



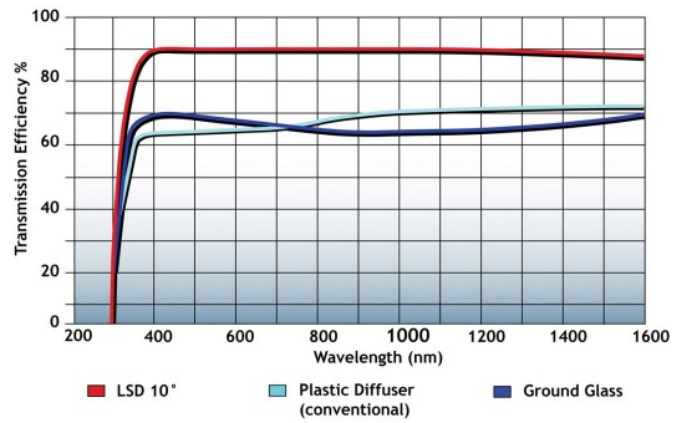
Light Shaping Diffusers®

Technical Data Sheet

Holographic Light Shaping Diffusers® or LSDs® are holographically recorded, randomized surface structures that enable:

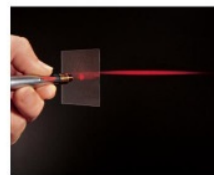
High Transmission Efficiency - 92%

Luminit's holographic Light Shaping Diffusers offer superior optical transmission between 300nm and 1500nm. Depending on the angle of distribution, LSDs will achieve between 85% and 92% transmission efficiency. The low back-scatter of LSD structures are anti-reflective in nature and utilize light that would otherwise be wasted due to Fresnel loss. A clear piece of polycarbonate substrate is 89% transmissive. With LSD, transmission improves to 92%. Note: Luminit measures transmission utilizing an integrated sphere with the LSD structure facing the light source. Listed are the transmission efficiencies of a 10° LSD measured at the following wavelengths: 532nm-90%, 632nm-90%, 850nm-89%, 980nm-89%, 1064nm-89%, 1550nm-88% (UV Transmitting Diffusers are also available.)

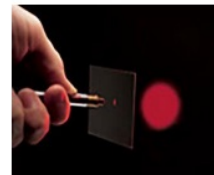


Beam Shaping

LSDs precisely shape, control and distribute light. The patented holographic master recording process allows a variety of circular or elliptical light patterns. Standard circular angles range from 0.5° to 100° FWHM.



Laser Source
40° x 20° FWHM



LED Source
20° FWHM Circular



Filament Source
60° x 10° FWHM Elliptical

Homogenized Light

"Hotspots" and uneven light distribution are common problems with filament, arc, LED, CCFL, fiberoptic and laser light sources. LSDs greatly smooth and homogenize sources while providing uniform light in critical applications such as LCD backlights, LED displays, machine vision, automotive lighting and viewing screens. Large angle LSDs produce the greatest degree of homogenized light.



Beams



Filament



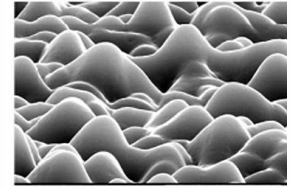
LED

LSD Applications

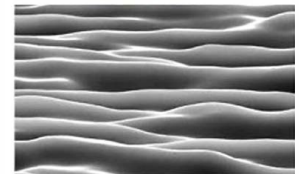
- LED Lighting
- Signs and Displays
- Barcode Scanners
- Microscopic Illumination
- LCD Backlighting
- Machine Vision Inspection
- Inspection Systems
- Fiber-Optic Illumination
- LED Display
- Front Projection Screens
- Set/Event Lighting
- Medical Instrumentation
- Projection Systems
- Mobile Phones & PDAs
- Architectural Lighting

How Light Shaping Diffusers Work

LSD surface relief holograms are replicated from a holographically recorded master. The pseudo random, non-periodic structures can be thought of as randomized micro-lenslets. LSDs are non-wavelength dependent and will work with white, monochromatic, coherent or incoherent light. LSDs diverge light, emulating a negative lens. While LSDs work best with collimated light, they will also work well with non-collimated light. The randomized structures eliminate Moiré and color diffraction, and incoming light is precisely controlled within well defined areas. Light does not escape these boundaries, resulting in greater control and utilization of light, thus maximizing photon utilization.



60° LSD
SEM Structure 1500x



60° x 1° Elliptical LSD
SEM Structure 600x

1. All LSD angles are specified in FWHM.
2. Large angle LSDs, when placed at the image plane, make excellent high resolution viewing screens.
3. Small angle LSDs can be combined with polarizers to reduce moiré and improve uniformity.
4. LSDs can be combined with other optical components such as lenses, Fresnels, and prismatic structures.
5. In selecting LSD angles, location and light source must be considered.

6.
$$\text{Effective Angular Output} = \sqrt{(\text{Light source angle})^2 + (\text{LSD angle})^2}$$

SPECIFICATIONS

| | | | |
|---|---|--|--|
| LSD Angle Range (FWHM): | Circular: 0.5° to 100° / Elliptical: minor: 1° to 60° ; major: 10° to 80° | | |
| Transmission Efficiency: | Circular: 0.2° to 20° ≥ 90% ; 20° to 80° ≥ 85% Elliptical: ≥ 85% | | |
| Angle Tolerance: (Based on a 10"x10" area) | $\leq 1^\circ \pm 0.5^\circ$ $(>1^\circ < 10^\circ) \pm 1^\circ$ $>10^\circ \pm 10\%$ | | |
| Transmission Spectral Range: | 300nm to 1500nm | | |
| Temperature Range: | -30°C to 80°C @ 240 hours | | |
| Humidity: | > 95% ± 5% RH @ 24 hours | | |
| Refractive Index: | PC=1.586; PE=1.51 / AC=1.494; Epoxy=1.50 | | |
| Pencil Hardness: | > 2H | | |
| UV Resistance: UVA/UVB (900 Kjm ²) | PE $\Delta a = -2.3$ $\Delta b = -4.42$ | P1 $\Delta a = -2.98$ $\Delta b = 10.27$ | P3 $\Delta a = 1.90$ $\Delta b = 3.98$ |
| Adhesion: | 100% on PET 5mil per ASTM D3359 | | |

All specifications contained herein are subject to change without notice.