Holographic Surface Diffusers
Features and Specifications

Customized surface diffusers with highest transmission for a wide range of applications
Scattering Characterization

Categories

Antiglare

Gaussian circular

Wide angle circular

It is possible to vary parameters like haze, grain size and sparkling in a wide range.

Diffusers with angles from 15° - 50° (FWHM) are available.

Diffusers with angles from 55° - 125° are available.

MEASUREMENT SETUP

Laser source

Sample position

Automatic rotation of sensor and tracking of position on high precision bearing

Sensor moves on circle while measuring light intensity

MEASUREMENT CONDITIONS

- 633nm Diode Laser
- Expanded beam (1/e² diameter approx. 8mm)
- Collimated, coherent illumination
- Distance adjustable at 25cm, 50cm, 75cm
- Mounted on optical table
- Normal incidence on structured side
- 125µm PET Foil
- LED as lightsource can be used
- Automatic data acquisition and postprocessing
- Tilt and pitch manually adjustable

For characterization of diffuse surfaces temicon uses the setup as sketched above/below. A monochromatic, collimated laser source is used for illumination, its beam is slightly expanded in order to average speckle effects. By default, a wavelength of 633nm is used, other wavelengths are available on request. The usage of a LED as light source is possible as well. With an increment of up to 0.045°, the diffusing properties of the surface can be analyzed in transmission as well as in reflection.

Typically, a polymer replica consisting of a PET base film with an imprinted UV-lacquer on top is measured. Besides the illumination conditions, sample properties such as refractive index, single- or multilayer design as well as the orientation of the diffuse surface (diffuser towards or diffuser averted to the incident beam) strongly influence the optical behaviour. Therefore, different measurement and material parameters may show deviating results.
Features and Applications

SEM images of diffuser surfaces

Gaussian circular
2D-stochastical surface

Wide angle circular
Surface with reduced grain size.

Gaussian linear
1D-stochastical surface

FEATURES
- Stochastic surface diffuser
  - Antiglare
  - Circular
  - Elliptical
  - Linear
- High transmission
- Excellent LED hiding (for WA)
- Sparkling effect can be minimized (for AG)
- Custom tailored haze value (for AG)
- Large, seamless surfaces
- Adjustable grain size

AVAILABLE AS
- Nickel tool
- UV-Rollimprint
- Mold insert
- Injection molded part
- Standard mold
  - Mold size: 100 mm x 100 mm
  - Mold thickness: 300 µm +/-5 %
  - Other sizes and materials on request

APPLICATIONS
- Automotive
- Backlite
- Illumination
- Imaging
- Sensors
- Haptic
- R&D

Custom tailored solutions are available on request.
Homogenization and blurring

LED luminaires often suffer from strong glaring effects due to the small size of single LED sources and their broad emission angles. By utilizing the WA-series diffusers, one can narrow down the emission angle due to internal reflection (refer to light blue measurement curve above). Additionally, an increase of the light emitting surface can be achieved. Both effects reduce unwanted glaring issues.

If an even broader emission pattern is requested, the diffuser can also be utilized to widen the LED emission (dark blue curve). Another goal is the homogenization of a discrete LED matrix (refer to photographs below). The WA-series diffusers allow to minimize the distance between light source and diffuser, while maintaining an uniform and homogeneous appearance.

Measurement using LED illumination

Distance to LED matrix: 0 mm
Almost no hiding for both diffuser types

Distance to LED matrix: 15 mm
Strong hiding for WA-C 125 diffuser (right), less hiding for C 35 diffuser (left)
Transmission and Optical Modeling

Transmission Properties

Measured and simulated transmission of different diffusers with structured side facing the collimated light source.

Values closely matching the maximum theoretical transmission efficiency calculated by raytracing can be observed in temicon’s surface diffusers. The simulations include a wide range of ray-optical effects. Transmission measurements of the diffusers were carried out according to ISO 9050. Light recycling happening in luminaires was not taken into account. Utilizing light recycling, transmission values of 95% are possible with our diffusers.

Modeling of diffusers

Non-approximated raytracing of stochastically micro-structured surfaces is used to gain insight into important optical effects. This approach leads to correct modeling of transmission and total internal reflection under any AOI.

As a result, even complex, non-gaussian scattering patterns can be modeled in order to design an appropriate diffuser for a wide range of applications.
Available diffuser types

<table>
<thead>
<tr>
<th>Type</th>
<th>Denotation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antiglare</td>
<td>HF-AG1</td>
<td>Low sparkling due to small grain size; Low haze 25.9%</td>
</tr>
<tr>
<td></td>
<td>HF-AG2</td>
<td>Low sparkling due to small grain size; High haze 81.5%</td>
</tr>
<tr>
<td></td>
<td>AG1</td>
<td>AG with larger grain size; Very low haze 1.65%</td>
</tr>
<tr>
<td></td>
<td>AG2</td>
<td>AG with larger grain size; Low haze 11.2%</td>
</tr>
<tr>
<td>Gaussian</td>
<td>C15</td>
<td>FWHM = 15°; Gaussian</td>
</tr>
<tr>
<td>Circular</td>
<td>C25</td>
<td>FWHM = 25°; Gaussian</td>
</tr>
<tr>
<td></td>
<td>C35</td>
<td>FWHM = 35°; Gaussian</td>
</tr>
<tr>
<td></td>
<td>C40</td>
<td>FWHM = 40°; Gaussian</td>
</tr>
<tr>
<td></td>
<td>C50</td>
<td>FWHM = 50°; Gaussian</td>
</tr>
<tr>
<td>Wide Angle</td>
<td>WA-C55</td>
<td>Non-Gaussian</td>
</tr>
<tr>
<td>Circular</td>
<td>WA-C90</td>
<td>Non-Gaussian</td>
</tr>
<tr>
<td></td>
<td>WA-C100</td>
<td>Non-Gaussian</td>
</tr>
<tr>
<td></td>
<td>WA-C110</td>
<td>Non-Gaussian</td>
</tr>
<tr>
<td></td>
<td>WA-C125</td>
<td>Non-Gaussian</td>
</tr>
<tr>
<td>Gaussian</td>
<td>E28-14</td>
<td>X-Axis FWHM = 28°; Gaussian</td>
</tr>
<tr>
<td>Elliptical</td>
<td></td>
<td>Y-Axis FWHM = 14°; Gaussian</td>
</tr>
<tr>
<td>Gaussian</td>
<td>L80</td>
<td>FWHM = 1°/80°; Gaussian</td>
</tr>
<tr>
<td>Linear</td>
<td>L90</td>
<td>FWHM = 1°/90°; Gaussian</td>
</tr>
</tbody>
</table>

Available as

- **Nickel mold**
  - Mold size: 100mm x 100mm
  - Active size: 80mm x 80mm
  - Thickness: 300µm (other thicknesses on request)
- **Film sample**
  - Substrate: 125µm PET
  - Size: approx. 100mm x 100mm
- **Injection molding**
  - Tools and parts (detailed specifications on request)
  - Custom tailored solutions are available on request
  - Scattering angle
  - Scattering profile (circular, linear, elliptical)
  - Grain size
  - Depth of profile
  - Haze value
  - Sparkling reduction
  - Mold size
  - Seamless sleeve