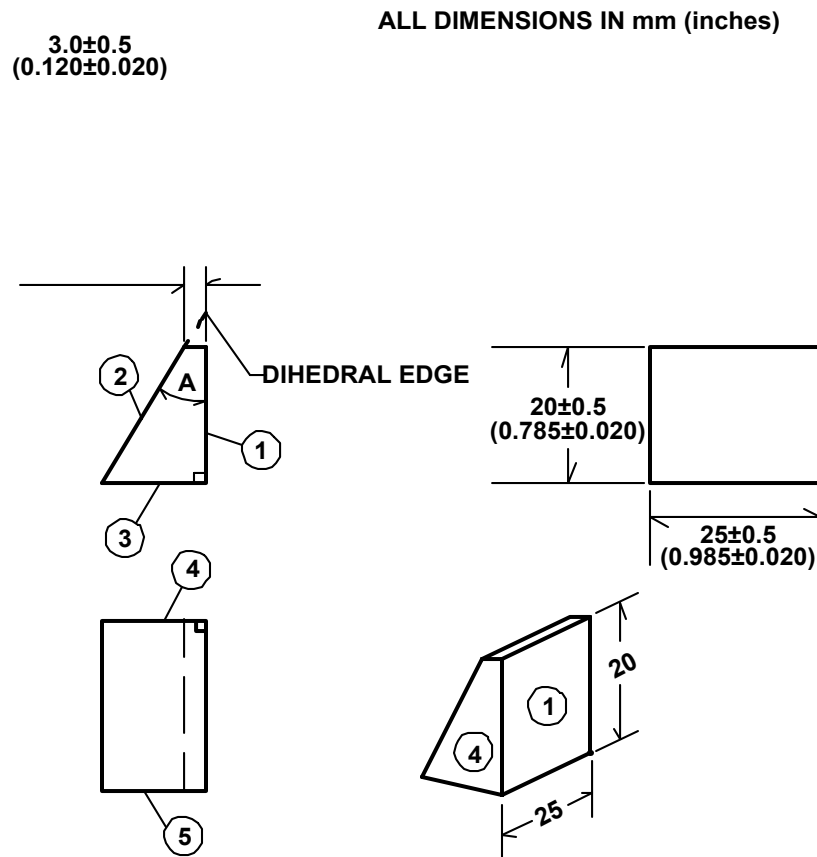


CRYOGENIC REFRACTOMETER - PRISM SPECIFICATIONS

Our cryogenic refractometer uses a modified minimum deviation method for the measurement of refractive index as a function of temperature and wavelength. The wavelength range of the instrument extends from 350 nm in the ultraviolet to 18 μm in the infrared (limits are imposed by the transmission of the windows available for the measurement Dewar).

The Dewar in which the sample is placed for cryogenic measurements has fixed windows, requiring a nominal deviation angle of 30° . A working drawing of a typical prism is shown below. The encircled numbers identify the various surfaces.

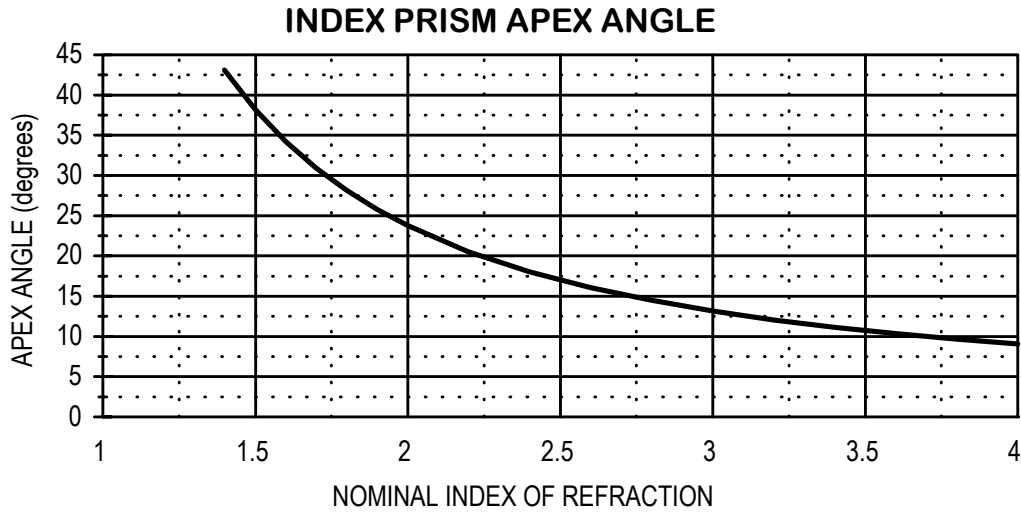


Dimensions are given in millimeters (inches). All edges should have a 0.5 mm ($0.020''$) \times 45° chamfer. The intersection of the projections of surfaces 1 and 2 is a straight line, named the dihedral edge. The primary mounting surface 4 must be $90^\circ \pm 0.1^\circ$ with respect to the dihedral edge. Mounting surface 3 must be parallel to the dihedral edge with a tolerance of $\pm 0.5^\circ$, and surface 1 and surface 3 must be perpendicular to surface 4 with a tolerance of $\pm 0.5^\circ$. Deviations from these angular specifications will compromise the achievable uncertainty.

The equation below is used to determine the prism apex angle A to achieve the required 30° deviation angle.

$$A = \tan^{-1}\left(\frac{0.5}{n - 0.866}\right)$$

where n is the nominal (mid-band) index of refraction. The tolerance on A is 0.01A, or 1%. A plot of A vs. n is shown below.



The angle A will vary from 40° (SiO₂, n = 1.45) to 9° (germanium, n = 4). The drawing shows the prism dimensions needed to fit our standard fixtures. Other prism sizes can be accommodated, but will require special tooling at extra cost. The following table shows the surface specifications for the prism:

SURFACE	FINISH	FLATNESS	FIGURE	SURFACE QUALITY
1	polished	λ/2	λ/4	80/50
2	polished	λ/2	λ/4	80/50
3	ground	2λ	N/A	N/A
4	ground	2λ	N/A	N/A
5	ground	N/A	N/A	N/A

NOTE: λ is specified as 632.8 nm (He-Ne).