INFOTEXT

.LIGHT LOVES GLASS

OKA*SOLAR* 3D

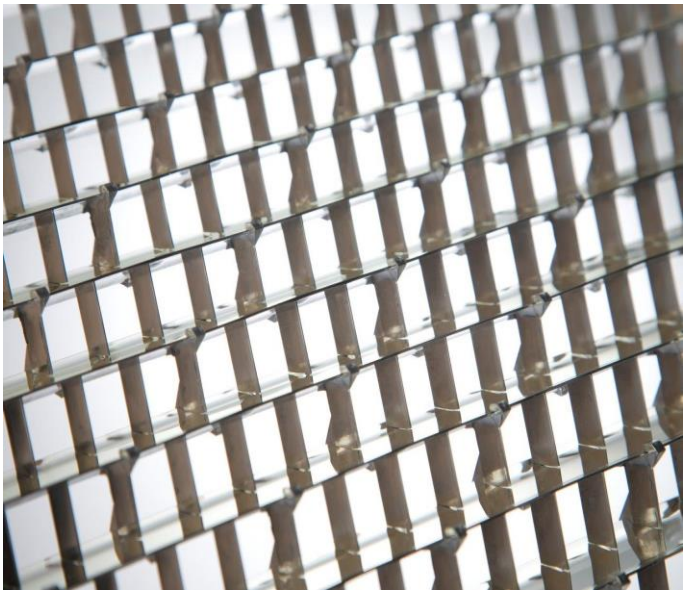
Insulating glass with three-dimensional sun protection grid

OKA*SOLAR* 3D is an insulated glazing system with a three-dimensional, highly reflective sun protection grid in the cavity between the glass panes. The geometry of the sun protection grid has been optimised for roof applications. The direct solar transmission is blocked at all times, irrespective of the height of the sun. This effectively reduces the heat gain into the interior of the building. At the same time a large proportion of diffuse daylight from the northern hemisphere gets into the interior. This results in even light distribution in the interior and significantly less fluctuation in brightness than with direct sunlight.

As façade glazing we recommend our products OKA*SOLAR* W and *OKASOLAR* F.

Thanks to its three-dimensional, highly reflective sun protection grid, OKA*SOLAR* 3D offers:

- Effective solar control
- Reduced heat gain
- No direct solar transmission
- Reduced glare
- Use of diffuse daylight
- Partial through-vision to the north
- Perceptible link to the exterior due to sun reflections
- Maintenance and fault-free
- Can be easily recycled
- Visibility for birds



Physical properties

Thermal insulation

OKA*SOLAR* 3D is available as a 2-pane make-up with a space between the panes of 24 mm, and also as a 3-pane make-up with an additional cavity between the panes.
Depending on the gas filling and coating, the 2-pane make-up achieves U_g values ≥ 1.4 W/(m²K). As a 3-pane make-up, Ug values ≥ 0.7 W/(m²K) are possible.

Sound insulation

The integrated louvres have no significant effect on the sound insulation. The achievable values depend on the glass assembly.

Spectral properties

The way OKA*SOLAR* 3D works depends on the relevant light conditions and it is manufactured to suit the geographical location, inclination and orientation of the roof in question. OKA*SOLAR* 3D is usually installed so that the main louvre runs from east to west. Together with the regularly spaced cross bars, the louvres provide complete shading from direct sunlight, leading to a reduction of the solar heat gain with an average g-value of approx. 10 % in the lock-out area.
The main louvre is made of aluminium with a reflection (solar and visual) of 90 %. The cross bars are concave in shape, so also at low solar altitude, the sunlight is always reflected to the outside. They are made of plastic with a highly reflective surface with a reflection (solar and visual) of over 80 %.
The sun protection grid, which is open to the north, enables partial transparency and allows diffuse irradiation. The thin cross section of the louvres enables a transparency of the grid itself of up to 85 %, depending on the direction of sight, and a diffuse light transmission of 60-70 % in the area of transmission.

In roof applications, OKA*SOLAR* 3D functions as follows:

1. Lock-out area (general direction: south)
   - Thermal sun protection with g-values of 7 % or more,
     particular secondary heat dissipation without solar radiation transmission
   - Reduced glare
2. Area of transmission (general direction: north)
   - diffused irradiation of daylight
   - partial through-vision

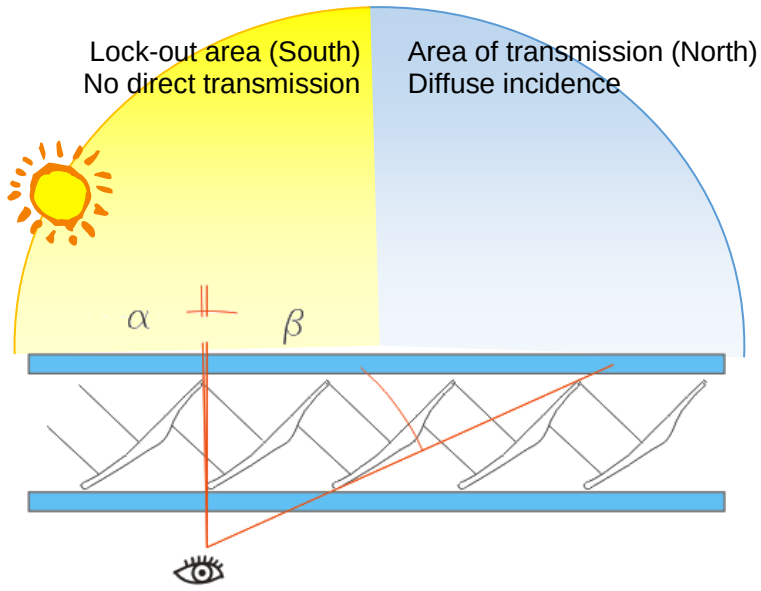


Table 1: Geometry of the different OKA*SOLAR* 3D types

Type	Angle of louvre [°]	Distance of louvre [mm]	Maximal through-vision %	Through-vision	
				from α [°]	to β [°]
3D 44/23	44	23	85	3	-66

Technical values of standard types

The following information applies to 2-pane make-up consisting of a 6 mm external pane and an 8 mm inner pane laminated safety glass with a thermal control coating at face #3.

Table 2: Technical values for the 2-pane make-up with low-e coating

Type OKA*SOLAR*	**T_v direct %**			**T_v diffuse %**	**TSET %**			**U_g value [W/(m²K)] / U_g [Btu/(hr ft² °F)] cavity 24 mm**		
	Lock-out area	Area of transmission	Vertical		Lock-out area	Average Lock-o. area	Vertical	Krypton	Argon	Air
3D 44/23	4-8	70	20	**27**	8-19	**10**	37	**1.4** / 0.25	**1.6** / 0.28	**2.0** / 0.35

The following information applies to 3-pane make-up consisting of a 6 mm external pane, a 6 mm middle pane and a thermal control coating at face #3 and an 8 mm inner pane laminated safety glass with a thermal control coating at face #5.

Table 3: Technical figures for a 3-pane make-up with low-e coating

Type OKA*SOLAR*	**T_v direct %**			**T_v diffuse %**	**TSET %**			**U_g value [W/(m²K)] / U_g [Btu/(hr ft² °F)] cavity 24 mm / 12 mm**		
	Lock-out area	Area of transmission	Vertical		Lock-out area	Average Lock-o. area	Vertical	Krypton	Argon	Air
3D 44/23	4-7	60	20	**23**	7-14	**10**	23	**0.7** / 0.12	**0.8** / 0.14	**1.1** / 0.19

Legend and related values:

	unit	**standard**	**technical term**
U_g	W/(m²K)	DIN EN 673 DIN EN 674	Thermal transmittance
TSET	%	DIN EN 410	Total solar energy transmittance or solar heat gain coefficient
T_v	%	DIN EN 410	Light transmission (direct/hemispheric resp. diffuse/ hemispheric)
R_w	dB	DIN EN 20140	Sound reduction coefficient
F_C	%	DIN 4108	Reduction factor of a solar control system, F_C=TSET/$TSET_{reference}$
SC	%	GANA Manual	Shading coefficient, SC=TSET/0.86

The above data are approximate data. They are based on measurements of approved test institutes and calculations derived from these measurements. Values determined on a project-specific basis may vary from the above values. The values continue to vary if other coatings are used.

Direct transmission relates to direct incidence of light, generally vertical (model situation for direct sunlight). Diffuse transmission applies to homogeneous, diffuse incidence of light from the outer hemisphere (model situation for an overcast sky). All values were measured hemispherically.

The specified values may change as a result of technical developments. No guarantee is therefore given for their correctness.

Make-up

The special feature of OKA*SOLAR* 3D is that the sun protection grid is integrated into the cavity of the insulated glazing system, so there are special requirements with regard to installation, maintenance or repair, and the entire system can be treated just like standard insulated glazing. The thickness and type of glass depend on structural and building requirements. However, for structural reasons the bending radius is to be limited to 12 m under deformation. For that reason we recommend the minimum thicknesses according to table 4 for the deformation of various types of glass.

Table 4: Minimum glass thicknesses when using float, Heat Strengthened Glass, Tempered Glass and Laminated Safety Glass

Minimum glass thicknesses	Annealed Float	Heat Strengthened Glass	Tempered Glass
Monolithic	3 mm	4 mm	6 mm
Each individual pane of LSG	3 mm	4 mm	6 mm

Standard make-up:

2-pane make-up

Outer pane made of thermally treated glass with surrounding screen-print at face #2
Cavity: 24 mm with integrated sun protection grid and gas filling
Inner pane: LSG made of float glass or Heat Strengthened Glass with low-e coating at face #3

3-pane make-up

Outer pane made of thermally treated glass with surrounding screen-print at face #2
Cavity 1: 24 mm with integrated sun protection grid and gas filling
Middle pane made of float glass or thermally treated glass with low-e coating at face #3
Cavity 2: 8 to 12 mm with gas filling
Inner pane: LSG made of float glass or Heat Strengthened Glass with low-e coating at face #5

Dimensions

The table below show maximum dimensions and visible widths.

glass dimension parallel to main louvre axis	max. 3000 mm
glass dimension perpendicular to main louvre axis	max. 3000 mm

The maximum area is 7 m^2. Special shapes are possible. It may be necessary to use an increased secondary sealant in the case of smaller dimensions and/or greater thickness of glass.

Pressure on the surface of the pane can permanently damage the louvre insert. Even when of the appropriate dimensions, the panes must not be walked on without the agreement of the manufacturer. When planks are laid over the window, the load must be carried over the edge of the pane.

For tolerance reason and due to different thermal expansions, the insert may exhibit a visible light gap between the insert and the spacer bar. For this reason, the overall sealant (spacer bar + secondary seal) plus additional 33 mm have to be covered by a profile or by an appropriate edge screen printing.

In the case of a polysulphide as secondary seal, it may be necessary to use a exceed cover in order to provide sufficient UV protection. In the case of a frameless glazing system, it is generally recommended that the edge areas are covered using a UV-impenetrable edge enamelling. Depending on loading, the required sealant width can be considerably greater than that of "conventional" insulating glazing.

Planning instructions

On the basis of the planning data, in particular

- geographical latitude of the project
- roof orientation
- roof inclination
- room utilisation

we develop a project-specific OKA*SOLAR* assessment. The shading times of the respective OKA*SOLAR* type are evident in the OKA*SOLAR* assessment.

In the case of OKA*SOLAR*, as a result of the back reflection of the light on the outer glass surfaces, an additional internal glare protection may be necessary in particularly critical applications (e.g. computer workstations). The reflections of the sun create a perceptible link to the exterior.

The louvres have a highly reflective coating, which contributes to an effective redirection of solar radiation. For this reason, certain lighting conditions and viewing angles may already make slight deviations in the positions of some of the louvres or cross bars visible. These deviations are unavoidable and do not affect the function of the insulating glass.

If the OKA*SOLAR* insulating glazing is being installed at temperatures < 0°C in an unheated building (winter construction site), we must be notified of this in writing beforehand.

Installation instructions

OKA*SOLAR* insulating glass is glazed as per normal insulating glass. During transportation, the insert may slide to the side, creating a greater visible slit between the spacer. We must be notified in writing beforehand of any special loads which may occur during transportation (vibrations/shaking).
For instructions and recommendations for the installation of our insulating glazing, please refer to our information and instructions for customers contained in "Delivery of OKA*LUX* Glass Products" and "General Information on Glazing".

OKA*SOLAR* Design

We recommend the use of the OKA*SOLAR* type that best complies with the requirements to be met and the installation situation (orientation, inclination) specified in the cover note.

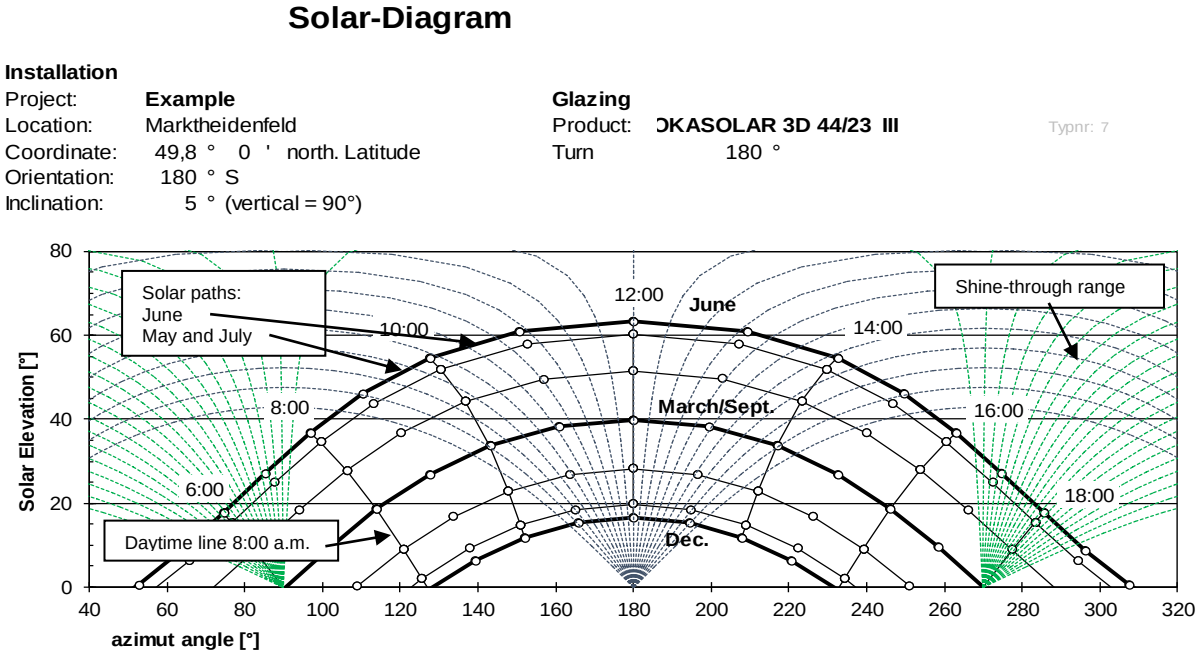
Type designation

The type designation ends in a Roman numeral (I, II, III or IV). This indicates the direction in which the louvres of OKA*SOLAR* are "opened". In façades, the louvres usually run horizontally (Type I, providing shade against the high sun).
When used in roof glazing constructions, the louvres should if possible be turned so that they are "opened" towards the north, in order to provide shade against the sun from the south.

Solar diagram

The OKA*SOLAR* design contains a solar diagram for each glazing orientation that occurs. This indicates how long the sun can shine directly through the selected glazing, for each time of year or time of day. With OKA*SOLAR*, the sun shines only partially through between the louvres.

Example of a solar diagram



Terms

Coordinates: Geographical latitude of the installation site, the path of the sun is dependent on the geographical latitude
Orientation: Direction the glazing is facing, 0° = North, 90° = East, etc.
Inclination: Inclination of the glazing with respect to the horizontal, horizontal = 0°, vertical = 90°
Product: OKA*SOLAR* type for which the diagram was drawn up. If clear glass without louvres is examined for purposes of comparison, "Clear glass" appears here.
Rotation: see type designation

Paths of the sun

The solid black lines show the paths of the sun for various days in the year. The height of the sun is entered depending on the azimuth angle (90° = East, 180° = South). The lines for the time of day are entered at right angles to these.
Example: At 4 p.m. (solar time) in June, the sun is at an azimuth of approx. 260° (that is, almost exactly in the West), and at about 37° above the horizon.

Shine-through range

At points where the tracks of the sun and the transparency area overlap (where the green and blue lines intersect), the sun shines through the glazing (in the case of OKA*SOLAR* partially through the louvres).
Specimen solar diagram: All the intersection points are outside the tracks of the sun so no direct sunlight enters at any time.

Solar time, deviations from local time

Solar time is specified in the solar diagrams, that is, at 12 noon the sun is at its highest point and is exactly due south. This time differs from local time. There are three reasons for this discrepancy:

- Time zone: since the sun cannot be at its highest point in all places within a time zone at 12 noon, solar time differs from local time by a few minutes. For example, the sun reaches its highest point in Berlin approx. 19 minutes earlier than in Frankfurt.
- Periodic fluctuations in the earth's orbit and in the earth's rotation cause an additional deviation of up to 16 minutes.

For this reason, actual local time fluctuates within a range of approx. 30 minutes, depending on the time of year. At 12 o'clock solar time, for example, local time in Berlin fluctuates between 11:50 and 12:20, and in Madrid between 12:59 and 13:29.

- Summer time: In summer time, one more hour must be added to solar time.

Other printed matter

If you do not have the following printer matter, please request it directly from OKALUX or download it from the Internet at www.okalux.com:

General terms and conditions of business
Product-specific information texts

As well as these, there are the following customer notes:

Customer notes on offers
Customer notes on delivery
Customer notes alarm glass
Customer notes screen printing
Customer notes Structural Glazing / Edge deletion
Customer notes on heat-soak test
Customer notes on glazing
Customer notes SIGNAPUR®
Customer notes OKA*WOOD* tolerances
Cleaning instructions for OKA*LUX* gen.
Cleaning instructions OKA*COLOR*
Guideline for visual quality