OPTICAL MATERIAL STANDARDS FOR QUALITY LEVEL

The U.S. Military defines Quality Level or Grade as different striae levels per Din 3140 and according to MIL-G-174-B. Striae is localized inhomogeneity within the optical material. Test is visual and compared against reference samples. Since this type of test is nonquantitative, the following list is based on homogeneity measurement of the index changes within a material by interferometric testing.

CATEGORY	nd SPEC
1. Commercial	not specified (typical application is front surface) mirror
2. Grade B	$+/- 1 \times 10^{-4}$
3. Grade A	$+/- 1 \times 10^{-4}$
4. H-1	$+/- 2 \times 10^{-5}$
5. H-2	$+/- 5 \times 10^{-6}$
6. H-3	$+/- 2 \times 10^{-6}$
7. H-4	$+/- 1 \times 10^{-6}$
8. H-5	$+/- 5 \times 10^{-7}$

SOURCE: A.G.I.

Formula for wavefront distortion to nd tolerance:

Total wavefront distortion	=	Surface Contribution	+	Inhomogeneity Contribution
$\frac{\lambda}{4}$	=	$2(n-1)\,\delta$	+	$(\Delta\ n_{max})\ t$

where: $(\Delta\ n_{max})$ is homogeneity

λ is the wavelength of light to be used

t is the geometrical thickness along the optical path

n is the average refractive index for material in visible

δ is the Peak to Valley departure for flatness of one surface

2(n-1) is the worst case contribution of both surfaces

Note: A nanogram can be used to determine the specification of inhomogeneity once the limit of the wavefront distortion is determined using the following equation:

$$(\Delta\ n_{max}) = \frac{\Sigma y}{t}$$

where: λ is the wavelength of light used in the interferometer

Σ is the fringe deviation (P-V)

t is the sample thickness; i.e., dimension along the light path in the interferometer

SOURCE: ZYGO CORP. AND DYNASIL CORP.

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