UNIVERSAL PHOTONICS INCORPORATED

LENS POWER FORMULA

The diopter is the unit of measure for the refractive power of a lens. The power of a lens is defined as the reciprocal of its focal length in meters, or D = 1/f, where D is the power in diopters and f is the focal length in meters.

- A lens with a focal length of two meters has a power of one-half diopter because the reciprocal of two is one-half or D = 1/2f
- A focal length of one-tenth meter would result in a power of 10 diopters

Disregarding thickness, the power of a lens is determined by combining the powers of the front and back surfaces: Dn = D1 + D2

- A lens with a front surface power of +9.00 and a back surface power of 6.00 would have a power of +3.00

Lens surface power can be found with the index of refraction and radius of curvature. The formula for surface power is Ds = (u-1)/r, where u is the index of refraction and r the radius of curvature in meters.

LENSMAKER'S EQUATION

The original formula for lens power can be written substituting (u-1)/r1 for D1 and (u-1)/r2 for D2 to arrive at Dn = (u-1)/r1 + (u-1)/r2, aka *the Lensmaker's Equation*.

EFFECTIVE POWER FORMULA

As long as thickness is not a factor, *The Lensmaker's Equation* can be used effectively. In the range of four diopters thickness may become a factor and compensation must be made. This is accomplished by adding t/u (D1)2 to the original formula as shown: De = D1+ D2 + t/u (D1)2 where D1 is the front surface power, D2 is the back surface power, t is the center thickness in meters, and u is the refractive index. This is known as *the Effective Power Formula*.

FORMULAS	
DIOPTER	$D = 1/f$
SURFACE POWER	$D_s = \frac{u-1}{r1}$
LENSMAKER'S EQUATION	$D_n = \frac{u-1}{r1} + \frac{u-1}{r2}$
NOMINAL POWER	$D_n = D_1 + D_2$
EFFECTIVE POWER	$D_e = D_1 + D_2 + \frac{t}{u}(D_1)^2$