Tunable prism TL-12-16

The tunable prism is a tunable wedge that allows to tilt two optically flat and AR coated glass windows with respect to each other. The two glass windows are held together by a bellow structure that is filled with a low dispersion clear optical fluid.

The core element can be integrated with a large variety of actuation principles such as mechanical or motorized lead screws, voice-coil and piezo actuators. Typical applications include laser beam-steering in transmission configuration and alignment between source and detector.

The following table outlines the specifications of our standard tunable prism core element for a particular fluid. Cover glass coatings and fluids can be adapted on demand.

Mechanical specifications

Clear aperture	12	mm
External diameter	16	mm
Thickness	12 ± 0.5	mm
Weight	3.4	g
Max. mechanical tilt angle (center pivot point)[1]	20	degrees

Optical specifications

Max optical deflection @ 525nm	8.2	degree
Refractive index (25°C, @ 525nm)	1.38	
Abbe number V (25°C)	63	
Flatness of windows @ 525nm	0.5	λ
Refractive index vs temperature (dn/dT)	-3.3e-4	1/°C
Transmission spectrum	420-950	nm
Optical damage threshold @ 525nm	Depends on selected coating	kW/cm^2
Absorption	<0.1%	
Polarization change	preserving	
Storage temperature	[-40, +85]	°C
Operating temperature[2]	[-40, +85]	°C

[1] Max. mechanical tilt angle could be higher for lower number of tilt cycles

[2] Operating temperature has only been tested to +85°C. From the material compatibility point of view, operating temperature could potentially be higher.

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Beam deflection

The beam deflection angle θ_d of a ray passing from left to right through a wedge with an wedge (or apex) angle θ_w (Fig. 1) is determined by

$$\theta_d = \sin^{-1}(n \cdot \sin\theta_w) - \theta_w$$

where *n* is the refractive index of the optical fluid inside the wedge. Beam deflection as a function of wedge angle is shown in Fig. 2.

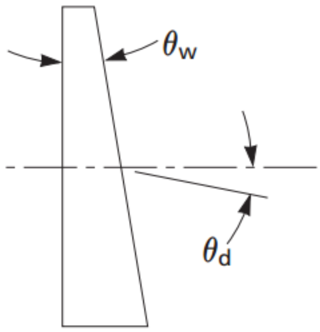

Figure 1: Deflection of beam upon passing a wedge with an apex angle θ_w

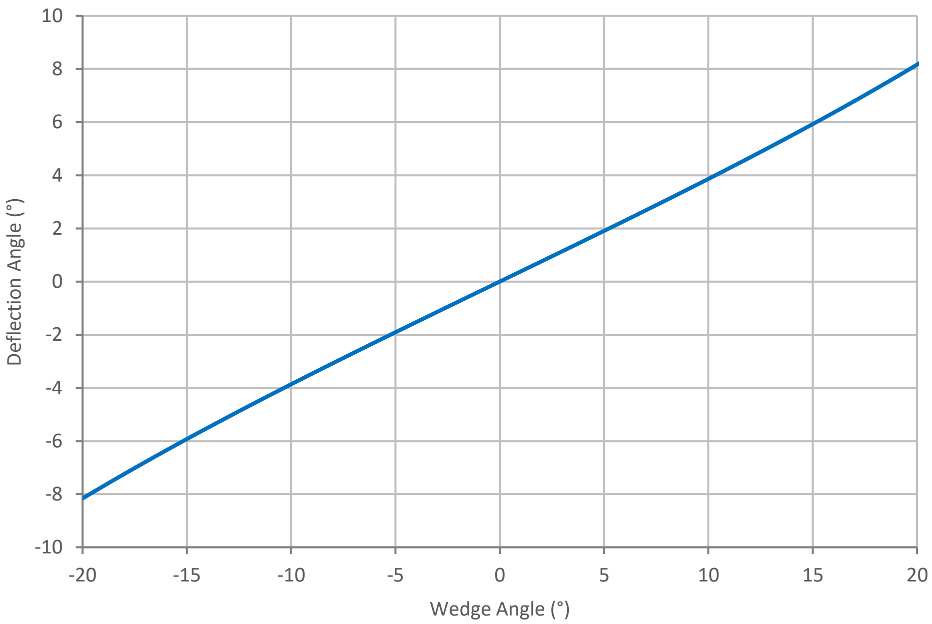

Figure 2: Beam deflection as a function of wedge angle

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Mechanical Layout

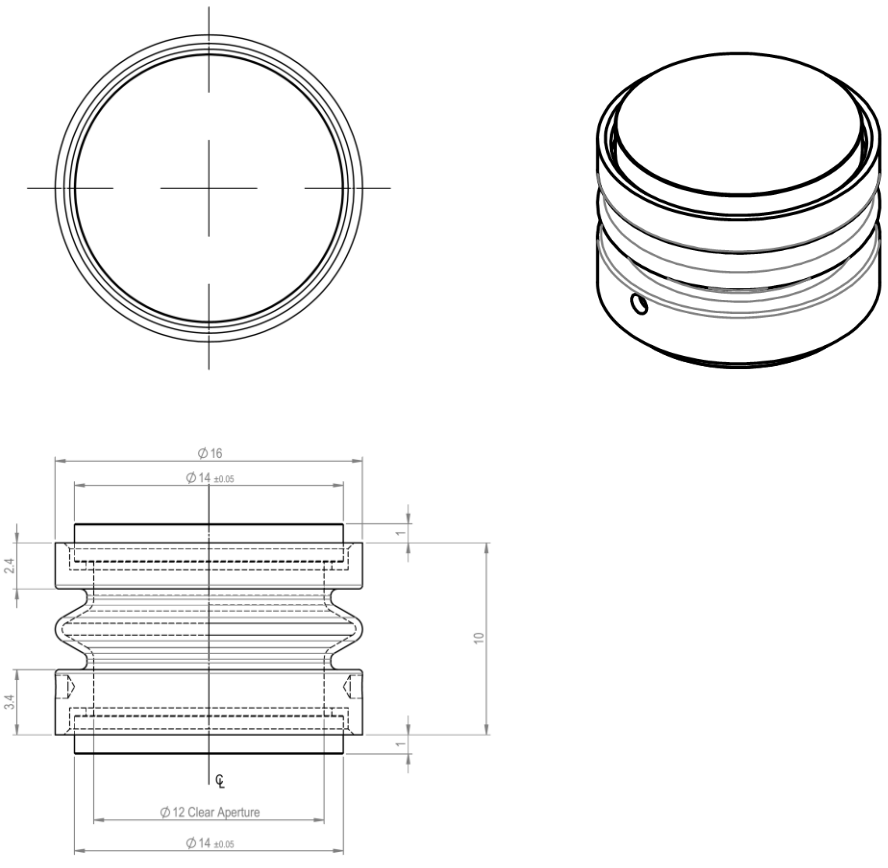
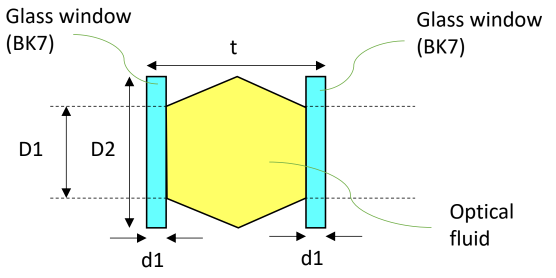


Figure 3: Mechanical drawing of the TP-12-16 (unit: mm)

Optical layout

Figure contains the information needed to model the TP-12-16 for simulations.



D1:	Clear aperture = 12 mm
D2:	Diameter of glass window = 14 ±0.05 mm
d1:	Thickness of glass window = 2 mm
t:	Height = 12 ± 0.5 (without applied pressure)

Figure 4: Optical layout of the TP-12-16

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The ZEMAX model can be downloaded from the website: http://www.optotune.com/downloads

Transmission range

The optical fluid and the two glass windows are highly transparent and hardly absorbing in the range of 250 – 2500 nm. The figures below show the transmission spectrum for the standard extended VIS coating (420-950 nm) assuming normal incidence. By request cover glasses can be coated as desired.

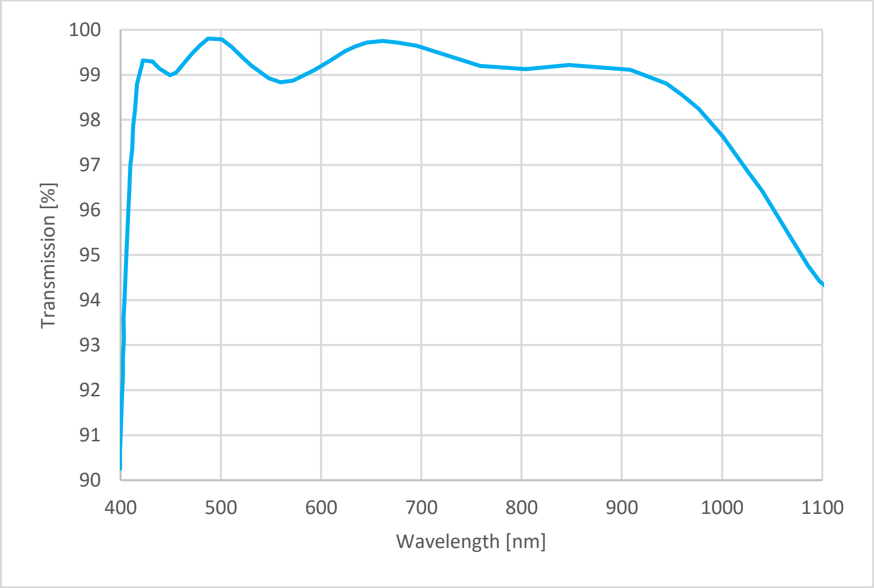

Figure 5: Transmission spectrum of the TP-12-16 with extended VIS coating (420-950 nm)

Auto-fluorescence

The TP-12-16 contains LD material that is not auto-fluorescent and can be used for fluorescence microscopy.

Mounting possibilities

There are various mounting possibilities for the TP-12-16. A simple mechanical gimbal mount based on off-the-shelf components is shown in Figure 6.

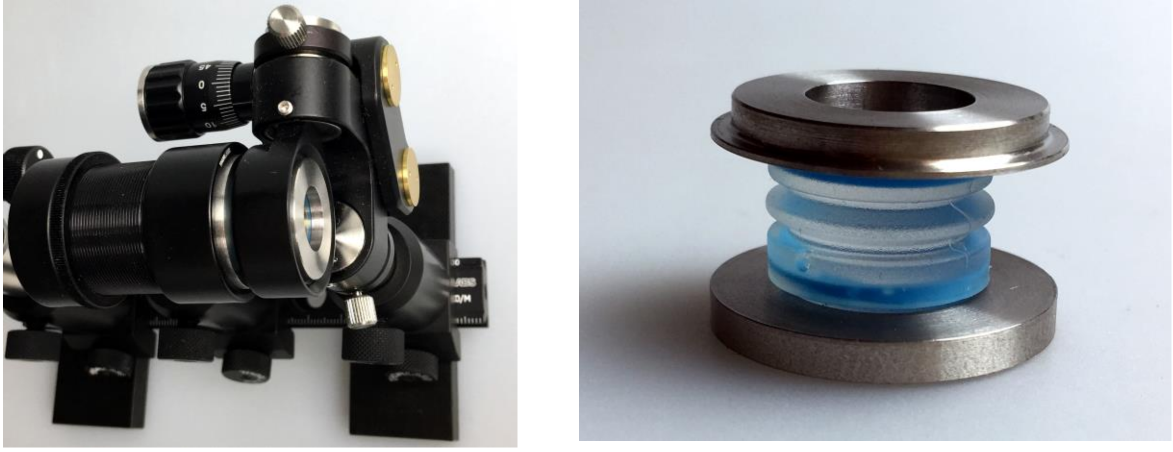

Figure 6: Example of mechanical mounting of the tunable prism with standard off-the shelf components and 2 adapter rings.

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The relevant components are listed below:

Component		Description	Supplier
TP-12-16		Tunable prism core element	Optotune
Adapter rings		Set of 2 adapter rings for TP-12-16	Optotune
GMB1/M		360 Degree Adjustable Gimbal Mount	Thorlabs
FMP1/M		Metric 1" Fixed Mirror Holder	Thorlabs
SM1V10		SM1 Series Variable Lens Tube 1" Travel	Thorlabs

Another possibility is to actuate the TL-12-16 electrically. For this, an off-the-shelf piezoelectric gimbal mount can be used instead of the GMB1/M gimbal mount:

PGM1SE/M		Piezoelectric Gimbal Mount with Strain Gauge Feedback	Thorlabs

Please contact sales@optotune.com to discuss your application.

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