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Surface Flatness

Surface flatness is a type of surface accuracy specification that measures the deviation of a flat surface such as that of a filter, mirror, window, prism or plano-lens. This deviation can be measured using an optical flat, which is a high quality, highly precise flat reference surface used to compare the flatness of a test piece. When the flat surface of the test optic is placed against the optical flat, fringes appear whose shape dictates the surface flatness of the optic under inspection. If the fringes are evenly spaced, straight, and parallel, then the optical surface under test is at least as flat as the reference optical flat. If the fringes are curved, the number of fringes between two imaginary lines, one tangent to the center of a fringe and one through the ends of that same fringe, indicate the flatness error. The deviations in flatness are often measured in values of waves (λ), which are multiples of the wavelength of the testing source. One fringe corresponds to ½ of a wave. 1λ flatness is considered typical grade, $\frac{1}{4}\lambda$ flatness is considered to be precision grade, and $1/20\lambda$ is considered high precision grade.