



CRYSTRAN'S ROUGH GUIDE TO ASPHERIC SURFACES

Equations used and the common pitfalls

The standard aspheric formula is:

$$Z = \frac{cr^2}{1 + \sqrt{1 - (1 + K)c^2r^2}} + A_4r^4 + A_6r^6 + A_8r^8 + A_{10}r^{10} \dots$$

Where:

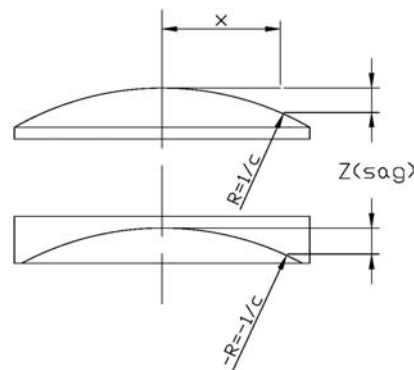
Z = Depth or "Sag" of the curve

r = Distance from the centre

c = Curvature (=1/Radius)

K = Conic constant

A_x = Higher order terms



Be aware that for some reason many designers show c as the Radius (R) and forget to show the reciprocal. This of course renders the equation obviously unworkable in most cases but it can catch you out. The Radius (R) does not represent the closest spherical surface, but the spherical surface from which the aspheric terms cause the curve to diverge from it, either shallower or deeper than the spherical curve. The closest or "best fit" spherical surface is the Radius which matches the aspheric sag at the largest useful diameter.

Taking care to obey the sign conventions, the sag figure must be added to the lens centre thickness to derive the actual lens thickness at any point. Do not simply present sag data to the machinist, they are likely to generate to that figure and produce a lens with zero edge thickness.

Most optical designers use only the even-order terms from A₂ to A₂₀, but should they be required the odd-order terms are available, for the profile only, from A₁ to A₁₉

The conic constant K has traditionally been used to design the first aspheres; simple parabolas and hyperbolas. It is now largely redundant in the above equation as the A_x terms can define any surface. A spherical surface is defined by the above equation when K=0 and all A_x terms are zero.

This listing represents the best of our understanding at present, and is not intended to be comprehensive. Crystran Ltd cannot be responsible for any problems caused by incorrect calculations as a result of using this data sheet.

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