

**DOCKETED**

<b>Docket Number:</b>	17-BSTD-02
<b>Project Title:</b>	2019 Title 24, Part 6, Building Energy Efficiency Standards Rulemaking
<b>TN #:</b>	224203
<b>Document Title:</b>	Jeff Sutton Comments Fenestration Shading Devices
<b>Description:</b>	N/A
<b>Filer:</b>	System
<b>Organization:</b>	Jeff Sutton
<b>Submitter Role:</b>	Public
<b>Submission Date:</b>	7/18/2018 5:47:00 PM
<b>Docketed Date:</b>	7/18/2018

*Comment Received From: Jeff Sutton  
Submitted On: 7/18/2018  
Docket Number: 17-BSTD-02*

## **Fenestration Shading Devices**

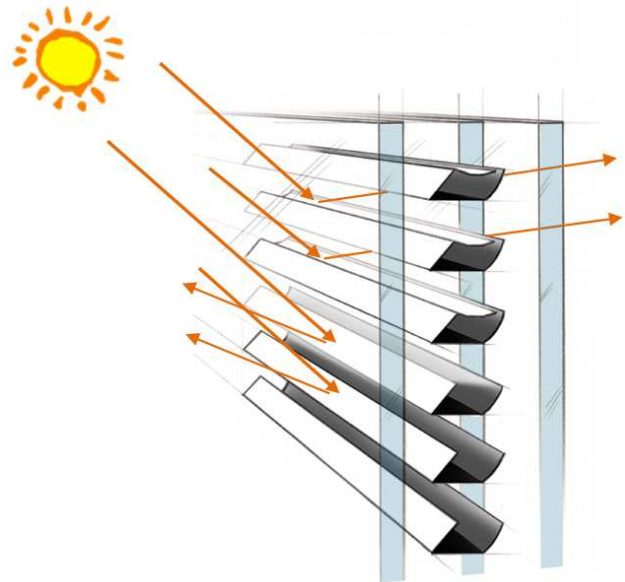
It is not clear from the text that a fixed shading screen such as the Okalux internal fixed louver would be treated as an external shading device. As it is between the glazing, it seems like it could be interpreted as "blinds", and "Glazing systems that use blinds between the glazing layers are also considered internal shading devices", and "Internal shading shall not be modeled in the proposed design, unless it is automatically controlled". This comment was intended to address Pella type windows with the internal mini-blinds that can be adjusted manually. These louvers are fixed, and should be correctly noted to be treated as an exterior shading device - otherwise this type of product and many others like it will not be utilized if the benefits can not be modelled.

*Additional submitted attachment is included below.*

## OKASOLAR F

### Glazing with Integral Sun Control Louvres

OKASOLAR F is an insulating glass with fixed louvres in the cavity between the glass panes. OKASOLAR F enables both the use of daylight as well as an effective solar control, and has been optimised for use in the façade. For roof glazing, we recommend our product OKASOLAR S.



With its three-dimensionally shaped, highly reflective profile, OKASOLAR F offers:

- Efficient directionally selective solar control
- Directionally selective light transmission
- Partial through-vision
- Two different louvre types (O and U), which can be combined in one element.
- Can be easily recycled
- Visibility for birds

### Physical properties

#### Thermal insulation

OKASOLAR F is available as a 2-pane make-up with cavity between the panes of 16 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  $\geq 1.1 \text{ W}/(\text{m}^2\text{K})$ . As a 3-pane make-up,  $U_g$  values  $\geq 0.6 \text{ W}/(\text{m}^2\text{K})$  are possible.

#### Sound insulation

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

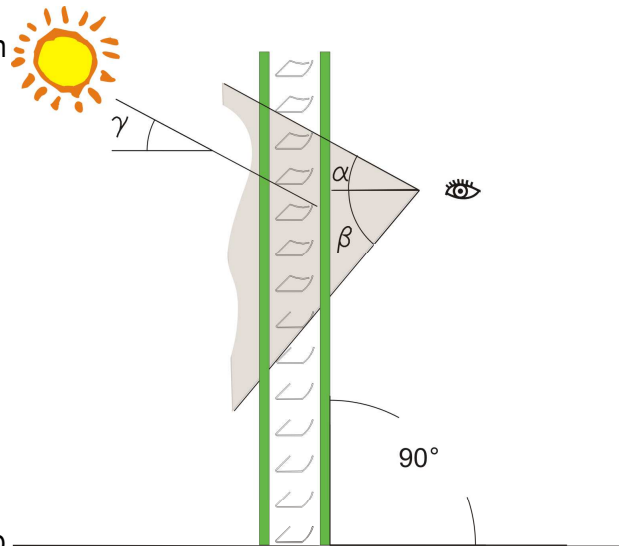
#### Spectral properties

The compact louvre cross-section permits horizontal through-vision on a proportional area of approx. 57%. Type U has been primarily optimized for glare protection and reflection of light outwards (retro-reflection). Type O has a special profile shape, which deflects daylight into the room. Therefore, O type is especially suited for skylights in vertical facades and for the area above approx. 1800 mm from the finished floor level in ceiling-high glazing, in order to avoid glare from the light deflected inwards.

The function of OKASOLAR F depends on the current radiation conditions. Partial through-vision is always given, despite the solar control which differs depending on the season and time of day.

Integrated in a vertical façade, OKASOLAR F functions as follows:

1. direct irradiation from high and medium solar altitude
  - thermal solar control with a low total solar energy transmittance as  $\geq 9\%$ , in particular secondary heat transfer with low solar radiation transmission
  - glare protection
  - light deflected into the room with type O
2. direct irradiation from low solar altitude
  - partial transmission of the direct sunlight
  - light deflected into the room with type O
3. diffused irradiation (overcast sky)
  - preferred light transmission flat in every part of the room

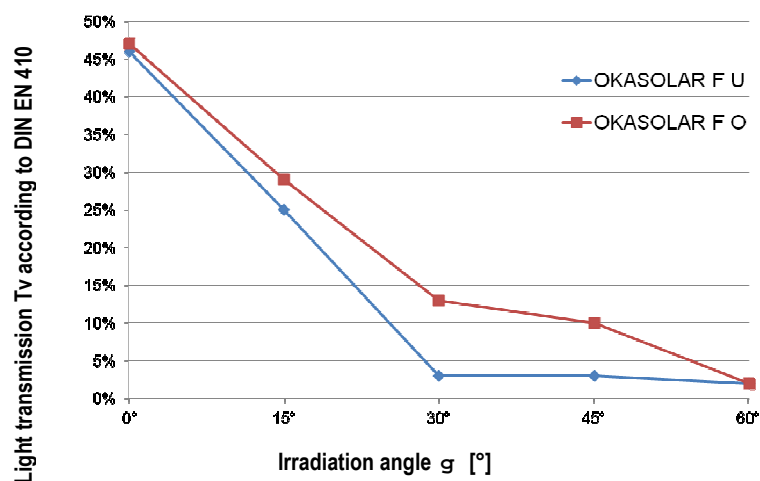


### Technical values of standard types

The following information applies to 2-pane make-up consisting an external pane with a thickness of 6 mm with a functional coating at face #2 and an inner pane with a thickness of 6 mm.

**Table 1:** Geometry of the different OKASOLAR F types

Type OKASOLAR	Angle of louvre [°]	Distance of louvre [mm]	Horizontal trough- vision %	Trough-vision to		Lock out angle $\varrho$ [°]
				above a [°]	lower b [°]	
F O	0	9.5	57	28	50	28
F U	0	9.5	57	28	50	28



**Figure 1:** Angle-selective light transmission  $T_v$  of the different OKASOLAR F types in the 2-pane make-up with low-e coating

**Table 2:** Technical values for the 2-pane make-up with low-e coating as well as solar control coating 70/37

Type OKASOLAR	Functional coating	T <sub>v</sub> % min. <sup>1)</sup>	T <sub>v</sub> % max. <sup>2)</sup>	g value % min. <sup>1)</sup>	g value % max. <sup>2)</sup>	U <sub>g</sub> value [W/(m <sup>2</sup> K)] U <sub>g</sub> [Btu/[hfr ft <sup>2</sup> F]] cavity 16 mm		
						Krypton	Argon	Air
FO FU	low-e	2	48	18	46	1.1 (0.19)	1.7 (0.30)	2.1 (0.37)
FO FU	solar	2	41	14	31	1.1 (0.19)	1.7 (0.30)	2.1 (0.37)

The following information applies to 3-pane make-up consisting of a 6 mm external pane functional coating at face #2, a 6 mm middle pane and a 6 mm inner pane with a thermal control coating at face #5.

**Table 3:** Technical values for the 3-pane make-up with low-e coating as well as solar control coating 70/37

Typ OKASOLAR	Functional coating	T <sub>v</sub> % min. <sup>1)</sup>	T <sub>v</sub> % max. <sup>2)</sup>	g value % min. <sup>1)</sup>	g value % max. <sup>2)</sup>	U <sub>g</sub> value [W/(m <sup>2</sup> K)] U <sub>g</sub> [Btu/[hfr ft <sup>2</sup> F]] cavity 16 mm/10 mm		
						Krypton	Argon	Air
FO FU	low-e	2	43	11	35	0.6 (0.11)	0.9 (0.16)	1.2 (0.21)
FO FU	solar	2	37	9	24	0.6 (0.11)	0.9 (0.16)	1.1 (0.19)

<sup>1)</sup> for angle of incidence  $\alpha = 60^\circ$

<sup>2)</sup> for angle of incidence  $\alpha = 0^\circ$  (vertical to the glass surface)

Legend and related values:

	unit	standard	technical term
U <sub>g</sub>	W/(m <sup>2</sup> K)	DIN EN 673 DIN EN 674	Thermal transmittance
TSET	%	DIN EN 410	Total solar energy transmittance or solar heat gain coefficient
T <sub>v</sub>	%	DIN EN 410	Light transmission (direct/hemispheric resp. diffuse/ hemispheric)
R <sub>w</sub>	dB	DIN EN 20140	Sound reduction coefficient
F <sub>c</sub>	%	DIN 4108	Reduction factor of a solar control system, F <sub>c</sub> =TSET/TSET <sub>reference</sub>
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.

A low-e coating or a combined solar and low-e coating at face #2 changes the colour appearance when viewed from outside.

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 OKASOLAR F is that the louvres for solar control and use of daylight are integrated in the cavity between the glass and therefore pose no special requirements concerning the installation, maintenance and cleaning. In fact, the OKASOLAR element can be treated like conventional insulating glass. The glass thickness and type are based on the structural needs and constructional requirements.

### Standard make-up:

#### 2-pane make-up

External pane made of thermally treated glass, low-e/solar control coating face #2  
 Cavity: 16 mm with integrated louvres and gas filling  
 Inner pane made of thermally treated glass

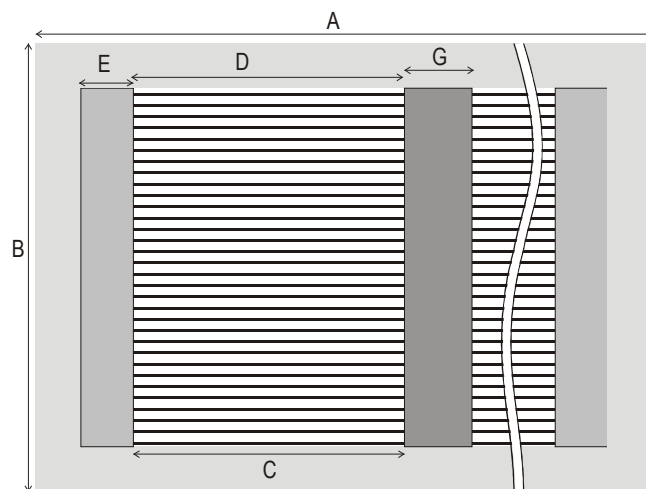
#### 3-pane make-up

External pane made of thermally treated glass, low-e/solar control coating face #2  
 Cavity 1: 16 mm with integrated louvres and gas filling  
 Intermediate pane made of thermally treated glass  
 Cavity 2: 8 to 12 mm with gas filling  
 Inner pane made of thermally treated glass, low-e coating face #5

## Dimensions

The table and drawing below show maximum dimensions and visible widths.

glass dimension parallel to louvre direction	A	max. 3000 mm
glass dimension perpendicular to louvre direction	B	max. 4000 mm
louvre length	C	max. 1000 mm
unsupported span of louvres	D	max. 1000 mm
visible width edge profile	E	17,5 mm
visible width of joint profile	G	17,5 mm



The maximum area is 7 m<sup>2</sup>. Special shapes are possible. The feasibility and divisions must be discussed with OKALUX beforehand. It may be necessary to use an increased secondary sealant in the case of smaller dimensions and/or greater thickness of glass. The required edge seal width must be discussed with OKALUX beforehand. In the case of over sized units, joints could occur at the edge and joint profiles. OKALUX will specify the location of the joints.

For tolerance reasons and due to differing temperature expansion, the insert may exhibit an expansion gap of up to 2.0 mm on each side. This can lead to a visible gap between the insert and the spacer bar. For this reason, the depths of the glazing rebate must amount to at least the required overall sealant (spacer bar + secondary seal) plus 5 mm. Otherwise the edge area has to be covered by a screen print. In the case of a polysulphide as secondary seal, it may be necessary to use a exceed cover in order to provide sufficient UV control. In the case of a frameless glazing system, it is generally recommended that the edge areas are covered using a screen print. Depending on loading, the required sealant width can be considerably greater than that of “conventional” insulating glazing.

Depending on the insulating glass formats, joint profiles may be required to support the louvres. If we do not receive any specifications, we will provide a symmetrical division of the louvres for each individual insulating glass unit. Please consult us in good time if a different division is required.

Edge and joint profiles have a matt, eloxal finish in the colour black C-35 (EV6). Profiles can be powder-coated in RAL colours upon request.

## Planning instructions

On the basis of the planning data, in particular

- geographical latitude of the project
- possible façade inclination
- façade orientation
- room utilisation

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

OKASOLAR does not totally block out the sun which can at times shine through the louvres and be partially redirected to the inside. A part of the retro-reflected light is reflected once more by the outer glass surfaces to the inside. These circumstances may make it advisable to put in additional internal glare protection to satisfy especially demanding applications (e.g. computer workstations).

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 visible. These deviations are unavoidable and do not affect the function of the insulating glass.

If the OKASOLAR 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**

OKASOLAR 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 and the insert or the support profiles could become inclined. 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 OKALUX Glass Products" and "General Information on Glazing".

## **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](http://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 OKAWOOD tolerances  
Cleaning instructions for OKALUX gen.  
Cleaning instructions OKACOLOR  
Guideline for visual quality