



APPLICATIONS

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

AVAILABLE AS

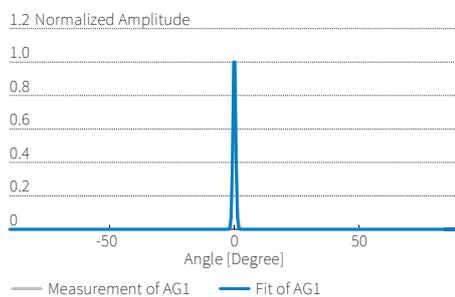
- Nickel tool
- UV-Rollimprint
- Mold insert
- Injection molded part
 - Mold size: 100 mm x 100 mm
 - Mold thickness: 300 μm +/-5 %
 - Other sizes and materials on request

Features of temicon's holographic diffusers

- Surface diffuser
- High transmission
- Custom tailored haze value (for AG)
- Adjustable grain size
- Sparkling effect can be minimized (for AG)
- Excellent LED hiding (for WA)
- Large, seamless surfaces
- Seamless sleeve tooling on request

Diffuser categories

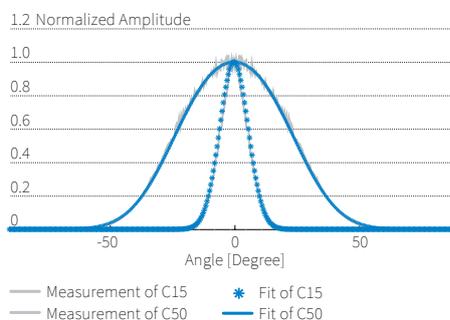
Antiglare



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

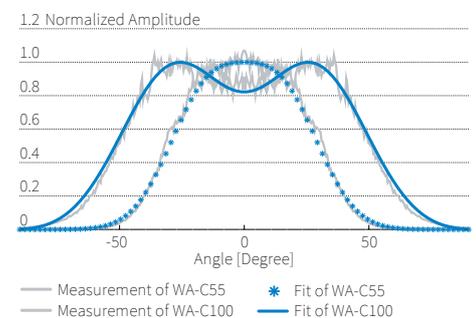
Custom tailored solutions are available on request.

Gaussian circular

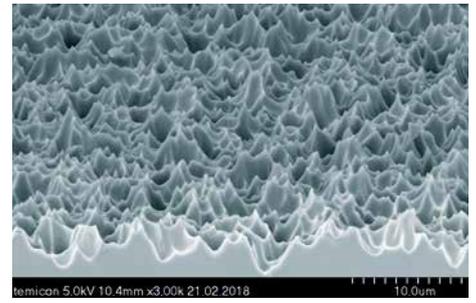
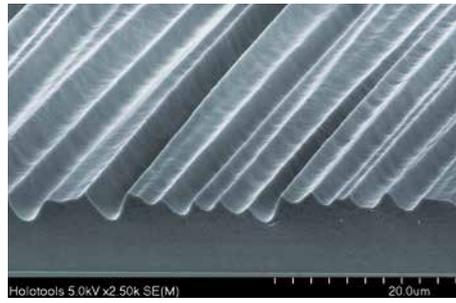
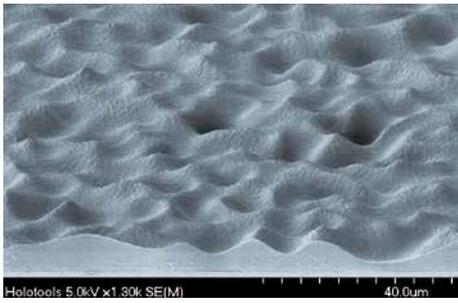


Diffusers with angles from 15° - 50° (FWHM) are available.

Wide Angle circular



Diffusers with angles from 55° - 110° are available.



Gaussian circular

SEM image showing a 2D-stochastic surface.

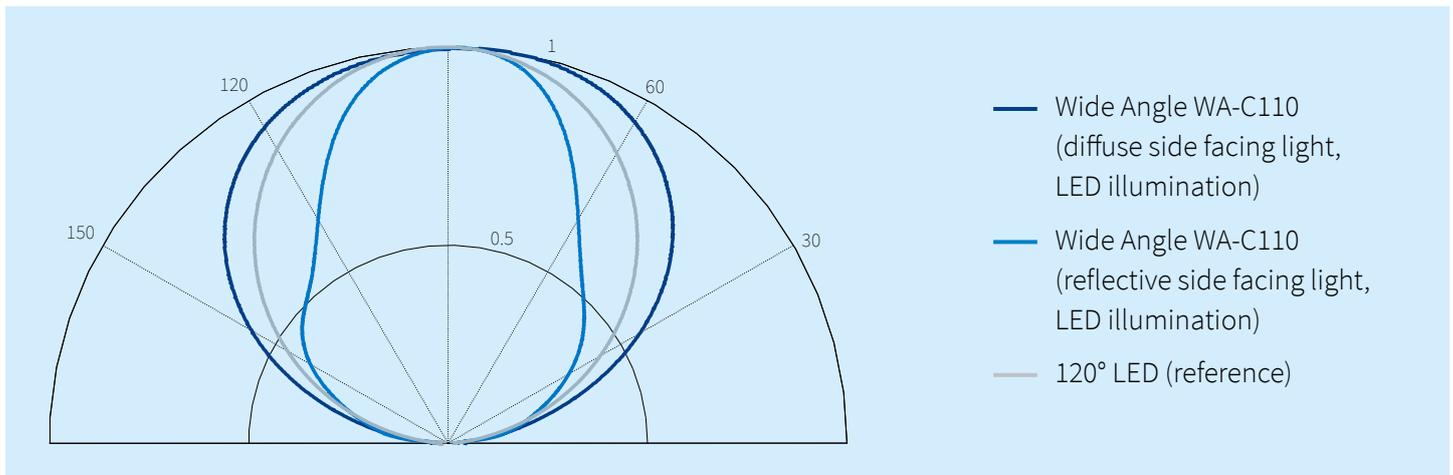
Gaussian linear

SEM image showing a 1D-stochastic surface.

Wide Angle circular

SEM image showing a surface with reduced grain size.

Measurements using LED illumination



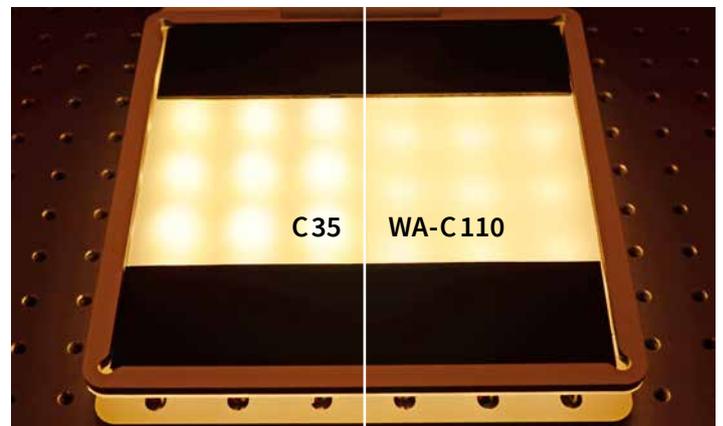
LED luminaires often suffer from strong glaring effects due to the small size of single LED sources and their broad emission angles. By utilizing the WA-series diffusers, one can narrow down the emission angle due to internal reflection (refer to light blue measurement curve above). Additionally, an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



Distance to LED Matrix: 0 mm

Almost no hiding for both diffuser types



Distance to LED Matrix: 15 mm

Strong hiding for WA-C110 diffuser (right), less hiding for C35 diffuser (left)

Laser source

Sample position

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

Sensor moves on circle, facing the diffuse surface while measuring light intensity

Depending on the used measurement setup and properties of the samples, the results may vary.

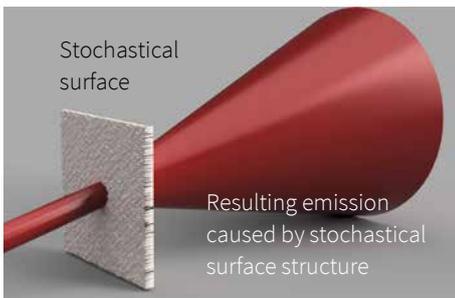
MEASUREMENT CONDITIONS

- 633nm Diode Laser
- Expanded beam ($1/e^2$ diameter approx. 8mm)
- Collimated, coherent illumination
- Distance adjustable at 25cm, 50cm, 75cm
- Mounted on optical table
- Normal incidence on structured side
- 125 μ m PET Foil
- LED as lightsource can be used
- Automatic data acquisition and postprocessing
- Tilt and pitch manually adjustable

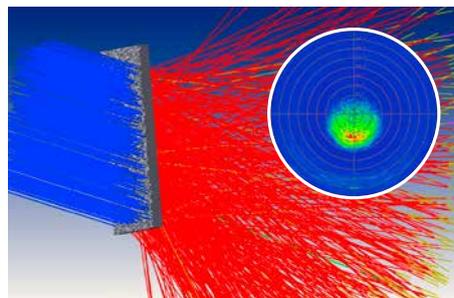
For characterization of diffuse surfaces temicon uses the setup as sketched above/below. A monochromatic, collimated laser source is used for illumination, its beam is slightly expanded in order to average speckle effects. By default, a wavelength of 633nm is used, other wavelengths are available on 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.

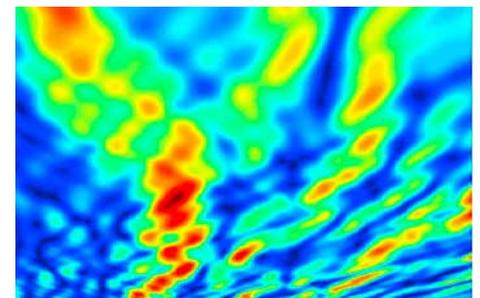
Optical modelling



Collimated laser beam under oblique incidence.



Scattering profile based on ray-tracing showing shifted pattern in polar coordinates.



Wave-optical, electromagnetic nearfield simulation showing speckles.

The usage of Laser Interference Lithography to generate holographic diffusers enables feature sizes of statistical surface topographies which are in the micro- or even nanometer range. However, such dimensions require ray- and wave-optical models in order to describe the system in a proper way. Therefore temicon's engineers use a library of different software tools and models. For example Zemax, rigorous coupled wave analysis (RCWA) or own codes (mainly based on Huygen's principle) are used in order

to simulate optical effects caused by various surface topographies accurately. Furthermore we can quantify the statistical surface properties of temicon's diffusers using various methods. Subsequently, this information can be used for the modelling of the optical behaviour under realistic conditions like oblique incidence and divergent illumination in order to offer the best solution for the requirements of our customers.

Specifications and availability

Available diffuser types

Type	Denotation	Description
Antiglare	HF-AG1	Low sparkling due to small grain size; Low haze 25,9%
	HF-AG2	Low sparkling due to small grain size; High haze 81,5%
	AG1	AG with larger grain size; Very low haze 1,65%
	AG2	AG with larger grain size; Low haze 11,2%
Gaussian Circular	C15	FWHM = 15°; Gaussian
	C25	FWHM = 25°; Gaussian
	C35	FWHM = 35°; Gaussian
	C40	FWHM = 40°; Gaussian
	C50	FWHM = 50°; Gaussian
Wide Angle Circular	WA-C55	Non-Gaussian
	WA-C90	Non-Gaussian
	WA-C100	Non-Gaussian
	WA-C110	Non-Gaussian
Gaussian Linear	L80	FWHM = 1°/80°; Gaussian
	L90	FWHM = 1°/90°; Gaussian

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 | • Haze value |
| • Scattering profile (circular, linear, elliptical) | • Sparkling reduction |
| • Grain size | • Mold size |
| • Depth of profile | • Seamless sleeve |

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