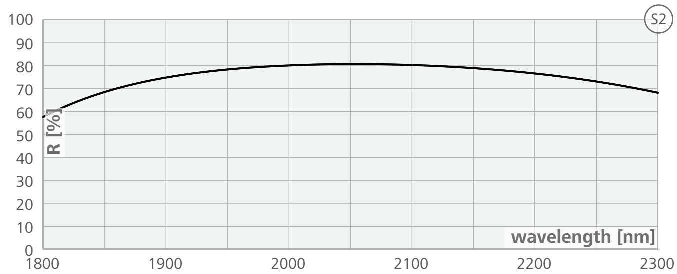


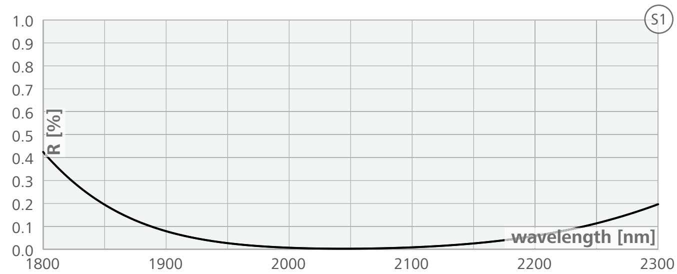


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4 b	5/ 2 x 0.025	102671	122 €

Output Coupler 80 %

S2: Coating 160390 *on Fused Silica IR grade*
PR (0°, 2 010 – 2 100 nm) = 80 (±2) %
S1: Coating 116213
AR (0°, 2 010 – 2 100 nm) < 0.25 %

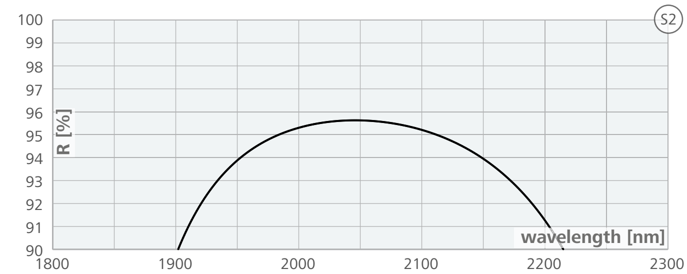


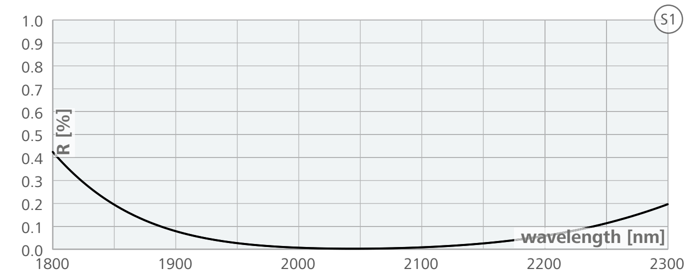


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4 b	5/ 2 x 0.025	100415	122 €

Output Coupler 95 %

S2: Coating 160391 *on Fused Silica IR grade*
PR (0°, 2 010 – 2 100 nm) = 95 (±1) %
S1: Coating 116213
AR (0°, 2 010 – 2 100 nm) < 0.25 %

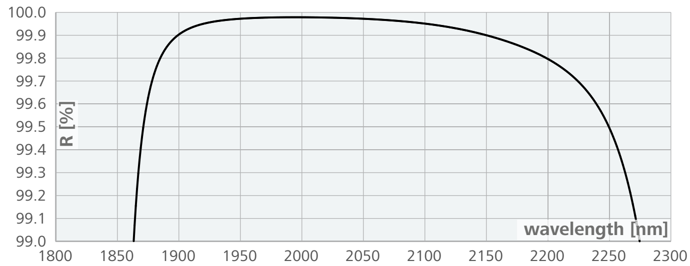


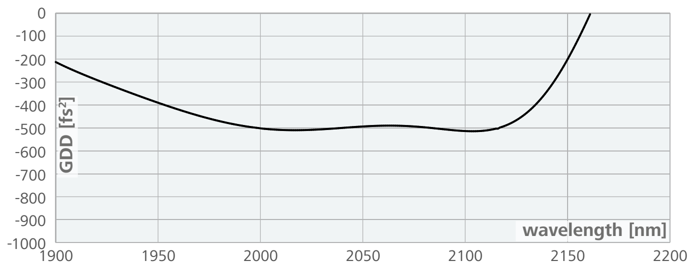


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4 b	5/ 2 x 0.025	107781	122 €

GTI-Mirror 5°, -500 fs²

Coating 159365
HR (0 – 5°, 2 010 – 2 100 nm) > 99.9 %
GDD-R (0 – 5°, 2 010 – 2 100 nm) = -500 (±150) fs²
without GDD measurement

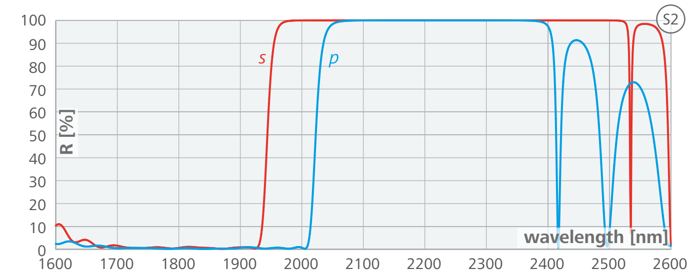


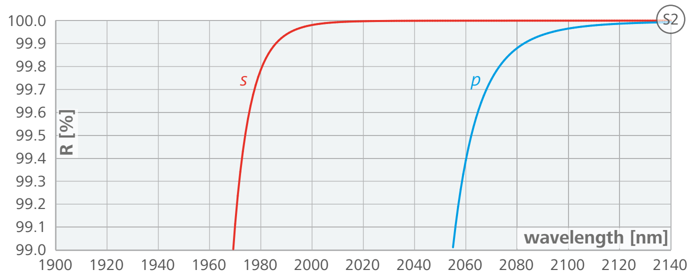


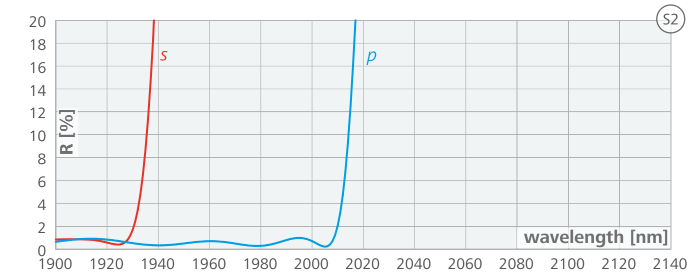
Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 6.35 mm	B4	5/ 2 x 0.04	160660	600 €

Short Wave Pass Filter 45°

S2: Coating 115311 *on Fused Silica IR grade*
HR$_{s,p}$ (45°*, 2 090 nm) > 99.8 %
R$_{s,p}$ (45°*, 1 908 nm) < 3 %
**specifications will be achieved by ±3° angle adjustment*
S1: Coating 123893
AR$_{s,p}$ (45°, 1 908 nm) < 0.6 %



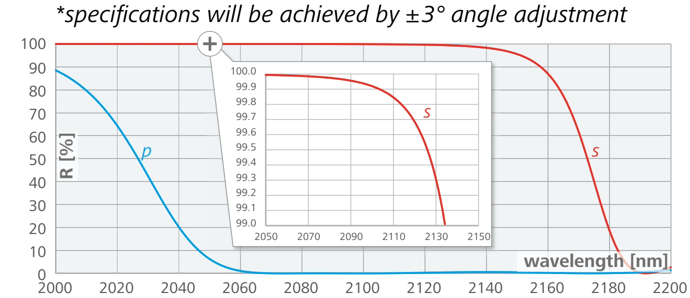




Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4 b	5/ 2 x 0.025	110072	350 €
Ø 25.0 mm | t 6.35 mm	B4 b	5/ 3 x 0.04	112699	725 €

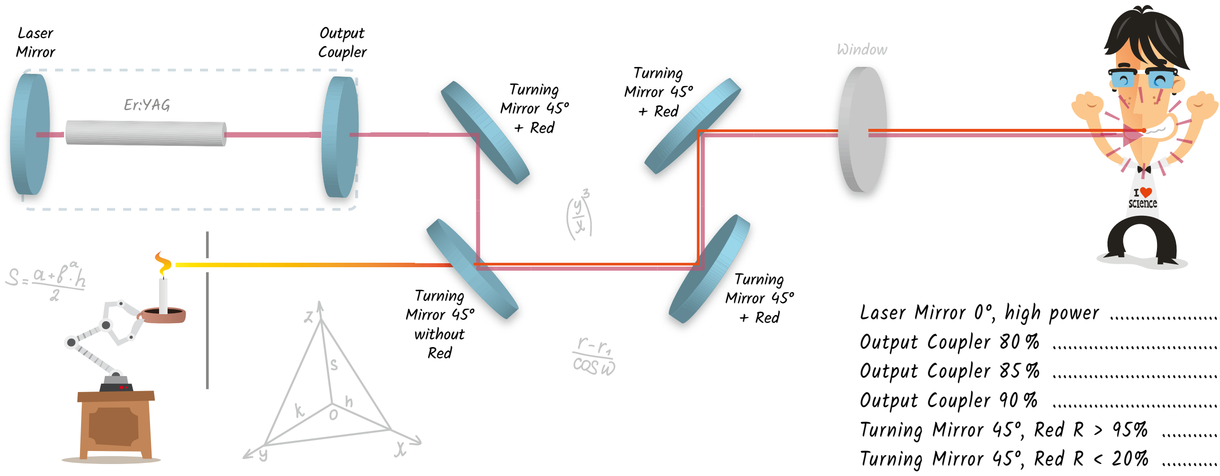
Thin Film Polarizer 55°

Coating 113900 *on Fused Silica IR grade*
TFP (55°*, 2 090 nm) R$_s$ > 99.9 % R$_p$ < 1 %
**specifications will be achieved by ±3° angle adjustment*



Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 3.0 mm	B3 b	5/ 2 x 0.04	102787	464 €

3 µm [Er:YAG]



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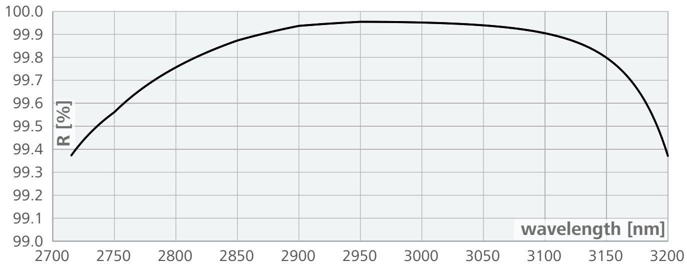
Laser Mirror 0°, high power

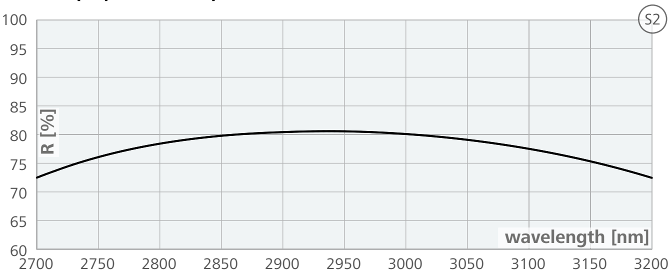
Coating 160428 *on Sapphire*
HR (0°, 2 940 nm) > 99.8 %

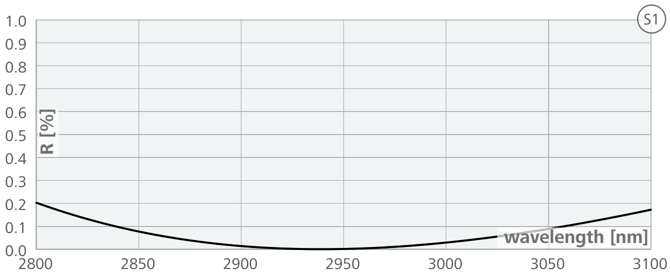


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 3.0 mm	A3 e	5/ 2 x 0.04	100417	147 €
Ø 25.4 mm | t 3.0 mm	B3 e	5/ 2 x 0.063	100418	266 €

Output Coupler 80 %

S2: Coating 160426 *on Sapphire*
PR (0°, 2 940 nm) = 80 (±2) %
S1: Coating 120759
AR (0°, 2 940 nm) < 0.25 %

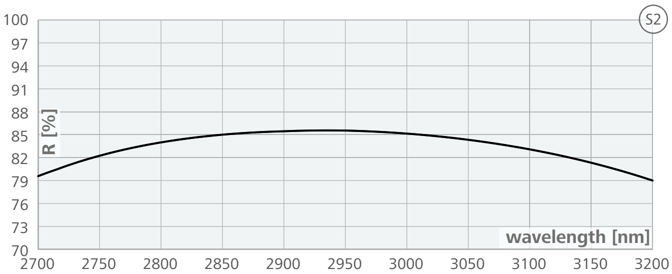


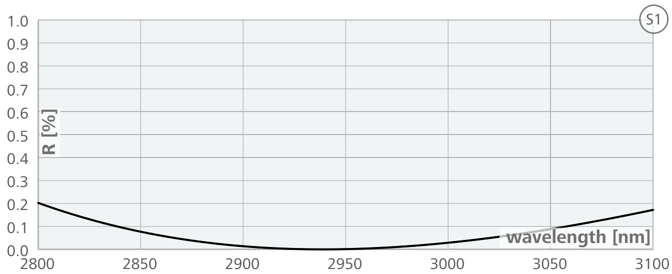


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 3.0 mm	A3 e	5/ 2 x 0.04	109753	147 €

Output Coupler 85 %

S2: Coating 160425 *on Sapphire*
PR (0°, 2 940 nm) = 85 (±2) %
S1: Coating 120759
AR (0°, 2 940 nm) < 0.25 %

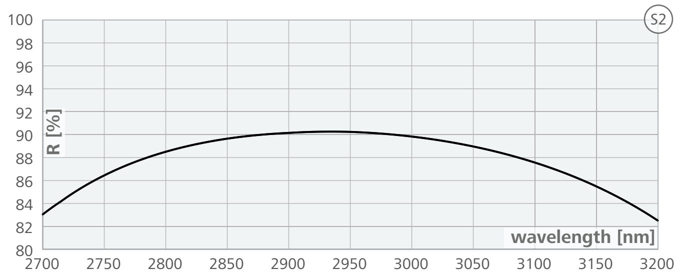


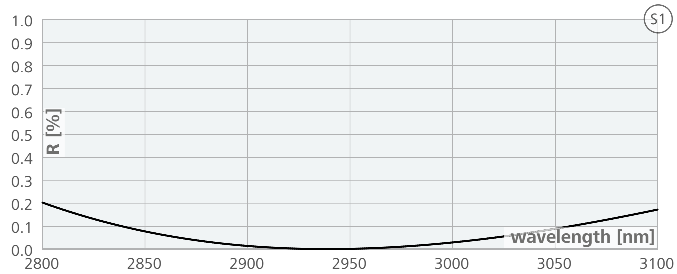


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 3.0 mm	A3 e	5/ 2 x 0.04	109581	147 €

Output Coupler 90 %

S2: Coating 135719 *on Sapphire*
PR (0°, 2 940 nm) = 90 (±1) %
S1: Coating 120759
AR (0°, 2 940 nm) < 0.25 %

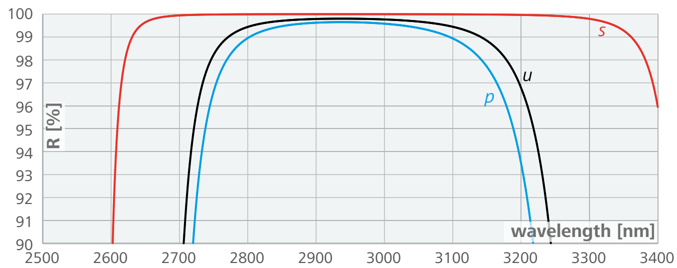


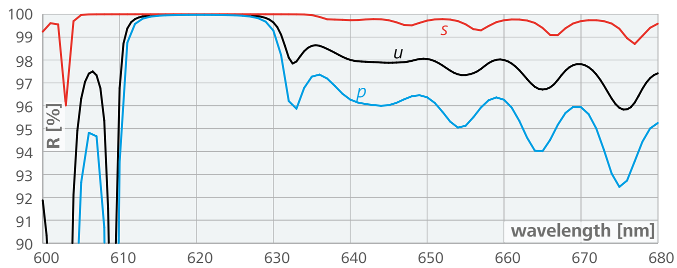


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 3.0 mm	A3 e	5/ 2 x 0.04	100419	147 €

Turning Mirror 45°, Red R > 95%

Coating 113862
HR_u (45°, 2 940 nm) > 99.5 %
R_u (45°, 635 – 655 nm) > 95 %

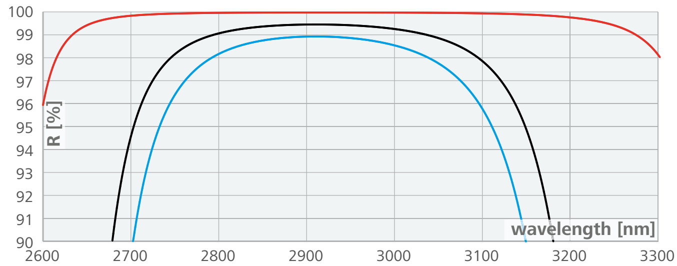


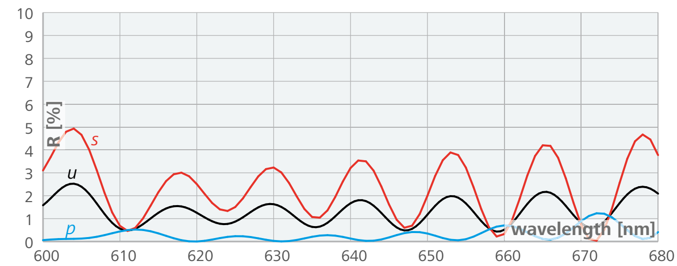


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.0 mm | t 3.05 mm	B3	5/ 2 x 0.063	160977	239 €

Turning Mirror 45°, Red R < 20%

Coating 115132 *on Sapphire*
HR_u (45°, 2 940 nm) > 99 %
R_u (45°, 635 – 655 nm) < 20 %





Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 25.4 mm | t 3.0 mm	B3 e	5/ 2 x 0.063	109093	266 €

Metallic Mirrors

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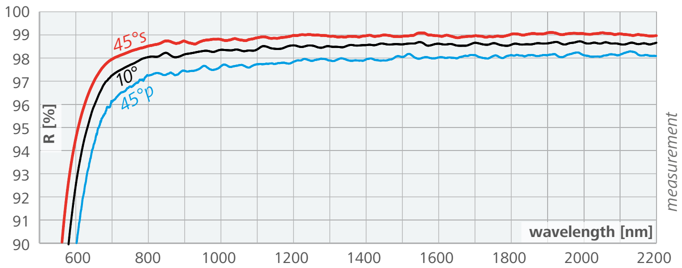
Unprotected Gold Mirror

Coating 140770
Au unprotected
HR (0°, 800 – 20 000 nm) > 98 %
HR_s (45°, 800 – 20 000 nm) > 98 %
HR_p (45°, 800 – 20 000 nm) > 97 %

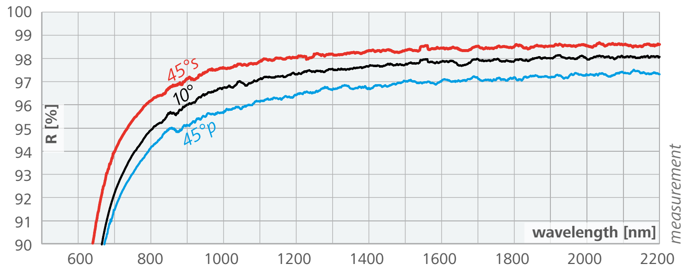


LIDT
6/ 0.5 J/cm²; 795 nm; 42 fs; 1 kHz; Ø 80 µm — WRCP Budapest

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5 / 2 x 0.025	142064	65 €
Ø 25.0 mm | t 6.35 mm	B4	5 / 2 x 0.04	142065	95 €
Ø 50.0 mm | t 9.5 mm	C3	5 / 6 x 0.04	142066	345 €
25 x 25 mm | t 6.35 mm	K2	5 / 2 x 0.04	142067	115 €

Protected Gold Mirror

Coating 140777
Au + protection layer
HR (0°, 800 – 4 000 nm) > 95 %
HR_s (45°, 800 – 4 000 nm) > 95 %
HR_p (45°, 800 – 4 000 nm) > 94 %

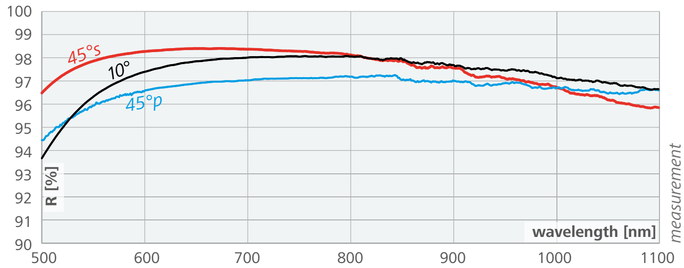


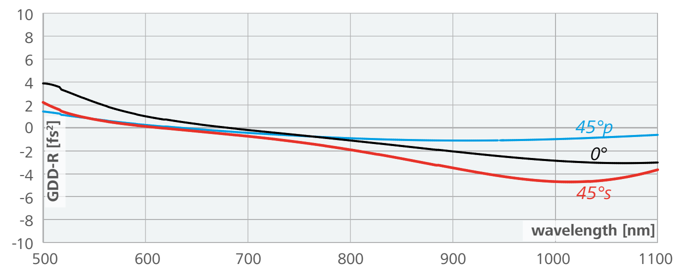
LIDT
6/ 0.2 J/cm²; 795 nm; 42 fs; 1 kHz; Ø 80 µm — WRCP Budapest

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5 / 2 x 0.025	142074	70 €
Ø 25.0 mm | t 6.35 mm	B4	5 / 2 x 0.04	142075	98 €
Ø 50.0 mm | t 9.5 mm	C3	5 / 6 x 0.04	142076	360 €
25 x 25 mm | t 6.35 mm	K2	5 / 2 x 0.04	142077	123 €

Protected Silver Mirror, 600 – 1000 nm

Coating 140780
Ag + protection layer, fs-opt. 600 – 1 000 nm
HR (0°, 600 – 1 000 nm) > 97 %
HR_s (45°, 600 – 1 000 nm) > 96 %
HR_p (45°, 600 – 1 000 nm) > 96 %
$|GDD\text{-}R_{s,p}$ (0 – 45°, 600 – 1 000 nm)$|$ < 10 fs²



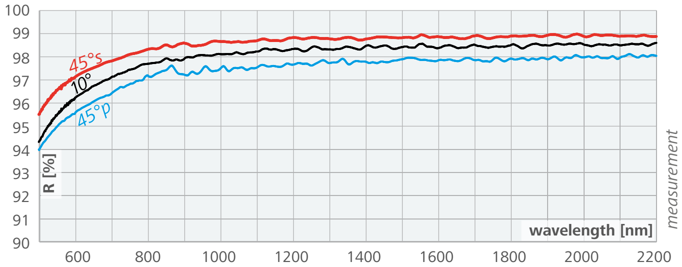


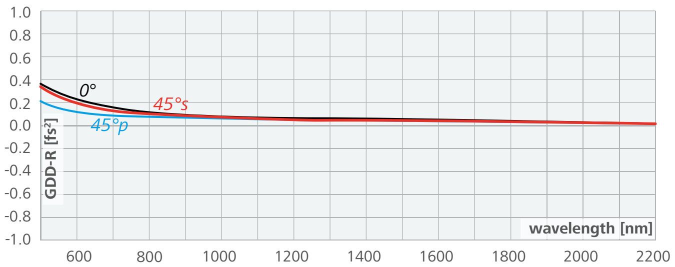
LIDT
6/ 5 J/cm²; 1 064 nm; 7 ns; 10 Hz; Ø 480 µm — LAYERTEC
6/ 0.7 J/cm²; 795 nm; 42 fs; 1 kHz; Ø 80 µm — WRCP Budapest

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5 / 2 x 0.025	142089	62 €
Ø 25.0 mm | t 6.35 mm	B4	5 / 2 x 0.04	142088	83 €
Ø 50.0 mm | t 9.5 mm	C3	5 / 6 x 0.04	142086	280 €
25 x 25 mm | t 6.35 mm	K2	5 / 2 x 0.04	142083	108 €

Protected Silver Mirror, 800 – 2 000 nm

Coating 140831
Ag + protection layer, fs-opt. 800 – 2 000 nm
HR (0°, 800 – 2 000 nm) > 97 %
HR_s (45°, 800 – 2 000 nm) > 98 %
HR_p (45°, 800 – 2 000 nm) > 97 %
|GDD-$R_{s,p}$ (0 – 45°, 800 – 2 000 nm)| < 5 fs²





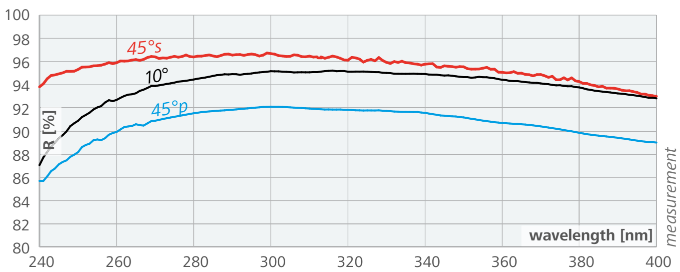
LIDT

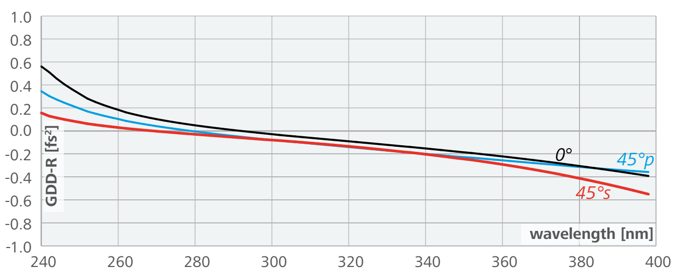
6/ 5 J/cm²; 1 064 nm; 7 ns; 10 Hz; Ø 480 µm — LAYERTEC
6/ 0.7 J/cm²; 795 nm; 42 fs; 1 kHz; Ø 80 µm — WRCP Budapest

Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5 / 2 x 0.025	142093	69 €
Ø 25.0 mm | t 6.35 mm	B4	5 / 2 x 0.04	142094	90 €
Ø 50.0 mm | t 9.5 mm	C3	5 / 6 x 0.04	142096	297 €
25 × 25 mm | t 6.35 mm	K2	5 / 2 x 0.04	142099	119 €

Protected Aluminum Mirror, UV-range

Coating 142407
Al enhanced, 260 – 360 nm opt.
$HR_{s,p}$ (0 – 45°, 260 – 360 nm) ≥ 90 %
|GDD-$R_{s,p}$ (0 – 45°, 260 – 360 nm)| < 1 fs²

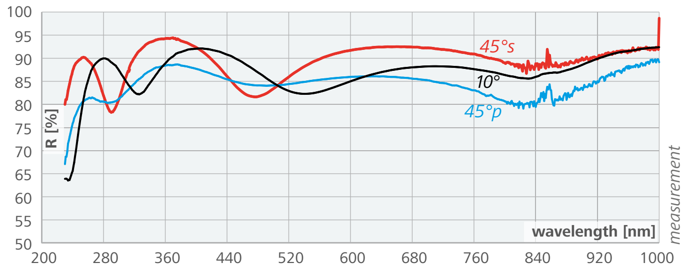


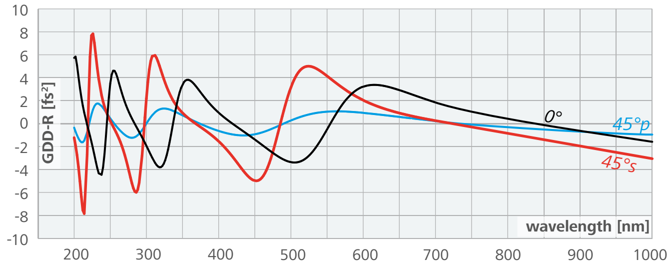


Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5 / 2 x 0.025	142415	73 €
Ø 25.0 mm | t 6.35 mm	B4	5 / 2 x 0.04	142416	105 €
Ø 50.0 mm | t 9.5 mm	C3	5 / 6 x 0.04	142417	387 €
25 × 25 mm | t 6.35 mm	K2	5 / 2 x 0.04	142418	141 €

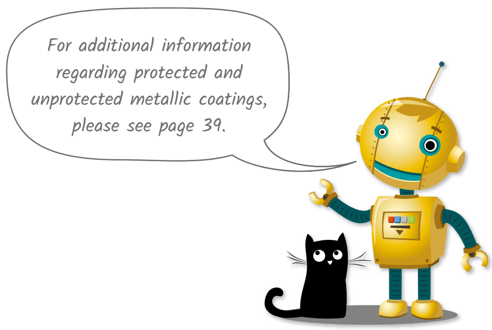
Protected Aluminum Mirror, UV-VIS-range

Coating 140842
Al + protection layer
$HR_{s,p}$ (0 – 45°, 266 + 400 + 800 nm) > 80 %
|GDD-$R_{s,p}$ (0 – 45°, 266 + 400 + 800 nm)| < 10 fs²
for polarization-sensitive and low-power ultrafast applications

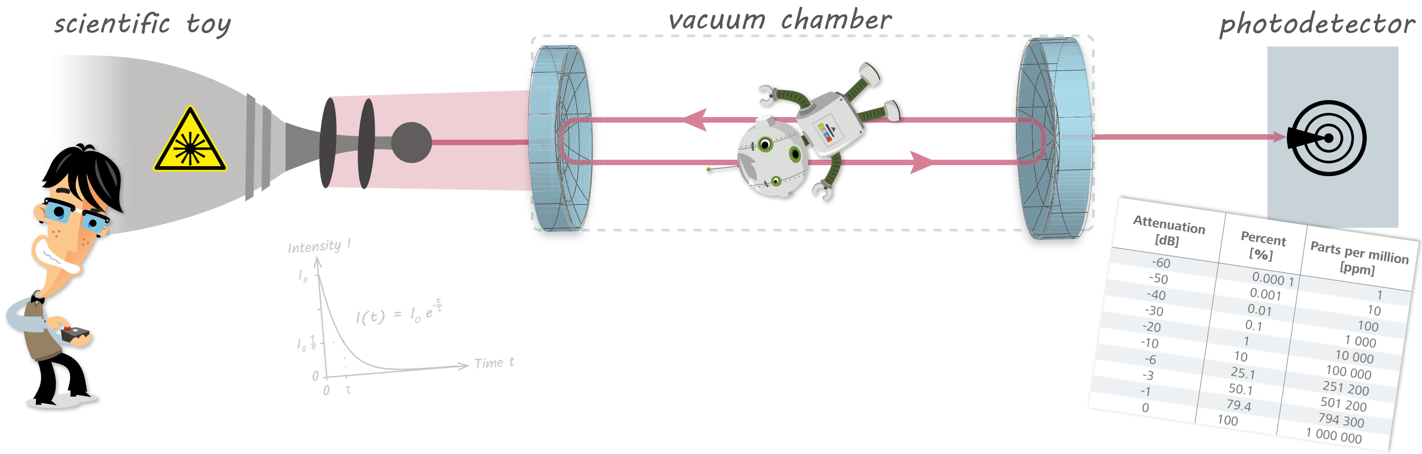




Substrate Dimensions	No.	Imperfections	Item #	Price
Ø 12.7 mm | t 6.35 mm	A4	5 / 2 x 0.025	142069	45 €
Ø 25.0 mm | t 6.35 mm	B4	5 / 2 x 0.04	142071	75 €
Ø 50.0 mm | t 9.5 mm	C3	5 / 6 x 0.04	142091	275 €
25 × 25 mm | t 6.35 mm	K2	5 / 2 x 0.04	142092	100 €



Low Loss Mirrors



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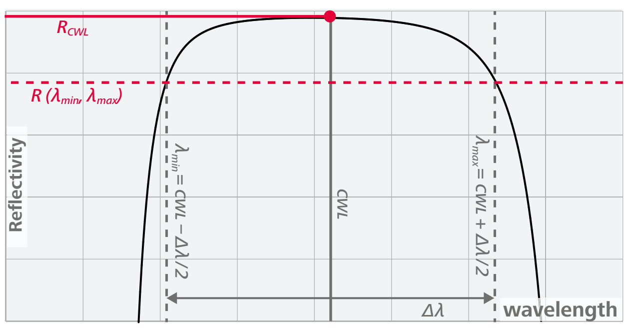
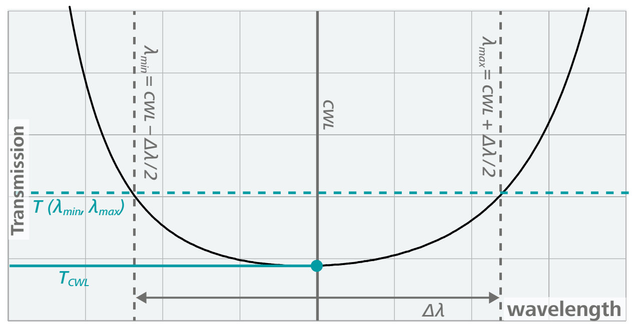
Principal Curves of Reflectance and Transmittance



Principal curve of reflectivity of a low loss mirror and definition of central wavelength (CWL) and bandwidth (Δλ)

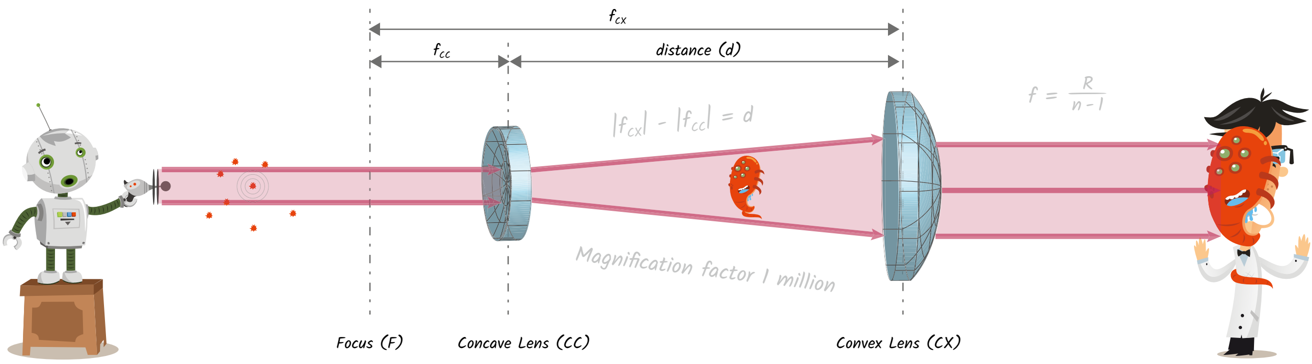


Principal curve of transmission of a low loss mirror and definition of central wavelength (CWL) and bandwidth (Δλ)

CWL	R_{CWL} [%]	T_{CWL} [ppm]	Δλ	R [%]	T [ppm]	Substrate Dimensions [mm]	No.	Imperfections	Item #	Price
350 (±7) nm	> 99.95	30	35 nm	99.93	50	Ø 12.7 I t 6.35 I CC 1000	R13	Ø$_e$8 5/ 2 x 0.016	140970	195 €
						Ø 25.0 I t 6.35 I CC 1000	S13	Ø$_e$20 5/ 2 x 0.04 I Ø$_e$10 5/ 2 x 0.016	140949	395 €
520 (±10) nm	> 99.99	20	60 nm	99.98	100	Ø 12.7 I t 6.35 I CC 1000	R13	Ø$_e$8 5/ 2 x 0.016	140969	195 €
						Ø 25.0 I t 6.35 I CC 1000	S13	Ø$_e$20 5/ 2 x 0.04 I Ø$_e$10 5/ 2 x 0.016	140964	395 €
640 (±15) nm	> 99.99	20	80 nm	99.98	100	Ø 12.7 I t 6.35 I CC 1000	R13	Ø$_e$8 5/ 2 x 0.016	140968	195 €
						Ø 25.0 I t 6.35 I CC 1000	S13	Ø$_e$20 5/ 2 x 0.04 I Ø$_e$10 5/ 2 x 0.016	140965	395 €
760 (±15) nm	> 99.995	15	110 nm	99.99	100	Ø 12.7 I t 6.35 I CC 1000	R13	Ø$_e$8 5/ 2 x 0.016	140967	195 €
						Ø 25.0 I t 6.35 I CC 1000	S13	Ø$_e$20 5/ 2 x 0.04 I Ø$_e$10 5/ 2 x 0.016	140966	395 €
960 (±20) nm	> 99.995	20	110 nm	99.99	100	Ø 12.7 I t 6.35 I CC 1000	R13	Ø$_e$8 5/ 2 x 0.016	140992	195 €
						Ø 25.0 I t 6.35 I CC 1000	S13	Ø$_e$20 5/ 2 x 0.04 I Ø$_e$10 5/ 2 x 0.016	140974	395 €
1 045 (±20) nm	> 99.995	20	120 nm	99.99	100	Ø 12.7 I t 6.35 I CC 1000	R13	Ø$_e$8 5/ 2 x 0.016	140973	195 €
						Ø 25.0 I t 6.35 I CC 1000	S13	Ø$_e$20 5/ 2 x 0.04 I Ø$_e$10 5/ 2 x 0.016	140971	395 €
1 260 (±20) nm	> 99.995	15	190 nm	99.99	100	Ø 12.7 I t 6.35 I CC 1000	R13	Ø$_e$8 5/ 2 x 0.016	140991	195 €
						Ø 25.0 I t 6.35 I CC 1000	S13	Ø$_e$20 5/ 2 x 0.04 I Ø$_e$10 5/ 2 x 0.016	140975	395 €
1 392 (±20) nm	> 99.995	15	200 nm	99.99	100	Ø 12.7 I t 6.35 I CC 1000	R13	Ø$_e$8 5/ 2 x 0.016	140989	195 €
						Ø 25.0 I t 6.35 I CC 1000	S13	Ø$_e$20 5/ 2 x 0.04 I Ø$_e$10 5/ 2 x 0.016	140976	395 €
1 550 (±20) nm	> 99.99	50	130 nm	99.99	100	Ø 12.7 I t 6.35 I CC 1000	R13	Ø$_e$8 5/ 2 x 0.016	140987	195 €
						Ø 25.0 I t 6.35 I CC 1000	S13	Ø$_e$20 5/ 2 x 0.04 I Ø$_e$10 5/ 2 x 0.016	140977	395 €
1 670 (±20) nm	> 99.99	25	180 nm	99.99	100	Ø 12.7 I t 6.35 I CC 1000	R13	Ø$_e$8 5/ 2 x 0.016	140986	195 €
						Ø 25.0 I t 6.35 I CC 1000	S13	Ø$_e$20 5/ 2 x 0.04 I Ø$_e$10 5/ 2 x 0.016	140980	395 €
1 980 (±20) nm	> 99.99	25	180 nm	99.99	100	Ø 12.7 I t 6.35 I CC 1000	R13	Ø$_e$8 5/ 2 x 0.016	140984	195 €
						Ø 25.0 I t 6.35 I CC 1000	S13	Ø$_e$20 5/ 2 x 0.04 I Ø$_e$10 5/ 2 x 0.016	140981	395 €
2 300 (±30) nm	> 99.99	25	220 nm	99.99	100	Ø 12.7 I t 6.35 I CC 1000	R13	Ø$_e$8 5/ 2 x 0.016	140983	195 €
						Ø 25.0 I t 6.35 I CC 1000	S13	Ø$_e$20 5/ 2 x 0.04 I Ø$_e$10 5/ 2 x 0.016	140982	395 €

Low Loss Mirrors are shipped with individual CRD measurement reports (reflectance and transmittance).
CRD measurement reports can also be requested individually for all Low Loss Mirrors in stock.

Beam Expanders



Lens Matrix

Magnification / reduction factor with distance d

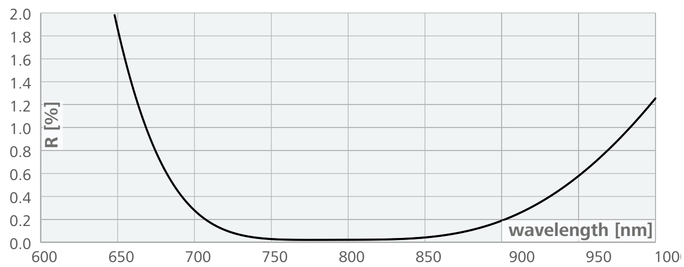
ROC of CC Lens	ROC of CX Lens			
	CX 125	**CX 150**	**CX 175**	**CX 200**
CC 100	**1.25** *(d≈55 mm)*	**1.5** *(d≈110 mm)*	**1.75** *(d≈165 mm)*	**2** *(d≈220 mm)*
CC 75	**$1\frac{2}{3}$** *(d≈110 mm)*	**2** *(d≈165 mm)*	**$2\frac{1}{3}$** *(d≈220 mm)*	**$2\frac{2}{3}$** *(d≈275 mm)*
CC 50	**2.5** *(d≈165 mm)*	**3** *(d≈220 mm)*	**3.5** *(d≈275 mm)*	**4** *(d≈330 mm)*
CC 25	**5** *(d≈220 mm)*	**6** *(d≈275 mm)*	**7** *(d≈330 mm)*	**8** *(d≈390 mm)*

Magnification and reduction factor depending on the ratios of the radii of curvature of concave (CC) and convex (CX) lens, distance d is calculated for Fused Silica @920 nm (with n = 1.4515)

1. Select an magnification or reduction factor from the table on the left. For your convenience the lens distance is also given in the table.
2. Find the corresponding ROC (radius of curvature) for both lenses. The concave lens (CC) is indicated on the left, the convex lens (CX) on the top.
3. Select the two lenses for your preferred spectral range from the tables below. Note: The AR coatings shown here are options. On request, LAYERTEC offers the anti-reflective quartz glass lens set for any wavelength in the range of 190 – 2 200 nm (except 1 370 – 1 420 nm).

Lenses 0°, 800 nm

Coating 160878
AR (0°, 725 – 875 nm) < 0.5 %

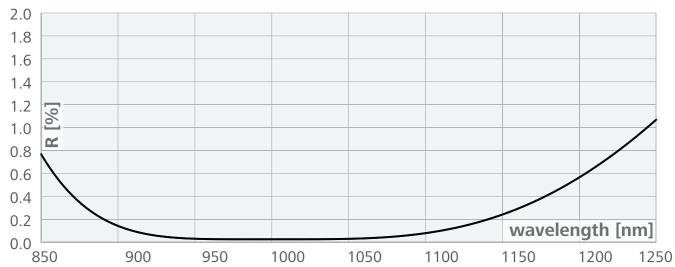


Calculated reflection for each side

Substrate Dimensions [mm]	No.	Imperfections	Item #	Price
Ø 25.0 | t_e 6.35 | CC 25	L1a	$Ø_e$ 15 | 5/ 1 x 0.04	160716	365 €
Ø 25.0 | t_e 6.35 | CC 50	L1b	$Ø_e$ 15 | 5/ 1 x 0.04	160717	325 €
Ø 25.0 | t_e 6.35 | CC 75	L1c	$Ø_e$ 20 | 5/ 1 x 0.04	160718	300 €
Ø 25.0 | t_e 6.35 | CC 100	L1d	$Ø_e$ 20 | 5/ 1 x 0.04	160719	290 €
Ø 50.0 | t_c 6.35 | CX 125	L2a	$Ø_e$ 30 | 5/ 2 x 0.04	160720	720 €
Ø 50.0 | t_c 6.35 | CX 150	L2b	$Ø_e$ 30 | 5/ 2 x 0.04	160721	710 €
Ø 50.0 | t_c 6.35 | CX 175	L2c	$Ø_e$ 30 | 5/ 2 x 0.04	160722	700 €
Ø 50.0 | t_c 6.35 | CX 200	L2d	$Ø_e$ 30 | 5/ 2 x 0.04	160723	690 €

Lenses 0°, 1000 nm

Coating 160881
AR (0°, 900 – 1 100 nm) < 0.5 %



Calculated reflection for each side

Substrate Dimensions [mm]	No.	Imperfections	Item #	Price
Ø 25.0 | t_e 6.35 | CC 25	L1a	$Ø_e$ 15 | 5/ 1 x 0.04	160704	365 €
Ø 25.0 | t_e 6.35 | CC 50	L1b	$Ø_e$ 15 | 5/ 1 x 0.04	160707	325 €
Ø 25.0 | t_e 6.35 | CC 75	L1c	$Ø_e$ 20 | 5/ 1 x 0.04	160710	300 €
Ø 25.0 | t_e 6.35 | CC 100	L1d	$Ø_e$ 20 | 5/ 1 x 0.04	160711	290 €
Ø 50.0 | t_c 6.35 | CX 125	L2a	$Ø_e$ 30 | 5/ 2 x 0.04	160712	720 €
Ø 50.0 | t_c 6.35 | CX 150	L2b	$Ø_e$ 30 | 5/ 2 x 0.04	160713	710 €
Ø 50.0 | t_c 6.35 | CX 175	L2c	$Ø_e$ 30 | 5/ 2 x 0.04	160714	700 €
Ø 50.0 | t_c 6.35 | CX 200	L2d	$Ø_e$ 30 | 5/ 2 x 0.04	160715	690 €

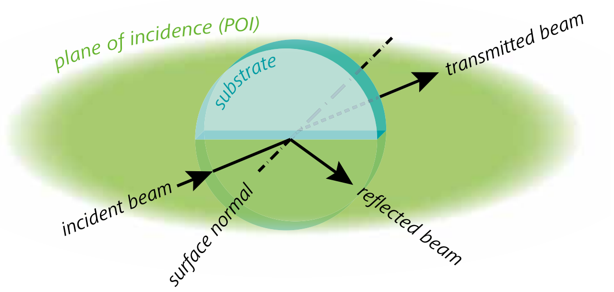
LAYERTEC Syntax

AR = Anti Reflection
HR = High Reflection (Transmission not specified, T = 0 % possible, e.g. metal mirrors)
PR = Partial Reflection (Transmission > 0 % in all cases)
R = Reflection (Transmission ≥ 0 % in all cases)

$\mathbf{AR_s}$ = s-pol. → electric field perpendicular to POI
$\mathbf{HR_p}$ = p-pol. → electric field parallel to POI
$\mathbf{PR_u}$ = unpol. → (s + p) / 2
$\mathbf{R_{s,p}}$ = valid for any polarization, known as »random« in the U.S.

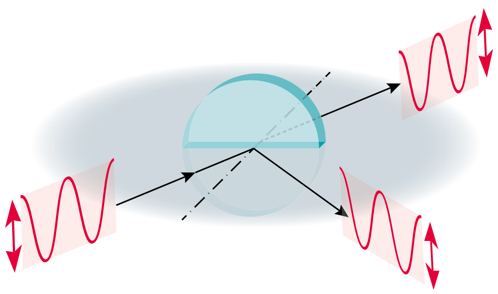
Reflection on a Plane Surface

The plane of incidence (POI) is defined by the incident beam and the surface normal.



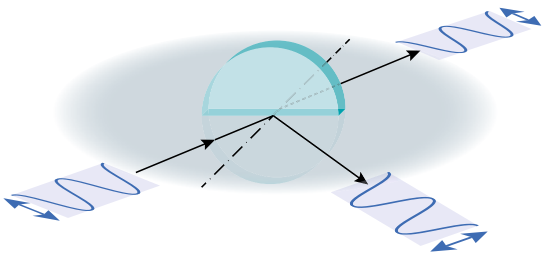
s-Polarization

Electric field polarized perpendicular (»senkrecht«) to the POI, also known as σ- or TE (transverse-electric) polarization.



p-Polarization

Electric field polarized parallel to the POI, also known as π- or TM (transverse-magnetic) polarization.

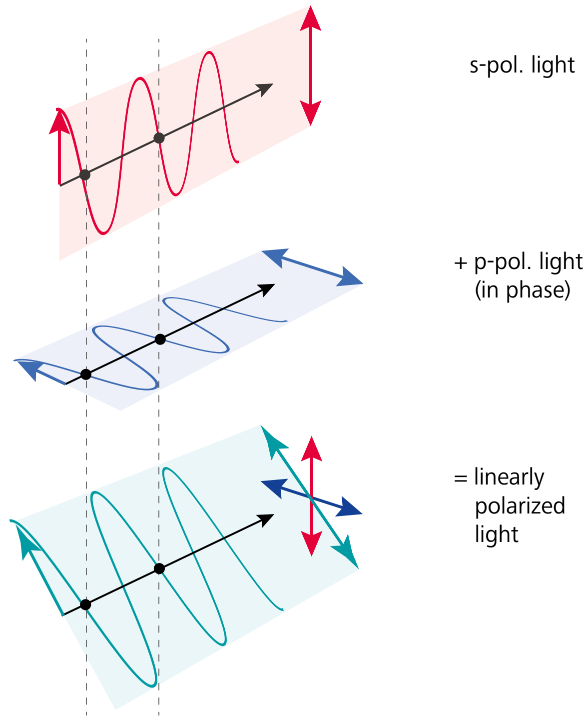


Superposition of s- and p-Polarized Light

Any polarization state can be understood as a superposition of s- and p-polarized light.

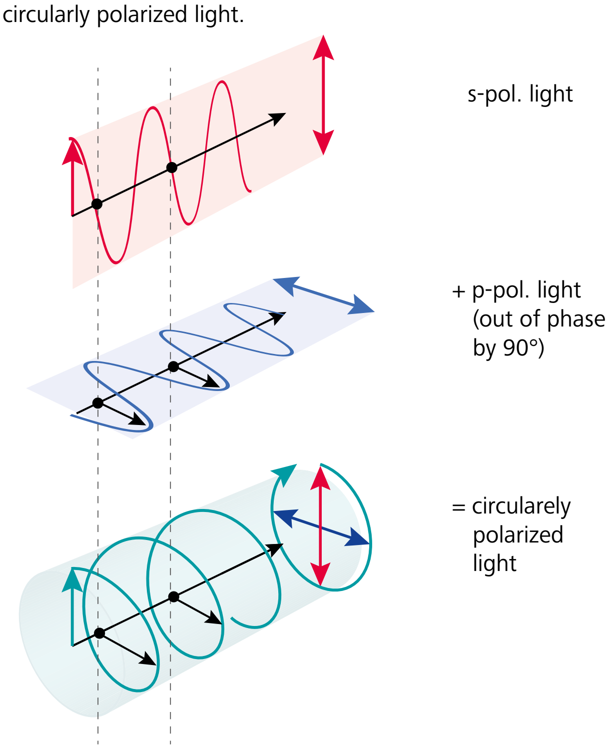
Linearly Polarized Light

s- and p-polarized light without phase shift results in linearly polarized light.

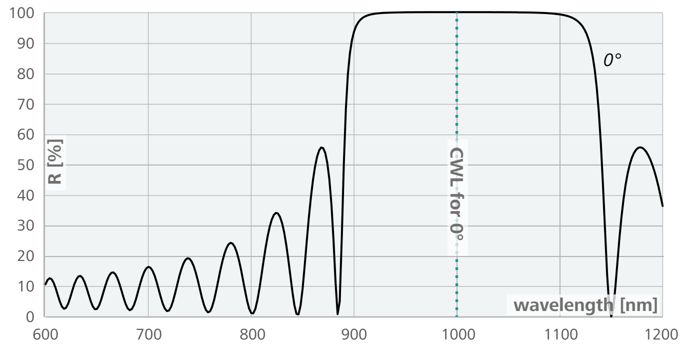


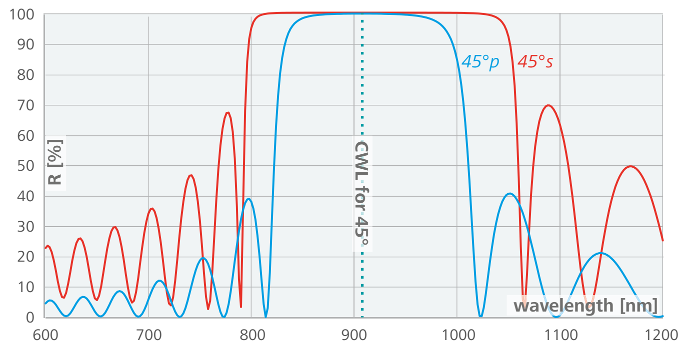
Circularly Polarized Light

s- and p-polarized light with a phase shift of 90° results in circularly polarized light.



Center Wavelength (CWL) Shift with AOI

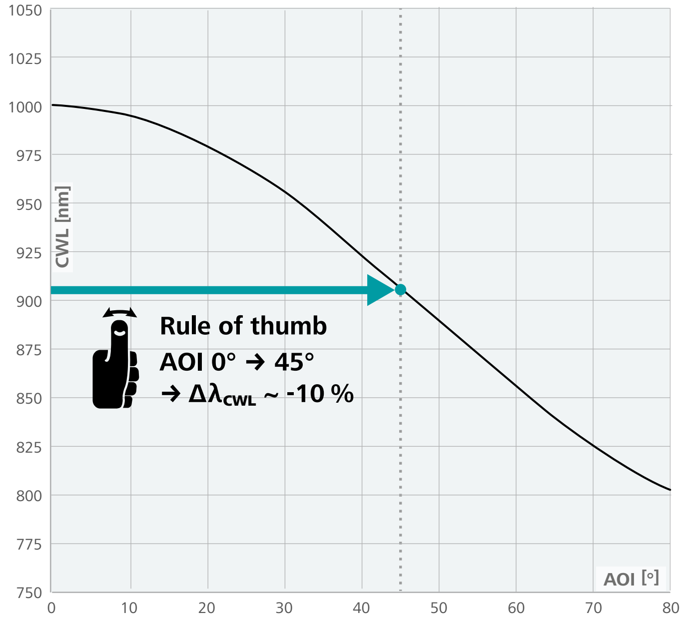




CWL s-pol. = CWL p-pol. for the same AOI

CWL Shift with AOI

CWL = f(AOI)

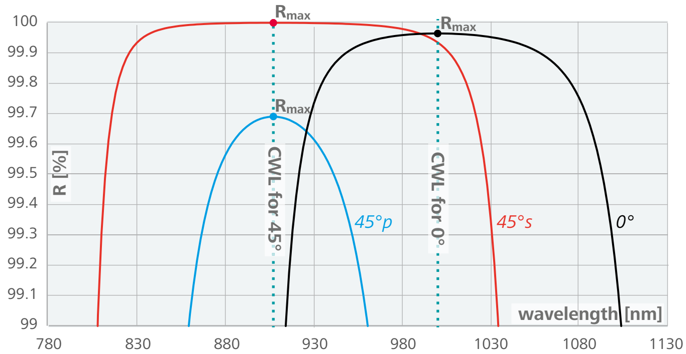


Please note that the plots shown here are numerical results. The actual values may change if different methods are used. However, the overall behavior, including the rule of thumb, remains the same.

Modification of Spectral Properties

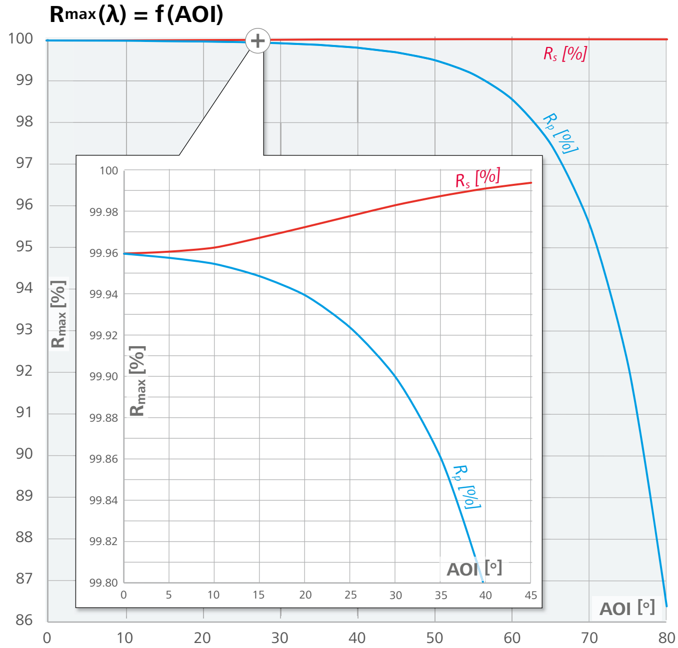
Effects of increasing AOI

- → HR-range shifts to shorter wavelengths
- → Wider HR_s-range
- → Narrower HR_p-range
- → Increasing R_s at the CWL
- → Decreasing R_p at the CWL

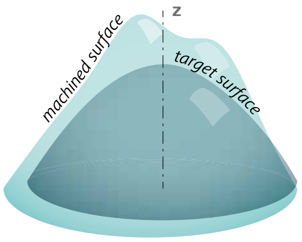


Split-Up of s- and p-Polarization

$R_{max}(\lambda) = f(AOI)$



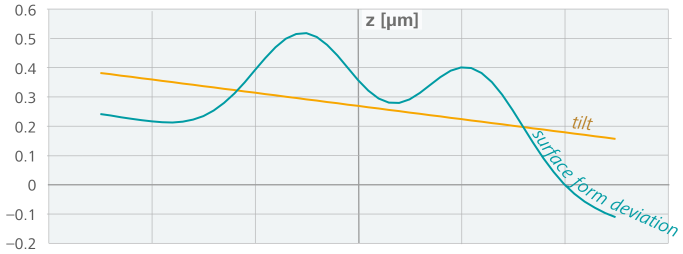
Target Surface vs. Machined Surface



Machined surface
– target surface
= surface form deviation

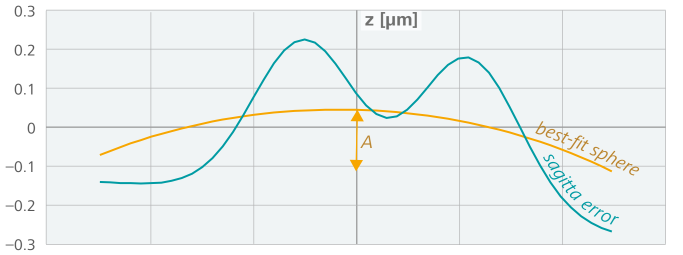
Surface Form Parameters

Surface form deviation



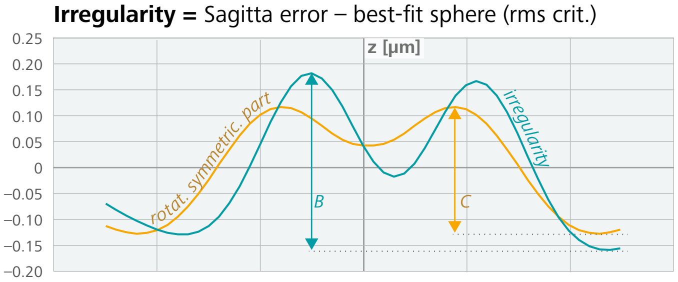
Dt = RMS (sagitta error); A = PV (best-fit sphere)

Sagitta error = surface form deviation – tilt (best linear rms fit)



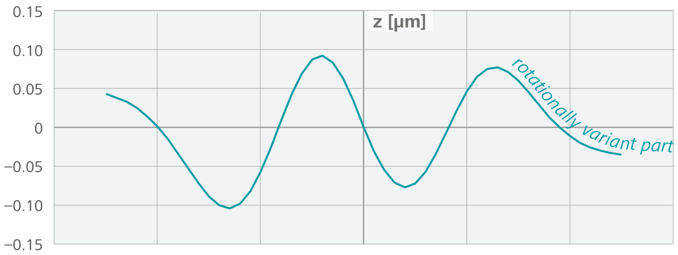
Dt = RMS (sagitta error); A = PV (best-fit sphere)

Irregularity = Sagitta error – best-fit sphere (rms crit.)



Di = RMS (irregularity); B = PV (irregularity); C = PV (rotat. symm. part)

Rotat. variant part = irregularity – rotat. symm. part (rms crit.)



Da = RMS (rotationally variant part)

Only sectional views of the 3D optical surface are shown above.

Syntax

3/ A (B/C) RMSt < Dt; RMSi < Di; RMSa < Da; λ = E

A = Sagitta error ≙ PV of best-fit sphere; [nm] or [fringes]
B = PV of irregularity; [nm] or [fringes]
C = PV of rotationally invariant irregularity; [nm] or [fringes]
Dt = RMS of sagitta error; [nm] or [fringes]
Di = RMS of irregularity; [nm] or [fringes]
Da = RMS of rotationally variant irregularity; [nm] or [fringes]
E = Reference wavelength for fringe spacing; [nm]

Syntax Example

Example	Meaning
3/ – (1); RMS a < 0.1	B = 1 fringe = 1×λ/2 = 0.5×546 nm = 273 nm; Da < 0.1 fringe
3/ 2(1/0.5); λ = 632.8 nm	A = 2 fringe; B = 1 fringe; C = 0.5 fringe; 1 fringe = 0.5×632.8 nm = 316.4 nm
3/ –; RMS t < 100 nm; RMS i < 30 nm	Dt < 100 nm; Di < 30 nm

Fringes to λ

Fringes	λ	λ = 546 nm
1 fringe	λ/2	273 nm
0.5 fringe	λ/4	136.5 nm
0.2 fringe	λ/10	54.6 nm
0.1 fringe	λ/20	27.3 nm
0.04 fringe	λ/50	10.92 nm

Basic Rules

If tolerances are specified without a unit they are given in fringes. According to ISO 10110-5:2016-04 the reference wavelength always has to be specified.
Please note that in older versions of the standard λ = 546 nm (Hg e-line) is assumed if no reference wavelength is specified.

How flat is flat?

A flatness of λ/10 on a substrate 6" in diameter is equal to

- a football on Germany

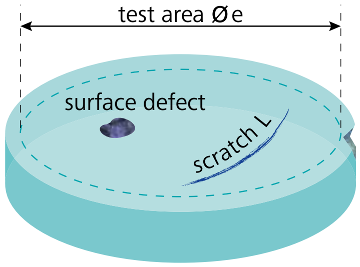
- a 30 µm hair on a football field

Syntax

5/ N×B; C N×B; L N×F; E D

A = Defect area [mm²]
B = $\sqrt{A}$ (grade number) [mm]
D = Length of edge chips [mm]
F = Width of a scratch [mm]
N = Number of imperfections

C = Coating
E = Edge chips
L = Scratch



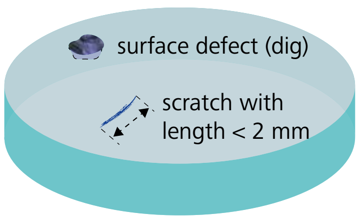
Syntax	Meaning	Example
5/ N×B	Imperfections of the final surface (uncoated or coated)	5/ 2×0.01
5/ N×B; C N×B	All imperfections of the surface; Imperfections of the coating only	5/ 4×0.025; C 2×0.063
5/ L N×F	Additional scratches (length > 2 mm)	5/ L 3x0.1
5/ E D	Additional edge chips	5/ E 1.0

Surface imperfections in this catalog are specified for coated substrates. For more information regarding specification of surface imperfections, especially long scratches and edge chips, please see »LAYERTEC's Guide to Optical Coatings and Optics.«

Digs and Scratches < 2 mm

5/ N×B

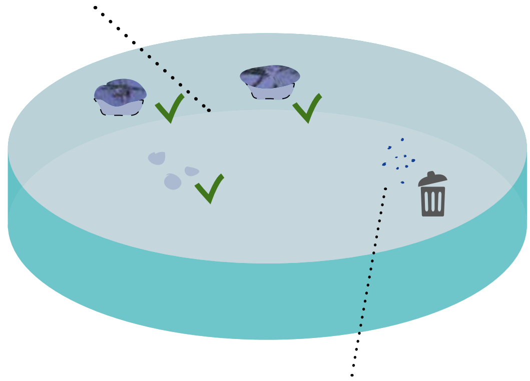
N = Number of imperfections (digs, scratches with length < 2 mm, local substrate imperfections)
B = Grade number = $\sqrt{A}$ [mm]; A: defect area [mm²]
Preferred values for laser optics (not specified by ISO 10110):
B = 0.16, 0.1, 0.063, 0.04, 0.025, 0.016, 0.01



Example

5/ 3×0.063

Maximum of 3 imperfections on the surface with a maximum area A ≤ 0.063×0.063 mm² each. Each permissible defect may be replaced by smaller ones with $A_{total} = A_1 + A_2 + A_3 + \ldots$ as long as the total area does not exceed N × B² mm² (here: 3×0.063² mm²).



Not considered are defects with areas equal to or smaller than A = (**0.16**×0.063)² mm².

Defects may be replaced by smaller ones as long as the specified total defect area is not exceeded: $A_{total} = \sum_i A_i < N \times B^2$. Defects with grade numbers equal to or smaller than **0.16** × B are not considered.

Why to use ISO 10110 rather than MIL

MIL: s/d 20−5

→ max. scratch width < 0.02 mm
→ max. dig size < 0.05 mm
Only dimensions are specified, not numbers of digs/scratches.

With regard to the MIL standard there is »confusion regarding physical sizes of scratches and digs of a given number.« Especially, there is »no consensus interpretation among U.S. optics vendors for the scratch spec.«

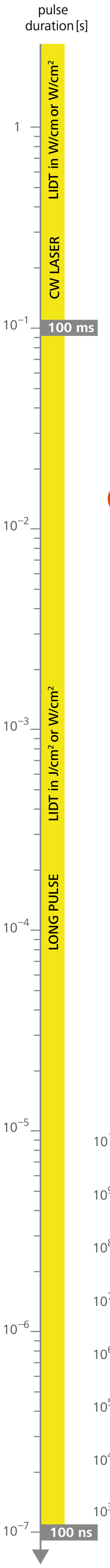
ISO 10110: 5/ 3×0.05 L 1×0.02

→ no more than 3 digs with max. size < 0.05 mm
→ no more than 1 scratch with max. width < 0.02 mm
(scratches with a length below 2 mm are considered as digs)
In contrast, ISO 10110 also includes the maximum number of permissible surface imperfections.

»ISO 10110 is intuitive and easy to understand (regarding) inclusions« as well as »clear and unambiguous (with respect to) surface imperfections«.

Wang et al.; Implementation of ISO 10110 optics drawing standards for the national ignition facility; SPIE, 3782:502-508; 1999

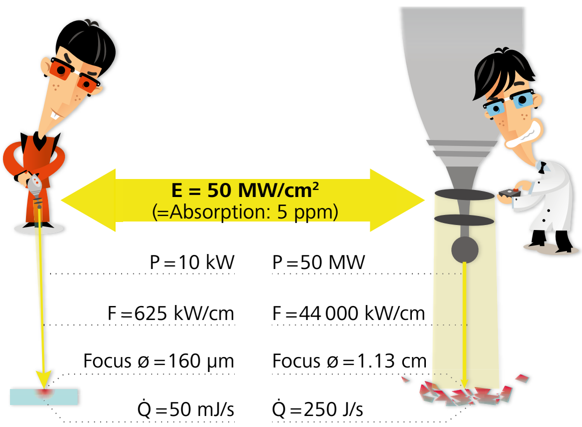
Long Pulse and cw-Lasers



Long pulse with high average power

- Absorption because of impurities, structural defects and intrinsic material properties:
  → Local heating
  → **Thermal destruction**
- LIDT is determined by melting point, heat transfer, purity of the coating

$$LIDT_{cw}\ [kW/cm^2] \sim 10\ LIDT_{long\ pulse}\ [J/cm^2]$$



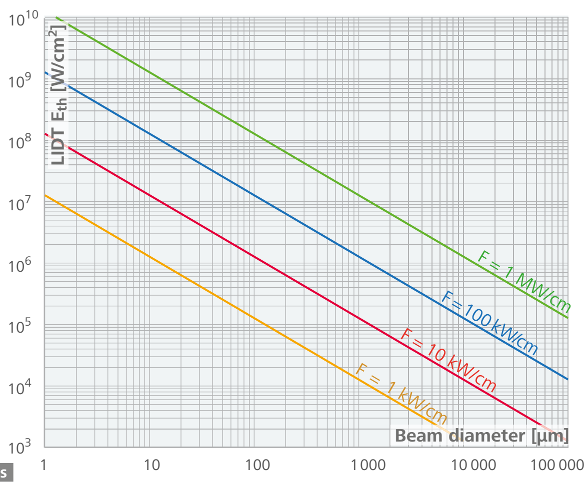
Sufficent heat transport within the substrate – component withstands the laser beam.

Heat buildup caused by insufficient heat transport – component is thermally destroyed.

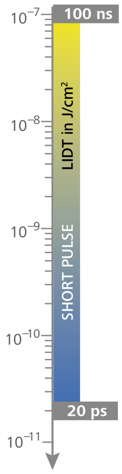
$$F = \frac{\text{beam power}}{\text{beam diameter}} = \frac{P}{d_{eff}}$$

$$d_{eff} = 2\sqrt{\frac{P}{\pi\, E_{max}}}$$

d_{eff} = Effective beam diameter [cm]
E_{max} = Maximal power density [W/cm²]



Short Pulses – Pulse Length Scaling



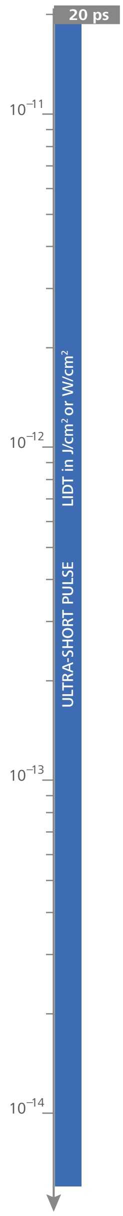
Scaling of LIDT test data to another pulse duration may result in an error of up to 25 %.

$$LIDT \propto \sqrt{\tau} \quad \rightarrow \quad LIDT_1 \approx LIDT_0 \sqrt{\frac{\tau_1}{\tau_0}}$$

20 ps ≤ τ ≤ 100 ns τ = Pulse duration

Ref.: Stuart, B.C., et al.; Laser-induced damage in dielectrics with nano-second to subpicosecond pulses; Phys. Rev. Lett., 74, 2248-2251; 1995

Ultra-Short Pulses – Temporal Pulse Shape



Short pulse with high peak pulse power

- Absorption because of transfer of electrons from valence band to conduction band:
  → Ionization
  → **Electronic destruction**
- LIDT is determined mostly by band gap, i.e. material properties

Towards shorter pulses intensity becomes the crucial quantity for LIDT.

Intensity [W/cm²]:

$$I = q_t\, q_A\, \frac{P}{A\, t\, R}$$

Fluence [J/cm²]:

$$E = q_A\, \frac{P}{A\, R}$$

q_A = Lateral beam quality factor
q_t = Temporal beam quality factor
A = Half width area
P = Average beam power
R = Repetition rate
t = Half width pulse duration

Quality factors for stating of LIDT values

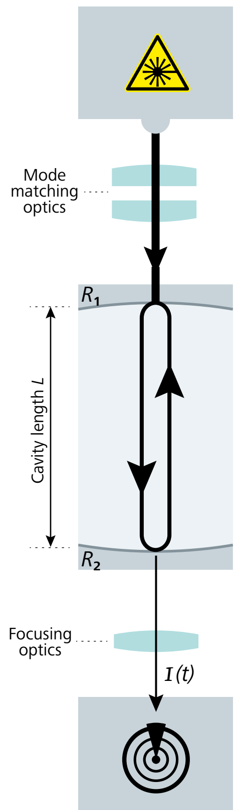
- Temporal pulse shape q_t: fraction of energy within temporal FWHM
- Lateral beam shape q_A: fraction of energy within lateral FWHM

Comparison of fs-LIDT values, measured with different setups, can be critical because each fs setup has a very unique pulse shape.

Beam diameter is important

- LIDT is usually normalized to beam spot area, but a larger beam will likely illuminate more defects. This may result in a smaller damage threshold.

Principal Optical CRD-Setup

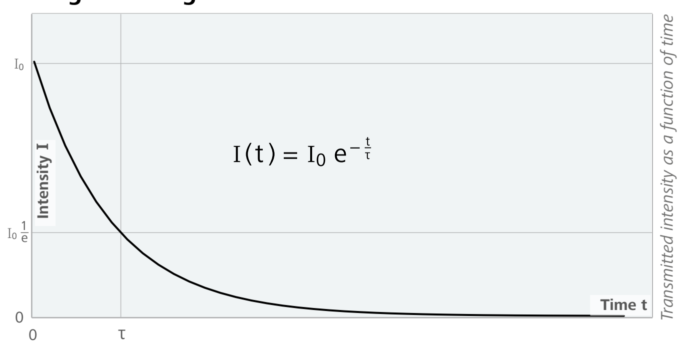


Pulsed light source
(e.g.: Q-switched laser, optical parametric oscillator)

Cavity

Photodetector
measures intensity $I(t)$

Ring-Down Signal



End of Laser Pulse

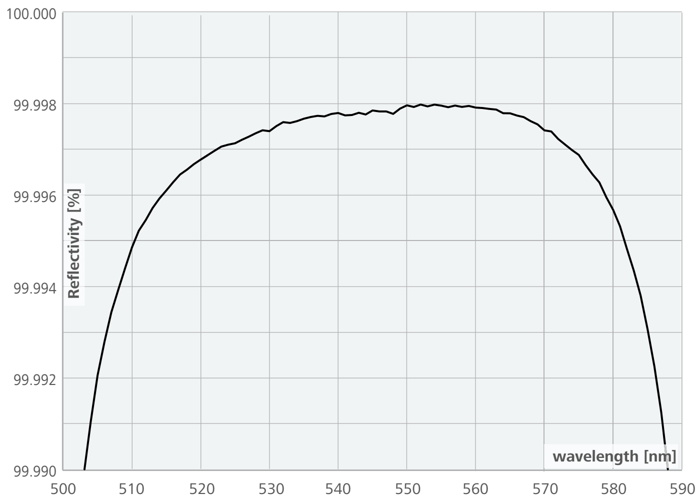
- Intensity decays exponentially
- Measurement of the time it takes for the intensity to decay to 1/e of its initial value
- Cavity decay time τ »Ring-Down Time« (~ms)

Calculating Reflectivities (assuming no intra-cavity losses)

$$\sqrt{R_1 \times R_2} = 1 - \frac{L}{c\tau}$$

c = Speed of light
L = Cavity length
$\mathbf{R_{1,2}}$ = Reflectivity of the cavity mirrors
τ = Cavity decay time

Spectrally resolved CRD Measurement



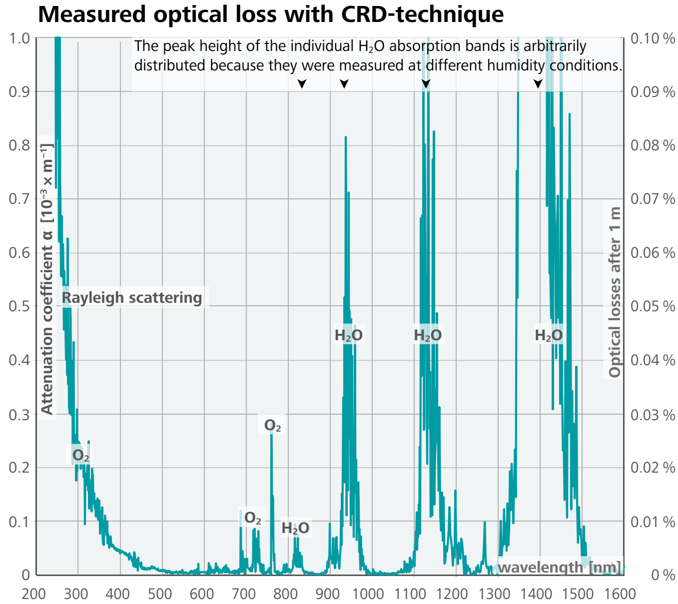
Spectroscopy

Suitable for gaseous samples which absorb light at specific wavelengths: To determine the optical loss (absorption and scattering), first measure in vacuum, then measure with sample-filled cavity. Calculate the difference afterwards.

$$V = \frac{L}{c}\left(\frac{1}{\tau_1} - \frac{1}{\tau_0}\right)$$

V = Optical loss between the cavity mirrors
c = Speed of light
L = Cavity length
$\boldsymbol{\tau_0}$ = Decay time of evacuated cavity
$\boldsymbol{\tau_1}$ = Decay time of cavity with sample between R_1 and R_2

Measured optical loss with CRD-technique



Measured optical loss spectrum of ambient air obtained with the LAYERTEC CRD Setup. For this measurement a total of 18 different pairs of CRD Low Loss Mirrors were employed.

Measurement of decay rate rather than absolute absorbance
→ no errors due to light-source drift between measurements

Large number of cycles in the cavity
→ long path length (~km)
→ very sensitive (mole fractions down to parts per trillion).

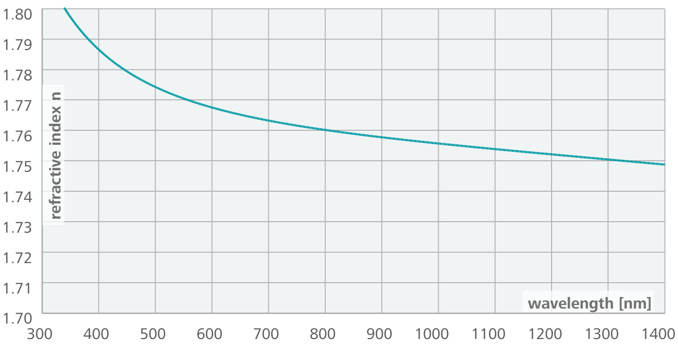
Group Delay Dispersion (GDD)

Basics
The velocity of each wavelength lambda is a function of the refractive index n.

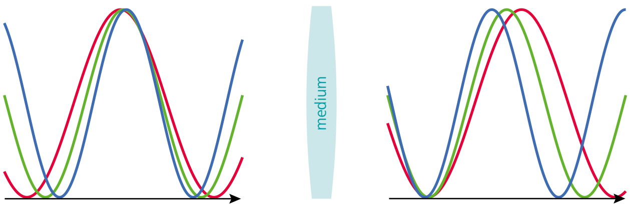
$$v(\lambda) = \frac{c_0}{n(\lambda)}$$

c_0 = Speed of light in vacuum
n = refractive index
v = velocity

Example (Sapphire)



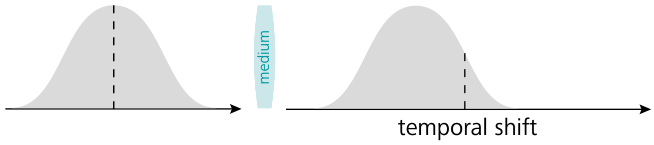
As you can see in the example above, longer wavelengths are faster than shorter ones. This is called »normal dispersion«.



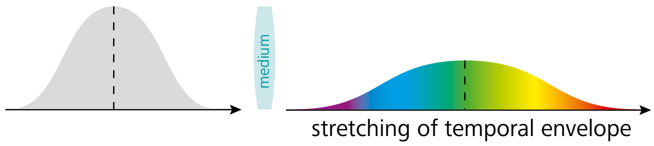
Result
The propagation of a compressed laser pulse through a dispersive medium (gasses, crystals, glass,…) will change the temporal pulse shape.

Reference Pulse

Group Delay (GD)



Group Delay Dispersion (GDD)



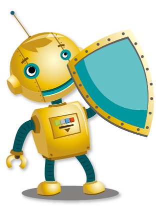
GDD > 0 (Normal Dispersion)
→ Shorter wavelengths propagate slower than longer wavelengths (»red is faster than blue«)

GDD < 0 (Anomalous Dispersion)
→ Shorter wavelengths propagate faster than longer wavelengths (»blue is faster than red«)

Protected vs. Unprotected Metallic Coatings

Metallic coatings provide high reflectance over a large bandwidth with negligible GDD. However, metallic coatings may oxidate (e.g. silver) or be too soft to be cleaned (e.g. gold, aluminum).

In order to overcome these restrictions, protective dielectric layers are recommended. Metallic coatings without such a dielectric overcoating are referred to as »unprotected«.

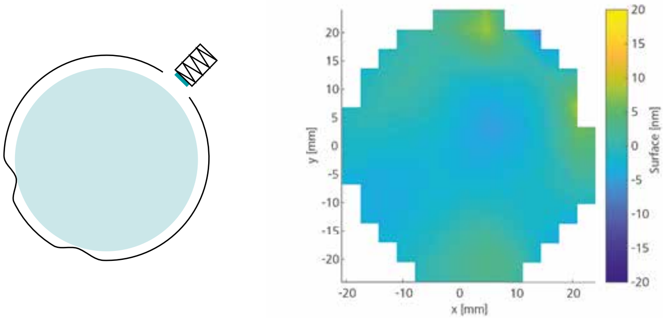


Please note that a protective layer can introduce small amounts of GDD or modify the interference contrast very slightly.

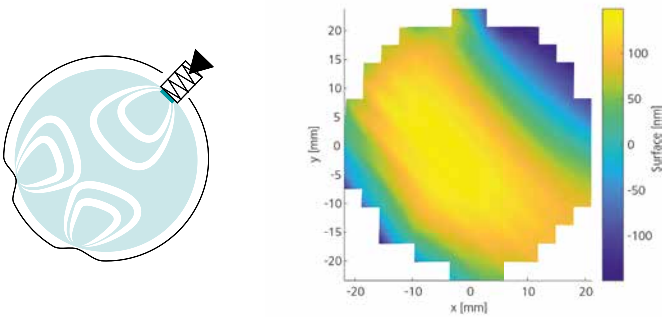
How to Mount Optics

While mounting optics mechanical stress is introduced into the substrate, which in turn can deform the mirror surface.

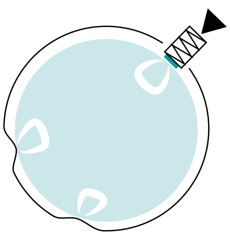
3-point mount without tightening
Optics whithout stress, but it might fall out if tipped.



3-point mount with excessive tightening
Optics with too much mechanical stress.

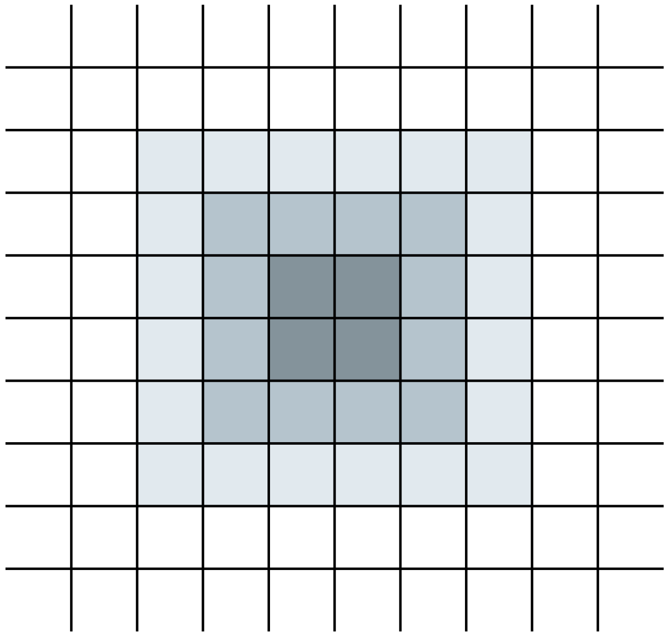


3-point mount with appropriate tightening
Best option. LAYERTEC recommends to reduce the thightening of the grub screw slightly after mounting and positioning the optics.



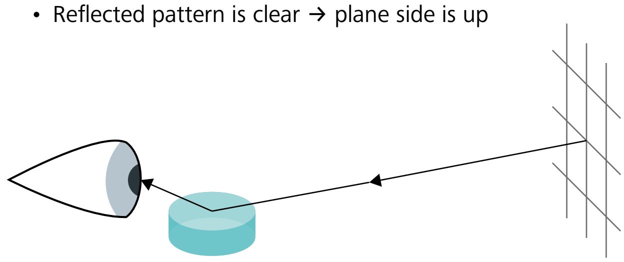
TAKE CARE WITH RING MOUNTS!
By using ring mounts, you can damage your optics. Even small friction can splinter the coating and render it unusable. Optics in a ring mount may also seize up easily during assembly.

Identification of Weakly Curved Substrates



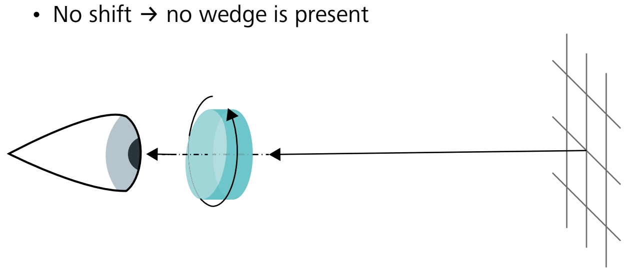
Finding the curved side
Hold optical element close to your eye. Watch the reflection of the pattern in the optical surface (focusing to a long distance).

- Reflected pattern is blurred → curved side is up
- Reflected pattern is clear → plane side is up



Is the substrate wedged?
Watch pattern through optical element. Rotate optical element around surface normal.

- Pattern shifts with respect to surrounding area → optical element is wedged
- No shift → no wedge is present

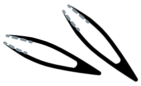


Workspace

flow box

clean workspace, e.g. flow box

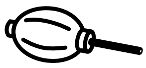
optical cleaning tissue (LAYERTEC recommends Whatman®)



non-slip tweezers (e.g. with cork)

spectroscopy grade acetone in a suitable bottle

latex/nitrile gloves (powder free)

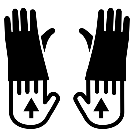


air blower

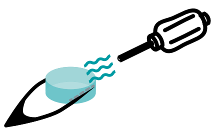
Precleaning

1. Clean hands with soap.

2. Dry hands.

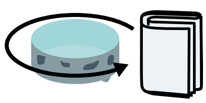


3. Use appropriate gloves.



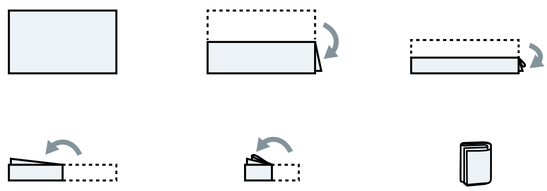
4. Blow off dust from all sides.

5. Moisten tissue with acetone. Do not contaminate the bottle! Compared to alcohol, acetone is the better solvent. It evaporates quickly and thus reduces the formation of streaks significantly.



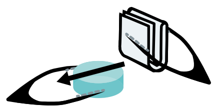
6. Remove coarse dirt from edge and chamfer of substrate.

Cleaning

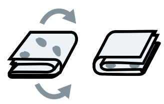


1. First fold new tissue along the long side several times. Then fold across until you have a round edge.

2. Moisten tissue with acetone. Only moist, not dripping wet. Otherwise, there will be streaks.



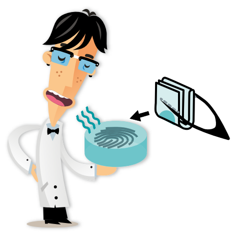
3. Grab moistened tissue or use tweezer. Hold sample with second tweezer. Slide tissue from one edge of the sample to the other once.



4. Do not use the same part of the tissue again. Turn tissue inside out (at most once!). If the surface is not clean then, use a new tissue.

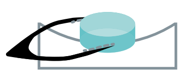
Attention: Use acetone only for sputtered surfaces!

Little Hints

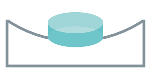


- Fingerprints on sputtered coatings: Moisten surface by breathing on it, slide acetone-moistened tissue over surface as long as water film is still visible. – Never do this with hygroscopic substrates (CaF_2,…)!

- Clean concave surfaces using a less folded tissue that can be slightly bent in the center. Use your thumb to gently press the tissue onto the curved surface.



- When cleaning, fix small samples on a concave support (polished, clean glass) using tweezers.



- Store samples on concave polished glass support that has been cleaned using tissue+acetone.

I. Scope

1.1 The General Terms and Conditions of Sale set out in the following shall apply to all products and services to be provided by LAYERTEC GmbH (hereinafter called »LAYERTEC«). These General Terms and Conditions of Sale shall apply only to contracts with entrepreneurs in the sense of section 310 para. 1 BGB (German Civil Code) in conjunction with section 14 BGB.

1.2 Unless LAYERTEC has expressly agreed to them, any customer's general terms and conditions shall not become part of the contract. This shall apply also where LAYERTEC has not expressly contradicted, or where it performs deliveries or services without having contradicted, the customer's general terms and conditions.

1.3 These General Terms and Conditions of Sale shall be valid for deliveries and services in conjunction with the acknowledgement of a purchase order or a quotation by LAYERTEC.

1.4. The contract language shall be German. These General Terms and Conditions of Sale are made available in both German and English. In case of any discrepancy in the meaning of individual stipulations the German language version shall take precedence exclusively.

II. Binding Agreement / Article of Sale / Copyright / Samples – Free Issue Materials

2.1 Unless expressly stated otherwise, any offer made by LAYERTEC shall be subject to confirmation and not binding and be merely construed as inviting offers to purchase/purchase orders from the customer.
Insofar as LAYERTEC makes any binding quotation to the customer and unless stated otherwise by LAYERTEC in any given case, LAYERTEC shall be bound by its quotation for one month from the quoting date. The contract shall be deemed agreed upon and binding if the customer accepts the LAYERTEC quotation within the acceptance period. In this case, following acceptance by the customer, LAYERTEC shall send to the customer a written acknowledgement of the order.

2.2 Where a customer submits to LAYERTEC an offer to purchase without being in receipt of any LAYERTEC quotation, LAYERTEC may on the basis of these General Terms and Conditions of Sale accept the customer's purchase order within one month of receipt of the order at LAYERTEC. In general, this is done by means of a written acknowledgement of the order.

2.3 The subject of the delivery or service to be provided by LAYERTEC is the product named in the order acknowledgement by LAYERTEC and in the specifications referred to in the acknowledgement.
Any publicity brochures or similar information on the homepage of LAYERTEC, etc., and documentation or performance characteristics on which the offer or the order acknowledgement by LAYERTEC is based, such as figures, drawings, information as to dimensions and weight or intended process technology for the deliveries and services of LAYERTEC as a rule constitute approximations only and are not binding, unless they are expressly declared binding. Properties of any samples or patterns, etc., shall only become part of the contract where this is expressly agreed upon. The customer shall have no right to pass on any samples or patterns, etc., unless LAYERTEC has given its consent or performance of the contract necessitates it.

2.4 To the extent that LAYERTEC has not by contract or under compelling statutory regulations expressly granted to the customer any rights to figures, drawings, software, cost estimates, knowhow, or other data and materials (collectively »information«), LAYERTEC shall retain any and all rights of ownership and copyright with respect to such information. Without the written consent by LAYERTEC such information must not be disclosed to any third party and must be safeguarded by appropriate means against any unauthorised access by third parties. This applies in particular to all "confidential" information. The customer must not use information of LAYERTEC, nor pass it on to any third party, for any purpose other than those agreed upon or assumed in the contract with LAYERTEC. Furthermore, no information must be passed on without the customer requiring such third party to sign a written confidentiality agreement in accordance with this section.

2.5 Any provision by the customer of samples for the manufacture of the product or of free issue materials, especially of material to be coated, shall be free of charge for LAYERTEC. On receipt, LAYERTEC will check samples and free issue materials for complete quantity only. LAYERTEC is not obligated to check quality or functionality. Except as stipulated in section IX. LAYERTEC shall not assume any liability for samples and free issue materials. Any samples and free issue materials not used for the contractual purposes will be returned together with the delivery of the product purchased.

III. Delivery / Default / Passing of Risk

3.1 Delivery dates and lead times shall be agreed upon for each case specifically and shall not be binding unless they are expressly stated as »binding«. LAYERTEC will strive to meet any time/date not expressly agreed upon as binding. Lead times shall commence to run on the date the acknowledgement of the order is received, but not before all the details of the execution of the service to be rendered or the manufacture of the product have been agreed upon.
The delivery dates or lead times agreed upon shall slip or be postponed in the event that any industrial action should take place at LAYERTEC or any of its suppliers relevant to the supply of the product or the rendering of the service to the customer. Also, the delivery dates or lead times shall slip or be postponed in the event of any unexpected circumstances occurring that are beyond the control of LAYERTEC, e.g. sub-suppliers in delay, late delivery of materials, denial of official shipping permits, government action, confiscation of the contractual product, unrest, sabotage, lack of material or power, as long as such circumstances are relevant to the delivery of the product or service to the customer and not attributable to LAYERTEC. In all the above cases leading to extended lead time or postponed delivery date, the lead time shall be extended or the delivery date postponed by the duration of the impeding circumstances. This shall also apply where LAYERTEC is in delay with its delivery or service at the time such circumstances occur.

3.2 Should the lead time be extended or delivery date be postponed in accordance with item 3.1 para. 2 by more than three months, the customer shall have the right to set a reasonable period of grace for LAYERTEC to perform its delivery or service. If LAYERTEC fails to deliver within the period allowed, the customer shall have the right to terminate such part of the contract as is not yet performed. Should LAYERTEC have delivered part of the contract performance, the customer shall not have the right to terminate the entire contract, unless the customer is not interested in the part already delivered.

3.3 Should the customer request any changes to the product or should changes to the product become necessary in accordance with item 6.1 or 6.2, the lead time shall be extended or the delivery date postponed by such period of time as is required for making the change to the product.

3.4 Should the customer delay or fail to perform any action of cooperation necessary on its part for the product or service to be provided, then the lead time shall be extended or delivery date shall be postponed by such period of time as the customer takes to rectify the cooperation omitted on its part. Consequently, the grace period shall start at the time the cooperation would have been due according to the contractual agreement. If no time has been specified for the action of cooperation to be performed the grace period shall commence with the receipt by the customer of LAYERTEC's request for cooperation. The grace period ends with the completion of the action of cooperation by the customer.

3.5 Unless stipulated otherwise, delivery of the product or service shall be ex works. Unless otherwise agreed upon, LAYERTEC shall at the customer's expense purchase goods in transit insurance for reasonable cover at reasonable cost.

3.6 Instalment delivery or service shall be allowed to the extent deemed acceptable to the customer.

3.7 The risk of accidental loss or accidental deterioration of the product shall pass to the customer at the time the product is handed over to the customer or to the carrier employed by the customer. This shall apply to instalments or consignments as soon as the respective instalment or consignment is handed over.
Should the customer fail to take delivery, the risk of accidental loss or accidental deterioration of the product shall pass to the customer at the time the customer fails to take delivery.

3.8 In the event of culpable failure on the part of the customer to take delivery or perform any other duty to cooperate, LAYERTEC shall be entitled to claim compensation for the resulting damage, in particular the profit lost including extra expenditure, if any.

3.9 Should LAYERTEC fail to deliver the product or service when due, the customer may set a reasonable period of at least two weeks within which LAYERTEC is to deliver. Upon futile expiration of such period the customer shall be entitled to terminate the contract. In this case the customer shall only have the right to claim damages for non-performance if such failure to perform was caused by intent or culpable negligence on the part of LAYERTEC, its legal representatives or agents. Damages for non-performance shall be limited to the loss typically predictable in such case.

IV. Price and Terms of Payment

4.1 All prices shall be deemed net prices exclusive of value added tax at the current statutory rate. Prices are ex works inclusive of normal packaging. Unless otherwise agreed upon, the amount invoiced shall be due for payment within 30 calendar days of the date the invoice is received.
Where the product is modified at the customer's request, the customer shall bear the resulting costs. Where the product is specifically packaged or insured at the customer's request, the customer shall bear the resulting costs.
In the event of any increase in material procurement costs, labour costs and costs of fringe benefits, energy costs and costs under environmental regulations, LAYERTEC shall have the right to unilaterally raise the purchase price reasonably (section 315 BGB (German Civil Code)) on the proviso that there are more than four months between the signing of the contract and the delivery.

4.2 In the case of export delivery the customer shall bear all taxes, customs duties and dues payable in conjunction with the sales contract outside the Federal Republic of Germany.

4.3 Insofar as the purchase price is not paid by cash deposit LAYERTEC may request reasonable collateral for the payment of the purchase price (e.g. documentary credit, bank guarantee, letter of credit) prior to despatch.

4.4. If and when the realisable value of all the secured claims LAYERTEC is entitled to, including the rights resulting from the extended retention of title under section V., exceeds the amount of all secured claims in the long term by more than 30 %, LAYERTEC shall release an appropriate part of the collateral upon the customer's request. It shall be LAYERTEC's choice what collateral to release.

4.5 The customer shall not be entitled to deduct any counterclaim from the amounts payable to LAYERTEC, unless such counterclaim is undisputed or has been confirmed by final court decision. Moreover, the customer shall not exercise any right to hold back money, unless its counterclaim is based on the same contractual relationship.

V. Retention of Title

5.1 The purpose of the retention of title agreed upon in the following is the assurance of all present and future claims receivable by LAYERTEC from the customer out of any supply or service contracts between the parties hereto (including any current account balance restricted to this business relationship).

5.2 LAYERTEC retains legal ownership of the product provided to the customer by LAYERTEC until all the secured claims have been paid up in full. The product, and in its place the goods subjected to retention of title under this contract will be referred to as the reserved goods in the following.

5.3 The customer shall store the reserved goods for LAYERTEC free of charge. The customer shall treat the reserved goods with care and purchase at its own cost fire, water damage and theft insurance for adequate replacement value cover.

5.4 The customer shall be entitled to process and sell the reserved goods in its normal course of business. The goods must not be pledged or assigned as security.

5.5 Where the reserved goods are processed by the customer, the processing shall take place in the name and for the account of LAYERTEC as the manufacturer and LAYERTEC directly acquires legal ownership or, where the processing involves materials of several owners or where the value of the processed item exceeds that of the reserved goods, an interest (fractional ownership) in the newly manufactured goods at the ratio of the value of the reserved goods to the value of the new goods. In case no such acquisition of ownership by LAYERTEC should occur, the customer hereby assigns to LAYERTEC as security its future title or interest at the above ratio in the new goods.

Where the reserved goods will be united or inseparably mixed with other goods to form mixed goods and any of the other goods are to be deemed the main goods, the customer, to the extent it owns the main goods, shall assign to LAYERTEC proportional interest in the mixed goods at the ratio named in sentence 1. LAYERTEC hereby accepts such assignment.

5.6 In order to provide security in case the reserved goods are sold on, the customer herewith assigns to LAYERTEC the resulting receivables from such purchaser, in proportion to the interest where LAYERTEC owns an interest in the reserved goods. The same shall apply to any other claims in place of the reserved goods or otherwise resulting with respect to the reserved goods, such as insurance claims or tort claims in the event of loss or destruction. LAYERTEC accepts this assignment.
LAYERTEC grants the customer revocable power to collect in its own name for the account of LAYERTEC the amounts receivable assigned to LAYERTEC. Should the customer act in breach of this contract, in particular should the customer fail to make payment when due, LAYERTEC may revoke this power to collect payments and require the customer to disclose to LAYERTEC the amounts receivable assigned and the respective debtors, to notify the respective debtors of the assignment made, and to provide to LAYERTEC all documentation and information LAYERTEC requires for asserting its claims.

5.7 Should any third party seize the reserved goods, especially by attachment, the customer shall immediately point out to such third party the legal ownership of LAYERTEC and shall notify LAYERTEC so that it may assert its title rights. To the extent that such third party should not be able to remunerate the legal and other costs incurred by LAYERTEC in this case, the customer shall be liable to pay such costs.

5.8 Should the customer act in breach of this contract, in particular should the customer fail to make payment when due, LAYERTEC shall have the right to repossess the reserved goods after setting a reasonable grace period for the contractual obligations to be performed. The costs of transport for the purpose of repossession shall be borne by the customer. Repossession by LAYERTEC of the reserved goods constitutes termination of the contract. Seizure of the reserved goods by LAYERTEC also constitutes termination of the contract. Reserved goods repossessed by LAYERTEC may be utilised by LAYERTEC. The revenue from such utilisation, after LAYERTEC has deducted a reasonable amount for the utilisation costs, shall be deducted against such amounts as the customer owes to LAYERTEC. If LAYERTEC terminates the contract because the customer is in breach of contract, especially in default of payment, LAYERTEC shall be entitled to demand the reserved goods to be returned.

5.9 Should a retention of title clause in favour of LAYERTEC be wholly or partly impossible or ineffective for legal or factual reasons, the customer shall be obliged, at the request of LAYERTEC, to create a legal and effective assurance (e.g. a lien on the object of purchase) for LAYERTEC. Should there be a variety of securities to be considered, then LAYERTEC shall have the choice as to what security is to be registered. LAYERTEC shall decide in its reasonable discretion.

5.10 The customer undertakes not to cause any changes to the specifications of the product without the prior written consent of LAYERTEC and not to attach to it or use in connection with the product any additional equipment not approved by LAYERTEC for as long as legal ownership of the reserved goods has not yet passed to the customer.

VI. Change to Specifications

6.1 Up to the delivery of the object of purchase LAYERTEC may change specifications of the product as long as such changes are necessary in order to manufacture a flawless product, do not alter essential technical characteristics of the object of purchase and are deemed acceptable to the customer. Also, the customer shall agree to further changes suggested by LAYERTEC, insofar as these are acceptable to the customer. Where such changes would cause the purchase price to increase, this shall be agreed upon between the parties prior to the execution of such changes.
Moreover, up to the delivery of the product, LAYERTEC may change the process technology intended for manufacturing the product at the time the order was placed, insofar as this will not change essential technical characteristics of the object of purchase and such changes are deemed acceptable to the customer.

6.2 Any changes to specifications of the product, of accessories or other services, which prior to their delivery should become necessary because of statutory regulations or official orders outside the Federal Republic of Germany shall be carried out by LAYERTEC at the customer's expense.

VII. Warranty

7.1 The customer shall check the product immediately on delivery. The customer shall report by written notification any obvious defect immediately and no later than within seven days of delivery, and any hidden defect immediately and no later than within seven days of its detection.

7.2 LAYERTEC may at its discretion repair or replace any defective delivery or service within a reasonable grace period. In the event that such repair or replacement should fail twice, the customer may at its discretion reduce the purchase price or terminate the contract.

7.3 Unless otherwise agreed upon, the warranty period for the product including any accessories bought with it is 12 months from the date of delivery.
No liability shall be assumed for normal wear and tear. Moreover, LAYERTEC shall not be responsible for the applicability of the product for any particular use or purpose, unless this is expressly agreed upon between the parties. Furthermore LAYERTEC shall not be liable for any suitability of the product, insofar as the product is not used for its ordinary use, unless this is expressly agreed upon between the parties.

7.4 LAYERTEC shall not assume responsibility or warranty for any defect or damage to the product, if the customer itself or with the help of any third party not instructed or authorised by LAYERTEC has carried out any repair, rectification or installation work on the product, the customer has failed to observe the manufacturer's instructions or has used the product inappropriately, unless the customer disproves the substantiated assertion by LAYERTEC that the defect or damage concerned is attributable to and was caused by such repair, rectification or installation work by the customer or any unauthorised third party, failure to observe the manufacturer's instructions or any inappropriate use etc. of the product.

7.5. Where LAYERTEC provides coating services on materials to be coated or other free issue materials provided by the customer, LAYERTEC shall not be liable for any defect in the coating services insofar as such defect is attributable to the material for coating or any other free issue material provided by the customer.

7.6 The costs of any unjustified notice of defects by the customer, in particular the costs of inspecting the defect notified, shall be borne by the customer.

VIII. Intellectual Property Rights; Defect of Title

Unless otherwise agreed upon, LAYERTEC shall provide the product free of any third party industrial trademark or copyrights (hereinafter: intellectual property rights). Should any third party lodge any justified claim against the customer for infringement of intellectual property rights by its contractual use of products or services provided by LAYERTEC, then LAYERTEC shall be liable to the customer as follows:

8.1. LAYERTEC shall at its discretion and at its own cost obtain the right of use for the products or services concerned or, where deemed acceptable to the customer, modify or replace the product or services in such a way that there is no infringement of the intellectual property right.
If this is not possible at reasonable terms for LAYERTEC, the customer shall be entitled to make use of its statutory rights of termination or price reduction. The customer shall not be entitled to claim compensation for futile expenditure.
For any obligation to pay damages refer to section IX.

8.2. The above obligations on the part of LAYERTEC shall not be valid unless the customer notifies LAYERTEC forthwith in writing about any claim lodged by any third party and all defensive measures and settlement conferences are reserved to LAYERTEC.

The customer shall not have the right to acknowledge to the third party any infringement of intellectual property rights, unless LAYERTEC has agreed to such acknowledgement. In the event that the customer should discontinue the use of the products or services for mitigation or other reasons, the customer shall be obliged to point out to the third party that its discontinuation of the use does not constitute any acknowledgement of an infringement of intellectual property rights.

8.3. Any claim on the part of the customer shall be precluded where any infringement of intellectual property rights is attributable to the customer or where infringements of intellectual property rights have been caused by design documentation or any other specific demand made by the customer with respect to the product or service or have been caused by inappropriate use, or by the customer altering the product or service or using it together with products not supplied by LAYERTEC.

8.4. The stipulations of section VII. shall be applied accordingly with respect to other defects of title. The customer shall have no further right to lodge any claim beyond those in sections VIII. and VII. against LAYERTEC on grounds of any defect of title.

IX. Damages

9.1 LAYERTEC shall not be liable in cases of ordinary or slight negligence.

9.2 In the event of gross negligence the liability of LAYERTEC shall be limited to such damage as can typically be expected to occur.

9.3 The disclaimer and limitation of liability under items 9.1 and 9.2 shall not apply where the liability of LAYERTEC is caused by intent, by the absence of any property promised or guaranteed, by mandatory liability under product liability legislation, injury to life, limb or health, violation of fundamental contractual obligations (obligations required for the proper execution of the contract and the performance of which the customer had a right to rely upon) or by any other legally mandatory liability.

9.4 The stipulations in items 9.1 to 9.3 shall also apply to any claims of the customer against employees or agents of LAYERTEC.

9.5 The stipulations in items 9.1 to 9.3 shall also apply where legal representatives or assistants of LAYERTEC have been acting on behalf of LAYERTEC.

X. Miscellaneous

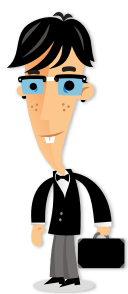
10.1 Any and all agreements between LAYERTEC and the customer shall be made in writing. Any waiver of this requirement of written form shall be made in writing only.

10.2 Without the prior consent of the party concerned, both parties to the contract must neither utilise nor disclose to any third party any of the other party's trade secrets or confidential information which have become known to them during their business relationship, unless such trade secret or confidential information is in the public domain. This shall also apply after the execution of this contract.

10.3 This contract shall be governed by the law of the Federal Republic of Germany; the provisions of the United Nations Convention on Contracts for the International Sale of Goods dated 11/04/1980 shall not be applied.

10.4 The exclusive legal venue for any claims arising out of this contract shall be Weimar, unless there is any statutory exclusive legal venue. Place of performance for all deliveries, services and payments shall be Mellingen.

10.5 Should any stipulation of this contract be or become void in whole or in part, or should there be any omission in this agreement, this shall not affect the validity of the remaining stipulations of this contract.



Volume Discount

LAYERTEC offers a volume discount for standard items from five pieces up.

Pieces	Discount
from 5 pieces up	5 %
from 10 pieces up	10 %
from 20 pieces up	20 %

Payment Methods

LAYERTEC accepts the following payment methods:

- Credit card (VISA, Mastercard)
- Wire transfer

LAYERTEC reserves the right to request advance payment.

Shipment Terms and Costs

LAYERTEC ships your components from Germany. If not requested otherwise, UPS delivery service with DAT Standard according to Incoterms 2010 is used. This standard includes the following conditions:

- The vendor pays the shipping costs.
- The customer pays duty and taxes.
- The item is fully insured from doorstep to doorstep.

Destination	Shipping fee
Within Germany	10 €
EU member states	25 €
Other european countries, USA, Canada, Japan	40 €
China	80 €
Other countries than mentioned above	70 €

The shipping time with UPS worldwide is usually less than 1 week. On request, it is possible to choose another delivery service (e.g. FedEx or DHL). If you choose another shipping service, please consider that shipping fees and the average shipping time may differ.

Please make sure to mention the complete shipping address of your company or research facility. If available please also disclose the optional VAT-number and the account number of your preferred delivery service.

If you have further questions please feel free to contact us.

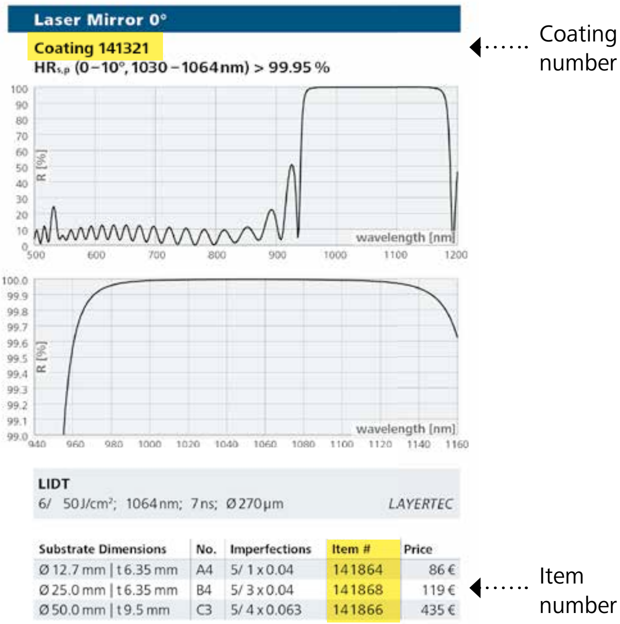
Phone: **+49 (0)36453 744 0**
E-mail: **info@layertec.de**

Phone (US): +1 707 48 10 216
E-mail (US): ussales@layertec.com

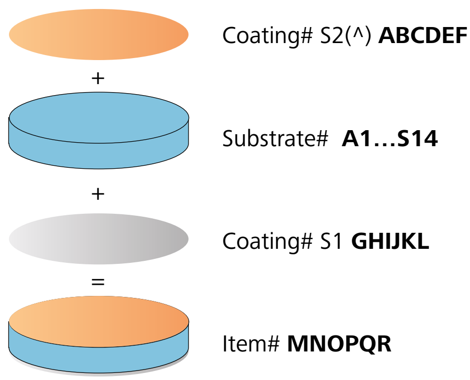
LAYERTEC Item Numbers

To order an optical component, you need to tell us the item number. Please note, that the item number is not identical with the coating number.

Example:
One coating number 141321 applied on 3 different substrates

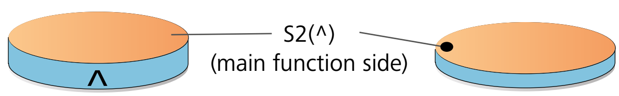


How LAYERTEC item numbers are generated



Main Function Side: S2(^)

LAYERTEC marks the main function side eiter with an arrow or a dot (items thinner than 1 mm). On items with edge thickness above 1 mm, also the coating batch is included. For all fused silica substrates, laser engraving is used.



About the Company

LAYERTEC is a German one-stop shop for optical high-end laser components. The company combines a variety of coating techniques with precision optics manufacturing. This allows LAYERTEC to produce plane, spherical or aspherical optics and to process them with magnetron or ion beam sputtering, thermal or ion assisted e-beam evaporation. The wavelength range extends from 130 nm (VUV) to 6 µm (NIR). Examples are ultrafast optics or high-power laser mirrors, with substrates ranging from small pieces to Ø 600 mm.

LAYERTEC customizes optical components ensuring optimum performance and cost efficiency. The variety in size and technology of the coating equipment allows high-volume fabrication as well as flexible prototype manufacturing for research and development.

LAYERTEC was established in 1990 as a spin-off of the Friedrich-Schiller-University Jena, Germany. The customers are reputable laser manufacturers as well as universities and research institutes worldwide. Many important developments in laser technology of the past years have been enabled by LAYERTEC products.

Today, 40 coating machines are available, employing various sputtering and evaporation techniques. More than 300 employees work in our precision optics facility and coating laboratories and are available to discuss your ideas. Please do not hesitate to contact us for a quotation or a discussion regarding your special requirement, even if it is not mentioned in this catalog.

Some LAYERTEC Products in Scientific Publications

Complex

»Low-loss VIS/IR-XUV beam splitter for high-power applications«; by: I. Pupeza et.al.; in: *Optics Express Vol. 19, Issue 13, pp. 12108-12118; 2011*

»Tunable spectral filters for precise gain control in ultra-short pulse laser systems«; by: S. Keppler et.al.; in: *Optics Letters Vol. 41, Issue 20, pp. 4708-4711; 2016*

UV

»NO PLIF Visualizations of the Orion Capsule in LENS-1«; by: C. Combs et.al.; at: *https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20130000846.pdf, page 5*

VUV/Ultrafast

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Low Loss

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High-Power/LL/Ultrafast

»Enhancement cavities for few-cycle pulses«; by: N. Lilienfein et.al.; in: *Optics Letters Vol. 42, Issue 2, pp. 271-274; 2017*

Chirped Mirror

»Generation of spectrally stable 6.5-fs visible pulses via filamentation in krypton«; by: K. Kaneshima et.al.; in: *High Power Laser Science and Engineering, Vol. 4, e17; 2016*

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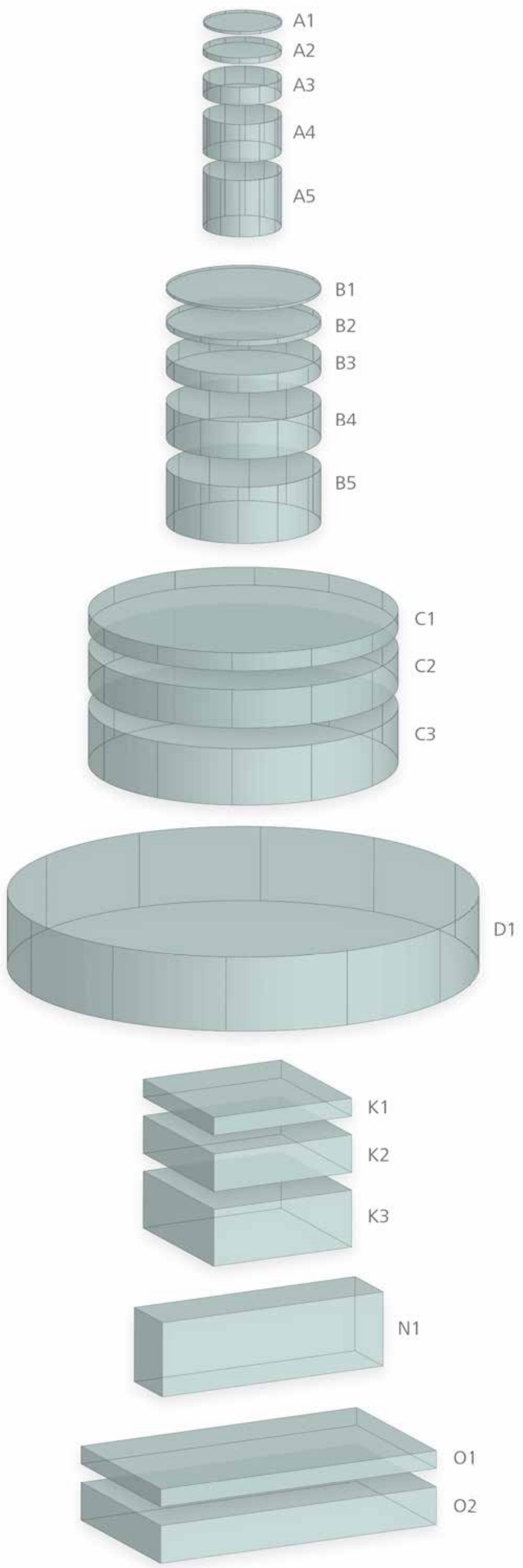
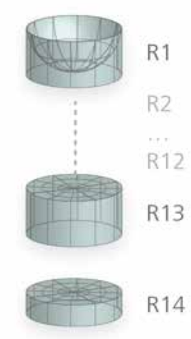


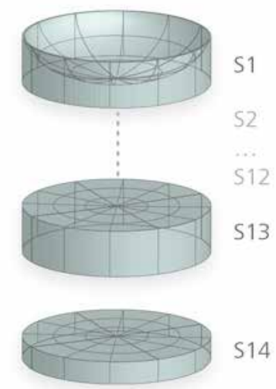
No.	Material	Length/Diameter	Thickness	S1	S2	//	Clear Aperture Øe	Uncoated Surface Form Tolerance with λ = 546 nm			No.
A1	Fused Silica	Ø 12.7 mm (-0.1 mm)	0.5 mm (±0.1 mm)	plane	plane	< 5'	10 mm	3 / 137 nm (55 nm)	3 / 0.5 (0.2)	λ/10 reg.	**A1**
A2	Fused Silica	Ø 12.7 mm (-0.1 mm)	1.0 mm (±0.1 mm)					3 / 137 nm (55 nm)	3 / 0.5 (0.2)	λ/10 reg.	**A2**
A3	Fused Silica	Ø 12.7 mm (-0.1 mm)	3.05 mm (±0.1 mm)					3 / 55 nm (55 nm)	3 / 0.2 (0.2)	λ/10	**A3**
A3 e	Sapphire	Ø 12.7 mm (-0.1 mm)	3.0 mm (±0.1 mm)					3 / 247 nm (247 nm)	3 / 1 (1)	λ/2	**A3 e**
A4	Fused Silica	Ø 12.7 mm (-0.1 mm)	6.35 mm (±0.1 mm)					3 / 55 nm (55 nm)	3 / 0.2 (0.2)	λ/10	**A4**
A4 b	Fused Silica (IR grade)	Ø 12.7 mm (-0.1 mm)	6.35 mm (±0.1 mm)					3 / 55 nm (55 nm)	3 / 0.2 (0.2)	λ/10	**A4 b**
A5	Fused Silica	Ø 12.7 mm (-0.1 mm)	9.5 mm (±0.2 mm)					3 / 55 nm (55 nm)	3 / 0.2 (0.2)	λ/10	**A5**
B1	Fused Silica	Ø 25.0 mm (-0.1 mm)	0.5 mm (±0.1 mm)	plane	plane	< 5'	20 mm	3 / 137 nm (55 nm)	3 / 0.5 (0.2)	λ/10 reg.	**B1**
B2	Fused Silica	Ø 25.0 mm (-0.1 mm)	1.0 mm (±0.1 mm)					3 / 137 nm (55 nm)	3 / 0.5 (0.2)	λ/10 reg.	**B2**
B3	Fused Silica	Ø 25.0 mm (-0.1 mm)	3.05 mm (±0.1 mm)					3 / 137 nm (55 nm)	3 / 0.5 (0.2)	λ/10 reg.	**B3**
B3 b	Fused Silica (IR grade)	Ø 25.0 mm (-0.1 mm)	3.0 mm (±0.1 mm)					3 / 137 nm (55 nm)	3 / 0.5 (0.2)	λ/10 reg.	**B3 b**
B3 c	Fused Silica (248 nm grade)	Ø 25.0 mm (-0.1 mm)	3.05 mm (±0.1 mm)					3 / 137 nm (55 nm)	3 / 0.5 (0.2)	λ/10 reg.	**B3 c**
B3 d	Fused Silica (193 nm grade)	Ø 25.0 mm (-0.1 mm)	3.0 mm (±0.1 mm)					3 / 137 nm (55 nm)	3 / 0.5 (0.2)	λ/10 reg.	**B3 d**
B3 e	Sapphire	Ø 25.4 mm (-0.1 mm)	3.0 mm (±0.1 mm)					3 / 247 nm (247 nm)	3 / 1 (1)	λ/2 reg.	**B3 e**
B3 f	CaF_2 (193 nm grade)	Ø 25.0 mm (-0.1 mm)	3.0 mm (±0.1 mm)					3 / 137 nm (137 nm)	3 / 0.5 (0.2)	λ/4 reg.	**B3 f**
B4	Fused Silica	Ø 25.0 mm (-0.1 mm)	6.35 mm (±0.1 mm)					3 / 55 nm (55 nm)	3 / 0.2 (0.2)	λ/10	**B4**
B4 b	Fused Silica (IR grade)	Ø 25.0 mm (-0.1 mm)	6.35 mm (±0.1 mm)					3 / 55 nm (55 nm)	3 / 0.2 (0.2)	λ/10	**B4 b**
B4 f	CaF_2 (UV grade)	Ø 25.0 mm (-0.1 mm)	6.35 mm (±0.1 mm)					3 / 55 nm (55 nm)	3 / 0.2 (0.2)	λ/10	**B4 f**
B5	Fused Silica	Ø 25.0 mm (-0.1 mm)	9.5 mm (±0.2 mm)					3 / 55 nm (55 nm)	3 / 0.2 (0.2)	λ/10	**B5**
C1	Fused Silica	Ø 50.0 mm (-0.1 mm)	3.05 mm (±0.1 mm)	plane	plane	< 5'	25 mm	3 / 137 nm (55 nm)	3 / 0.5 (0.2)	λ/10 reg.	**C1**
C1 f	CaF_2 (UV grade)	Ø 50.0 mm (-0.1 mm)	5.0 mm (±0.1 mm)				40 mm	3 / 137 nm (137 nm)	3 / 0.5 (0.2)	λ/4	**C1 f**
C2	Fused Silica	Ø 50.0 mm (-0.1 mm)	6.35 mm (±0.1 mm)				30 mm	3 / 137 nm (55 nm)	3 / 0.5 (0.2)	λ/10 reg.	**C2**
C3	Fused Silica	Ø 50.0 mm (-0.1 mm)	9.5 mm (±0.2 mm)				40 mm	3 / 55 nm (55 nm)	3 / 0.2 (0.2)	λ/10	**C3**
D1	Fused Silica	Ø 76.2 mm (-0.1 mm)	12.5 mm (±0.2 mm)	plane	plane	< 5'	60 mm	3 / 55 nm (55 nm)	3 / 0.2 (0.2)	λ/10	**D1**
K1	Fused Silica	25 × 25 mm² (-0.1 mm)	3.05 mm (±0.1 mm)	plane	plane	< 5'	20 mm	3 / 137 nm (55 nm)	3 / 0.5 (0.2)	λ/10 reg.	**K1**
K2	Fused Silica	25 × 25 mm² (-0.1 mm)	6.35 mm (±0.1 mm)					3 / 55 nm (55 nm)	3 / 0.2 (0.2)	λ/10	**K2**
K3	Fused Silica	25 × 25 mm² (-0.1 mm)	9.5 mm (±0.2 mm)					3 / 55 nm (55 nm)	3 / 0.2 (0.2)	λ/10	**K3**
N1	Fused Silica	40 × 10 mm² (-0.1 mm)	12.5 mm (±0.2 mm)	plane	plane	< 5'	32 × 8 mm²	3 / 55 nm (55 nm)	3 / 0.2 (0.2)	λ/10	**N1**
O1 f	CaF_2 (UV grade)	50 × 27 mm² (-0.1 mm)	3.0 mm (±0.1 mm)	plane	plane	< 5'	42 × 23 mm²	3 / 1100 nm (1100 nm)	3 / 4 (4)	2λ	**O1 f**
O2	Fused Silica	50 × 27 mm² (-0.1 mm)	6.35 mm (±0.1 mm)					3 / 55 nm (55 nm)	3 / 0.2 (0.2)	λ/10	**O2**

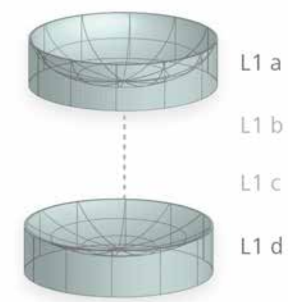
← Plane substrates in detail ←

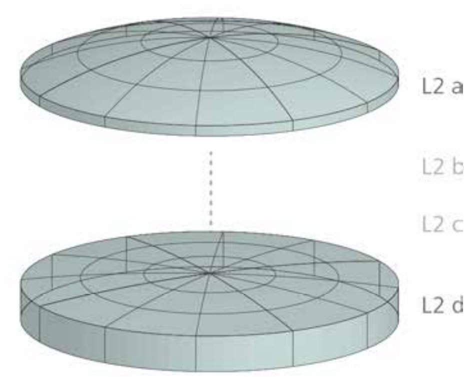
→ Curved substrates in detail →

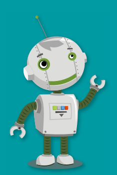
No.	Uncoated Surface Form Tolerance with λ = 546 nm			Clear Aperture Øe	//	S2	S1	ROC	Length/Diameter	Thickness	Material	No.
R1	3 / – (55 nm)	3 / – (0.2)	λ/10 reg.	10 mm	< 5'	CC (concave)	plane	25 mm (±0.5 %)	Ø 12.7 mm (- 0.1 mm)	6.35 mm (±0.1 mm)	Fused Silica	R1
R2								38 mm (±0.5 %)				R2
R3								50 mm (±0.5 %)				R3
R4								75 mm (±0.5 %)				R4
R5								100 mm (±0.5 %)				R5
R6								125 mm (±0.5 %)				R6
R7								150 mm (±0.5 %)				R7
R8								200 mm (±0.5 %)				R8
R9								250 mm (±0.5 %)				R9
R10								300 mm (±0.5 %)				R10
R11								500 mm (±0.5 %)				R11
R12								750 mm (±1.0 %)				R12
R13								1000 mm (±1.0 %)				R13
R14								1000 mm (±1.0 %)		3.0 mm (±0.1 mm)	YAG	R14
S1	3 / – (55 nm)	3 / - (0.2)	λ/10 reg.	20 mm	< 5'	CC (concave)	plane	25 mm (±0.5 %)	Ø 25.0 mm (- 0.1 mm)	6.35 mm (±0.1 mm)	Fused Silica	S1
S2								38 mm (±0.5 %)				S2
S3								50 mm (±0.5 %)				S3
S4								75 mm (±0.5 %)				S4
S5								100 mm (±0.5 %)				S5
S6								125 mm (±0.5 %)				S6
S7								150 mm (±0.5 %)				S7
S8								200 mm (±0.5 %)				S8
S9								250 mm (±0.5 %)				S9
S10								300 mm (±0.5 %)				S10
S11								500 mm (±0.5 %)				S11
S12								750 mm (±1.0 %)				S12
S13								1000 mm (±1.0 %)				S13
S14								1000 mm (±1.0 %)		3.0 mm (±0.1 mm)	YAG	S14
L1 a	3 / – (55 nm)	3 / - (0.2)	λ/10 reg.	15 mm	centr. < 4'	CC (concave)	plane	25 mm (±0.5 %)	Ø 25.0 mm (- 0.1 mm)	6.35 mm (±0.1 mm)	Fused Silica	L1 a
L1 b				15 mm				50 mm (±0.5 %)				L1 b
L1 c				20 mm				75 mm (±0.5 %)				L1 c
L1 d				20 mm				100 mm (±0.5 %)				L1 d
L2 a	3 / – (55 nm)	3 / - (0.2)	λ/10 reg.	30 mm	centr. < 4'	CX (convex)	plane	125 mm (±0.5 %)	Ø 50.0 mm (- 0.1 mm)	6.35 mm (±0.1 mm)	Fused Silica	L2 a
L2 b								150 mm (±0.5 %)				L2 b
L2 c								175 mm (±0.5 %)				L2 c
L2 d								200 mm (±0.5 %)				L2 d











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