Optics for Nd:YAG Laser

Tydex offers various optics for Nd:YAG lasers which in parallel with CO2-lasers have found high spreading. Unique properties of these lasers - wavelength tuning from UV to near IR range, possibility to achieve high energy in pulse, high power in CW mode, and others make them the key laser source for different applications – industry, medicine, science, and research.

Together with K8 glass (analogue of Schott's BK7) majority of optical components here are made from UV Fused Silica – Russian quartz glass KU-1.

Synthetic origin of the material manufactured by flame hydrolysis of SiCI4 results in high perfection and homogeneity; it is practically free of inclusions, bubbles, and other internal defects. High purity of the material together with relatively low refractive index allow achieving high transmission in UV and VIS ranges. The edges of transmission interval are 160nm and 4350nm, in VUV and IR, respectively, with OH absorption band at wavelength diapason 2600-2800nm.
Analogues of quartz glass KU-1 are Suprasil (Heraeus), Spectrosil (Saint-Gobain) and Corning 7940 (Corning).

It should be said especially that in handling with these materials Tydex capacity is enough good vertically integrated. We use high quality raw material produced in Russia on time-proved technology existing from Soviet times. Our polishing process, electron beam coating technology, testing instruments and metrology tools, all of this results in high marketability of Tydex's goods in this field.

For the components various coatings emphasizing both lasing (1064nm, 1319nm) and a triple of non-linear crystals created wavelengths (532nm, 355nm, 266nm) are available.

Depending on customer needs Tydex offers the following components:

- Lenses
- Windows
- Mirrors
- Scanning mirrors
- Beamsplitters
- Prisms.

TYDEX® J.S.CO. Domostroitelnaya str. 16, 194292 St.Petersburg, RUSSIA
Tel: 7-812-3346701, -3318702; Fax: 7-812-3346702
E-mail:tydex@tydex.ru, URL: http://www.tydex.ru

LENSES

Lenses are widely used at YAG-laser apparatuses for welding, cutting, drilling, and marking as well as in based on YAG-laser other applications like collimators, magnifiers, radiometers, optical transceivers, and condensers.
Tydex offers plano-convex, plano-concave, bi-convex, bi-concave, and meniscus lenses of spherical design. Cylindrical and custom-made lenses are also available.

Specification:

Substrate material	KU-1, K8
Surface figure (irregularity) @ 633nm	λ/10
Surface quality, scr/dig	20/10
Clear aperture	exceeds central 85% of dimension
Dimensional tolerance, mm	+0/- 0.25
Thickness tolerance, mm	+/- 0.25
Edge thickness variation, mm:	<= 0.05
Effective focal length (EFL) tolerance, %	+/- 2
Antireflection coating	dielectric; user specified, R<=0.25% per surface (R<=0.1% is also possible on request)
Damage threshold, J/cm^2	2-5, depending on coating spec.

No.	Diameter, mm	EFL, mm	Central thickness, mm
1	4.0	6	2.1
2	5.0	10	3.9
3	10.0	25	4
4	12.7	50	2
5	25.4	50	5.3
6	25.4	100	4
7	38.1	100	6

Here are some examples of the lens coatings:

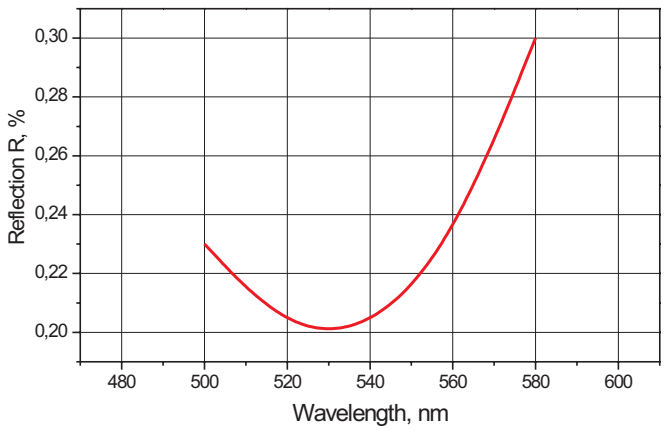


Figure 1. UV Fused Silica plano-convex lens, AR (R <= 0.25%) @ 532nm

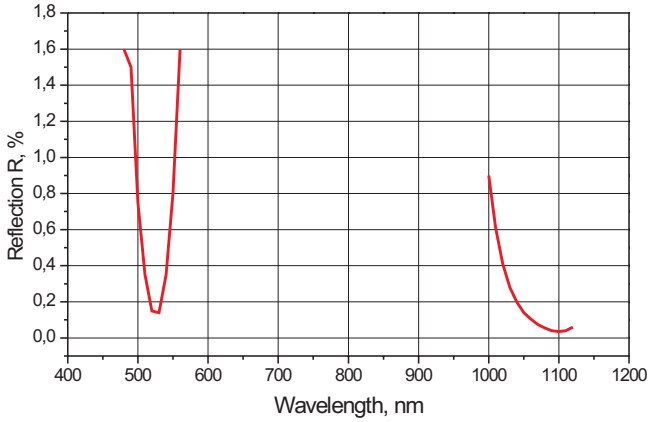


Figure 2. UV Fused Silica plano-convex lens, AR/AR (R <= 0.25%) @532nm & 1064nm

TYDEX® J.S.CO. Domostroitelnaya str. 16, 194292 St.Petersburg, RUSSIA
Tel: 7-812-3346701, -3318702; Fax: 7-812-3346702
E-mail:tydex@tydex.ru, URL: http://www.tydex.ru

Optics for Nd:YAG Laser

WINDOWS

Windows are used to enable optical radiation to pass from one environment to another without allowing to environments to mix. Tydex offers plano-plano windows of round, square, rectangular, and elliptical (including Brewster's) shape. Wedged parts are also available.

Specification:

Substrate material	KU-1, K8
Surface figure @ 633nm	λ/10
Surface quality, scr/dig	20/10
Clear aperture	exceeds central 85% of dimension
Dimensional tolerance, mm	+0/- 0.25
Thickness tolerance, mm	+/- 0.25
Wedge	user specified (for example, <=10 arc. sec., <= 5 arc. min., 30 (+/-5) arc. min.)
Antireflection coating	dielectric; user specified R<=0.25% per surface (R<=0.1% is also possible on request)
Damage threshold, J/cm^2	2-5, depending on coating spec.

No.	Diameter, mm	Thickness, mm
1	10.0	3.175
2	12.7	6.35
3	12.7	9.525
4	25.4	6.35
5	25.4	9.525
6	38.1	6.35
7	50.8	9.525

Here are some examples of the window coatings:

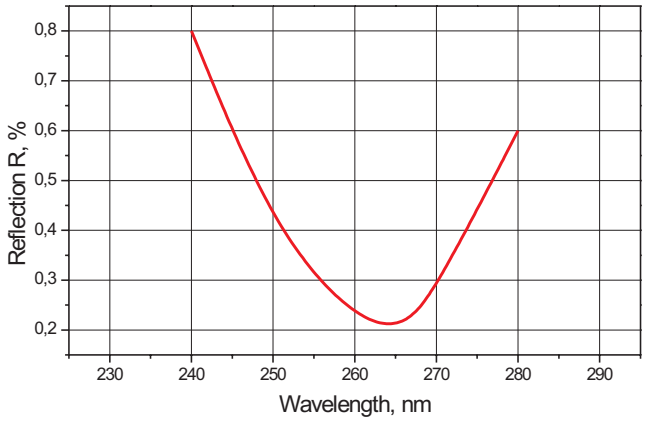


Figure 3. UV Fused Silica plano window, AR/AR (R <= 0.25%) @ 266nm

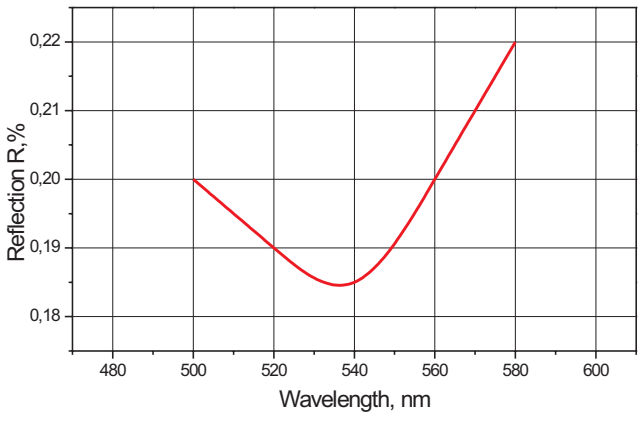


Figure 4. K8 plano window, AR/AR (R <= 0.2%) @ 532nm

TYDEX® J.S.CO.
Domostroitelnaya str. 16, 194292 St.Petersburg, RUSSIA
Tel: 7-812-3346701, -3318702; Fax: 7-812-3346702
E-mail:tydex@tydex.ru, URL: http://www.tydex.ru

MIRRORS

Tydex offers the mirrors used as high reflectors (including in-cavity laser mirrors), dichroic (including hot/cold) mirrors or partial reflecting output couplers. Parts of round, square, rectangular, and elliptical shapes are offered.

Specification:

Substrate material	KU-1, K8
Surface figure @ 633nm	λ/10
Surface quality, scr/dig	20/10
Clear aperture	exceeds central 85% of dimension
Dimensional tolerance, mm	+0/- 0.25
Thickness tolerance, mm	+/- 0.25
Wedge, arc. min	<= 5
Edge thickness variation, mm	<= 0.05
Coating	dielectric, metal-dielectric, metallic; user specified
Damage threshold, J/cm^2	2-5, depending on coating spec.

No.	Diameter, mm	Thickness, mm
1	12.7	3.175
2	12.7	6.35
3	19.05	9.525
4	25.4	6.35
5	25.4	9.525
6	38.1	6.35
7	38.1	9.525

Here are some examples of the mirror coatings:

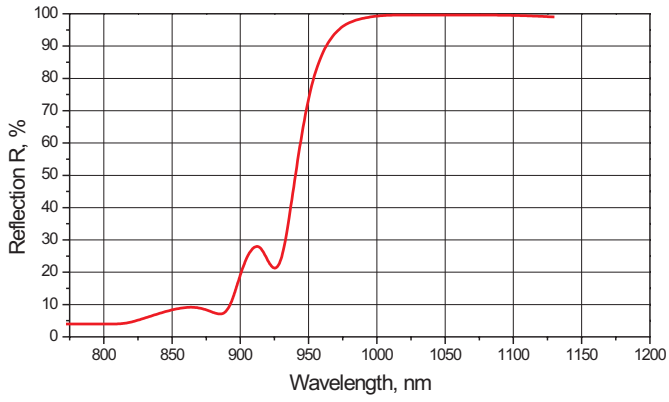


Figure 5. K8 dichroic mirror (hot mirror), R=(95.0+/-4)% @ 960-1100 nm, T >= 90% @ 808 nm

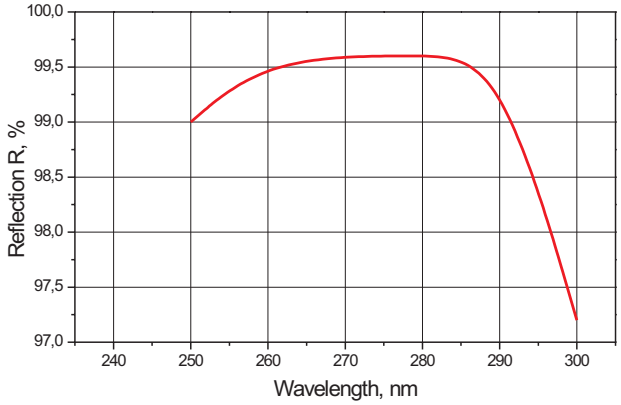


Figure 6. UV Fused Silica laser mirror, R >= 99.5% @ 266 nm, AOI=45°, S-polarization

TYDEX® J.S.CO. Domostroitelnaya str. 16, 194292 St.Petersburg, RUSSIA
Tel: 7-812-3346701, -3318702; Fax: 7-812-3346702
E-mail:tydex@tydex.ru, URL: http://www.tydex.ru

Optics for Nd:YAG Laser

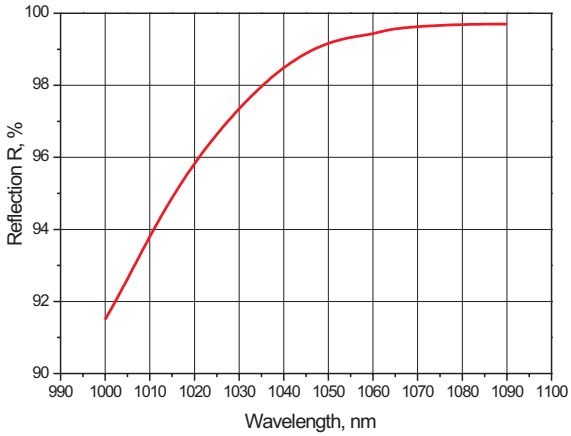


Figure 7. K8 end cavity mirror,
R >= 99.5% @ 1064 nm, AOI=45°

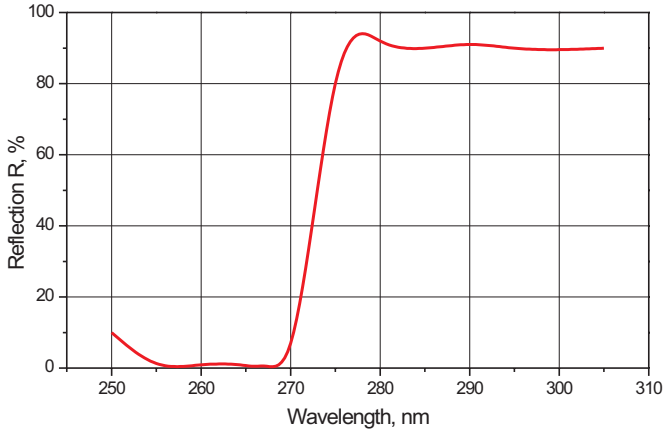
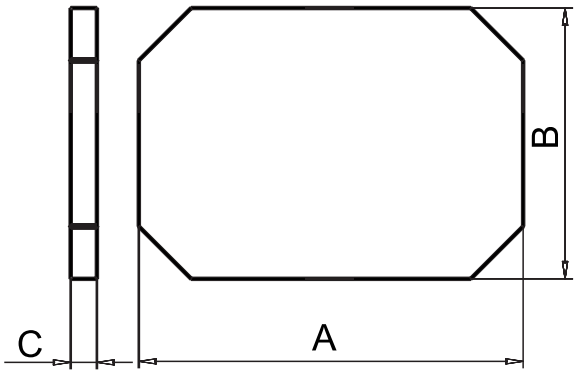


Figure 8. K8 dichroic mirror, AR (R <= 0.5%)
@ 266 nm/R>=90% @ 280-308 nm,
T >= 90% @ 266 nm, AOI=0°

SCANNING MIRRORS

Tydex offers scanning mirrors of custom-made shape to achieve high stable reflective parameters in the limited range of AOI. In a system a couple of mirrors can be utilized that allows deviating incident beam into two flats. So called X-mirrors and Y-mirrors are emphasized.



Specification:

Substrate material	KU-1, Si
Surface figure @ 633nm	λ/2
Surface quality, scr/dig	40/20
Clear aperture	exceeds central 85% of dimension
Dimensional tolerance, mm	+/- 0.25
Thickness tolerance, mm	+/- 0.25
Wedge, arc. min	<= 5
Range of scanning angles	user specified
Coating	dielectric, metal-dielectric; user specified
Damage threshold, J/cm^2	2-5, depending on coating spec.

No.	Title	Overall dimensions, mm		Thickness C, mm	Range of AOI, degrees
		A	B		
1	X-mirror	18	11.5	1.5	45
2	Y-mirror	22	15.5	1.5	45
3	mirror	65	55	10	30-45
4	mirror	75	40	10	30-45
5	mirror	80	30	10	30-45

TYDEX® J.S.CO.
Domostroitelnaya str. 16, 194292 St.Petersburg, RUSSIA
Tel: 7-812-3346701, -3318702; Fax: 7-812-3346702
E-mail:tydex@tydex.ru, URL: http://www.tydex.ru

Here is an example of the scanning mirror coating:

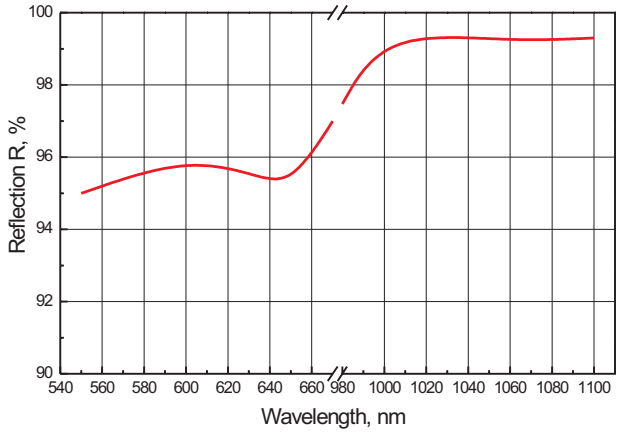


Figure 9. Si scanning mirror, HR (R>99%) @1064 nm and R>90% @633 nm, AOI=45°

BEAMSPLITTERS

Beamsplitters are plate windows coated with a dielectric coating to separate laser light into your choice of reflection/transmission split ratio. Beamsplitters exhibit almost no absorption and are designed specifically for 45 deg. at the wavelength and polarization being used. Standard substrates have an anti-reflection coating on the second surface.

Specification:

Substrate material	KU-1, K8
Surface figure @ 633nm	λ/10
Surface quality, scr/dig	20/10
Clear aperture	exceeds central 85% of dimension
Dimensional tolerance, mm	+0/- 0.25
Thickness tolerance, mm	+/- 0.25
Wedge, arc. min	<= 5
Coating	dielectric; user specified
Damage threshold, J/cm^2	2-5, depending on coating spec.

Here is an example of the beamsplitter coating:

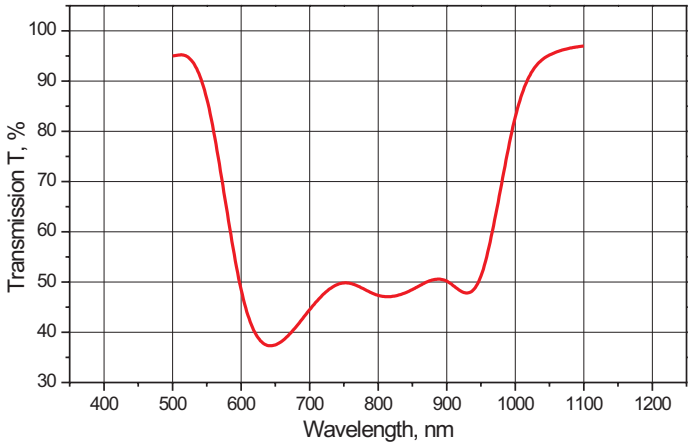


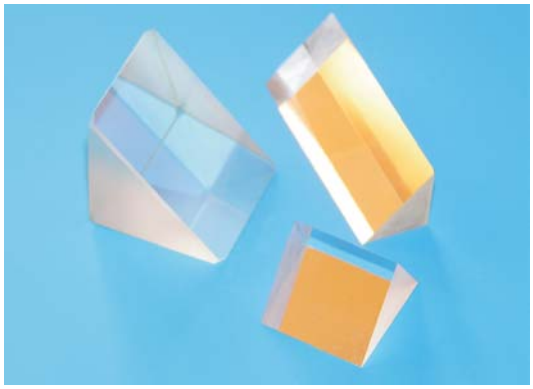
Figure 10. K8 dichroic beamsplitter;
T >= 95% @ 532 nm, P-polarization
T >= 95% @ 1064 nm, S-polarization, AOI=0°

TYDEX® J.S.CO. Domostroitelnaya str. 16, 194292 St.Petersburg, RUSSIA
Tel: 7-812-3346701, -3318702; Fax: 7-812-3346702
E-mail:tydex@tydex.ru, URL: http://www.tydex.ru

Optics for Nd:YAG Laser

PRISMS

Prisms are blocks of optical material with flat polished sides arranged at precisely controlled angles to each other. Prisms are used at an optical system to deflect or deviate a beam of light. They can invert or rotate an image, disperse light into its component wavelengths, and be used to separate state of polarization.



Specification:

Material	KU-1, K8
Surface figure @ 633nm	λ/10
Surface quality, scr/dig	20/10
Clear aperture	exceeds central 85% of dimension
Dimensional tolerance, mm	+/- 0.2
Angular deviation, arc. min	+/- 3
Coating	dielectric, metal-dielectric, metallic; user specified
Damage threshold, J/cm^2	2-5, depending on coating spec.

Here is an example of the prism coating:

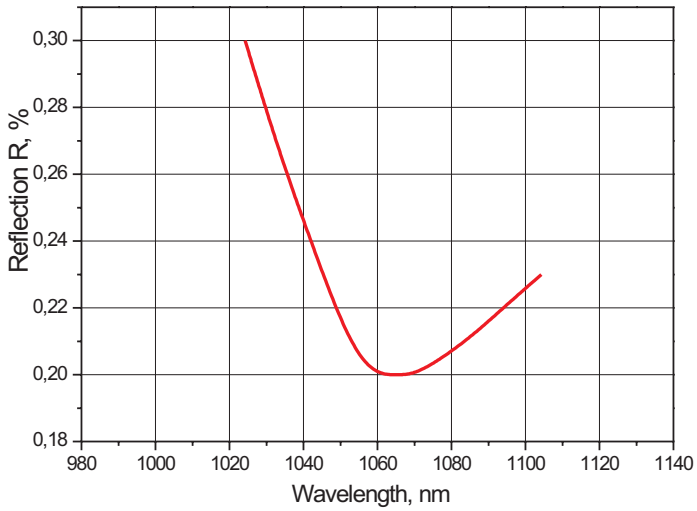


Figure 11. K8 prism, AR/AR (R <= 0.25%) @ 1064 nm

TYDEX® J.S.CO. Domostroitelnaya str. 16, 194292 St.Petersburg, RUSSIA
Tel: 7-812-3346701, -3318702; Fax: 7-812-3346702
E-mail:tydex@tydex.ru, URL: http://www.tydex.ru