PRELIMINARY

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Tunable Prism

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.

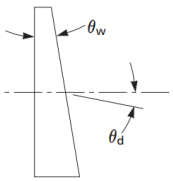
The following table outlines the specifications of our standard tunable prism core element for a particular fluid. Cover glass coatings and fluids can be adapted on demand.

Mechanical specifications		
Clear aperture	12	mm
External diameter	16	
Thickness	12 ± 0.5	mm
Weight	3.4	g
Max. mechanical tilt angle (center pivot point)[1]	20	degree
Optical specifications[2]		
Max optical deflection @ 525nm	8.2	degree
Refractive index (25°C, @525nm)	1.38	
Abbe number V (at 25°C)	63	
Flatness of windows @525nm	0.5	lambda
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/cm²
Absorption	<0.1%	
Polarization change	preserving	
Storage temperature	[-40,+85]	°C
Operating temperature[3]	[-40,+85]	°C

Beam deflection

The beam deflection of a ray passing through the wedge with an apex angle θ_w from left to right 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.

[1] Maximum mechanical tilt angle could be higher for lower number of tilt cycles
[2] Values base on optical fluid OL1129
[3] Operating temperature has only been tested to +85°C. From the material compatibility point of view, operating temperature could potentially be higher.

Optotune AG | Bernstrasse 388 | CH-8953 Dietikon | Switzerland
Phone +41 58 856 3000 | www.optotune.com | info@optotune.com

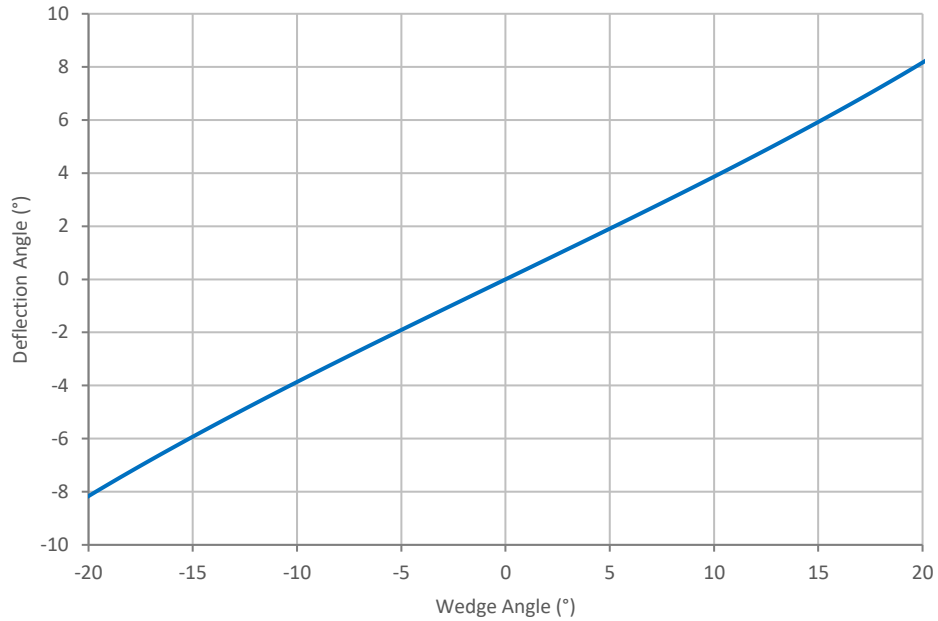


Figure 1: Beam deflection as a function of wedge angle

Mechanical layout

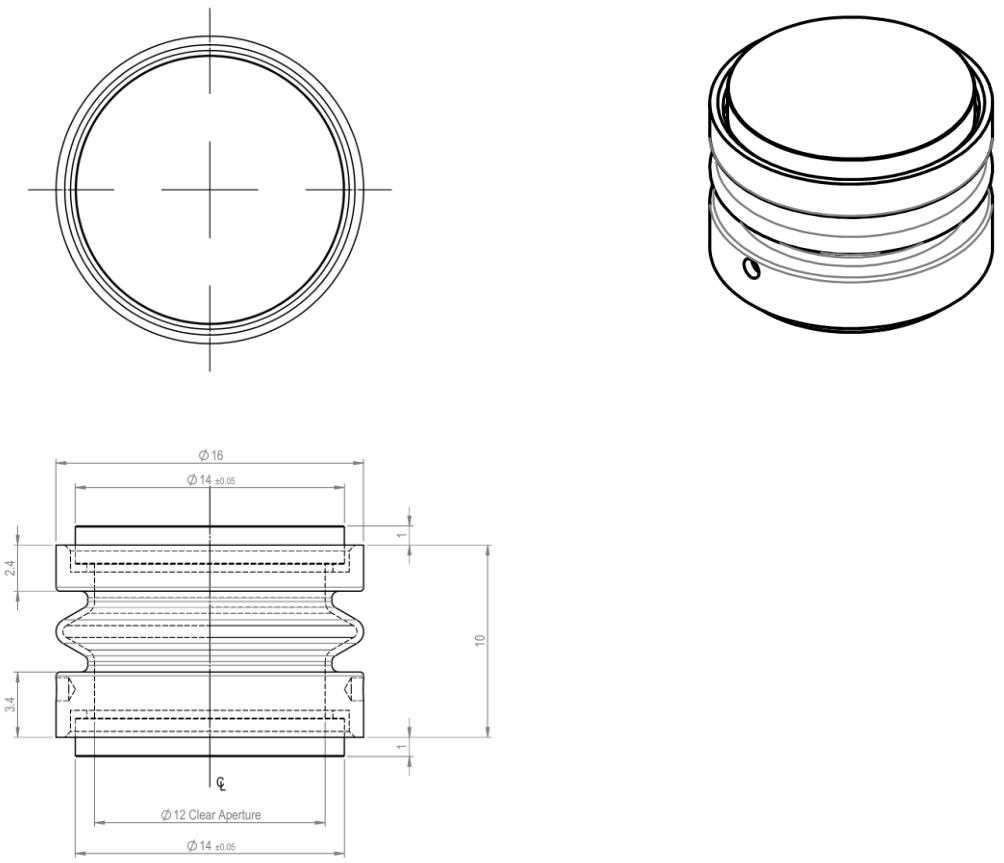


Figure 2: Mechanical drawing of the TP-12-16 (unit: mm)

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Optical layout

Figure 3 contains the information needed to model the TP-12-16 for simulations.

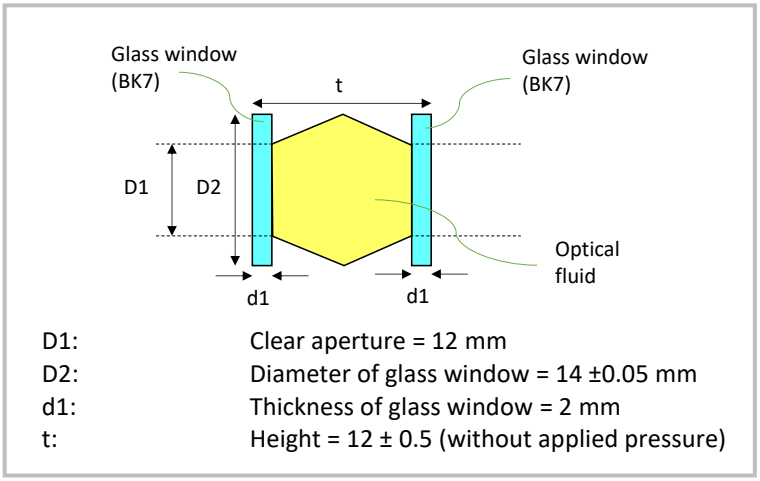

Figure 3: Optical layout of the TP-12-16

A ZEMAX model is available on request.

Transmission range

The optical fluid and the two glass windows are highly transparent and hardly absorbing in the range of 250 – 2500nm. 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.

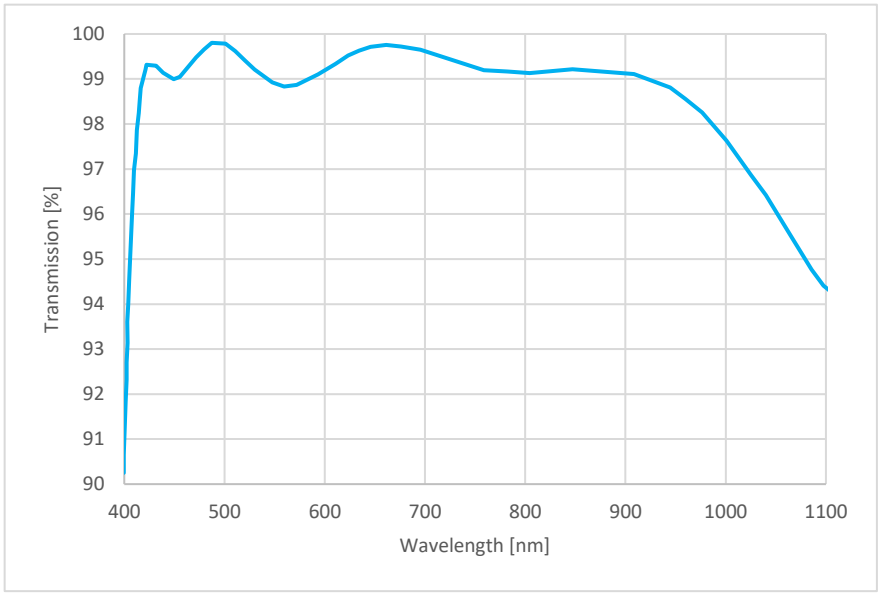

Figure 4: Transmission spectrum of the TP-12-16 with extended VIS coating (420-950nm)

Auto-fluorescence

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

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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 5.

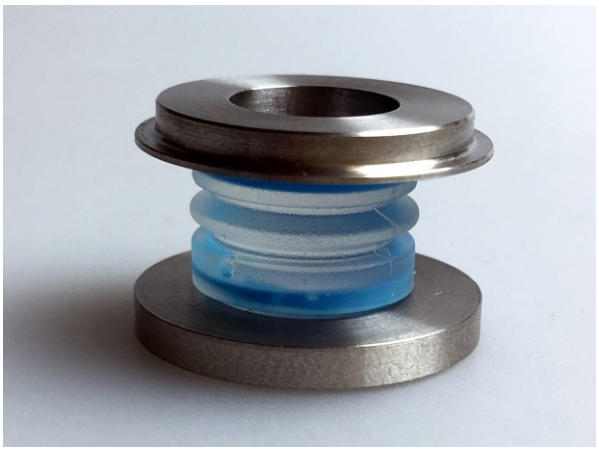

Figure 5: Example of mechanical mounting of the tunable prism with standard off-the shelf components and 2 adapter rings.

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

Please contact Optotune (sales@optotune.com) to discuss your application.

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