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.LIGHT LOVES GLASS

OKACELL building-integrated photovoltaic

OKACELL makes building-integrated photovoltaic available for architectural applications. OKACELL offers the greatest possible variety of designs with different cell types, cell colours and customized alignment. A wide range of module shapes is possible in addition to rectangular panels. OKACELL is available as monolithic glazing and insulated glazing for facade and roof.

OKACELL offers:

- Individual design options
- High efficiency up to 180 W_p/m^2 depending on the cell type and coverage density
- Extensive support in planning
- Combination with OKALUX light diffusing insulated glass
- Combination with individually printed front glasses
- Visibility for birds

Physical properties

Thermal insulation

The U-value depends on the cavity between the panes, the emissivity of the glass coating and the gas infill. In insulating glass with low-e coating, the figures are 1.0 W/(m^2K) with krypton gas, 1.1 W/(m^2K) with argon and 1.4 W/(m^2K) with air. For more information about different make-ups, please refer to our OKATHERM information text. The thermal insulation is improved in combination with our light-diffusing capillary slab. For more information about this, please refer to the information text of our capillary products.

Sound insulation

The sound attenuation value of a glazing system depends in a complex way on

- glass thicknesses and coatings in laminated glass
- cavity
- gas filling

Spectral properties

The total energy transmittance and the light transmission are highly dependent on the cell coverage density. This can be specified for the specific project. The individual PV cells function as a shading element at the same time in this case. In order to avoid the individual cells casting shadows, it is possible to combine OKACELL with our light-diffusing products, e.g. OKALUX K light-diffusing glass. Due to the capillary inlay only diffuse daylight penetrates into the interior. This improves the spatial depth illumination and avoids unwanted glare. A disruptive stroboscopic effect can be created by normal transparent glass, in particular at sporting facilities.

Technical values of standard types

U-value	1.0 to 1.4 W/(m²K) as insulation glazing and up to 0.8 W/(m²K) in combination with OKALUX K
TSET	≤ 12 %
T_v	10 % to 80 %

Legend and related sizes

	Unit	Standard	Name
U	W/(m²K)	DIN EN 673 DIN EN 674	Heat transfer coefficient, U_g = U
TSET	%	DIN EN 410	Total energy transmittance
T_v	%	DIN EN 410	Light permeability (direct/hemispheric)

The specified values are approximate. They are based upon measurements by recognised test institutes and the derived calculations.

Dimensions

The cells are embedded in a laminated glass made from tempered/toughened glass or heat-strengthened glass (low-iron glass). PVB or EVA foil is used as the intermediate layer.

max glass dimensions	up to 2200 mm x 3600 mm
Minimum size	with two cells alongside each other approx. 400 mm
Individual cell size	158.75 mm x 158.75 mm
Minimum cell spacing	≥ 2.5 mm
Distance from cell to edge seal	≥ 20 mm
Lateral projection connector	approx. 10 mm (cable diameter)

Electrical data

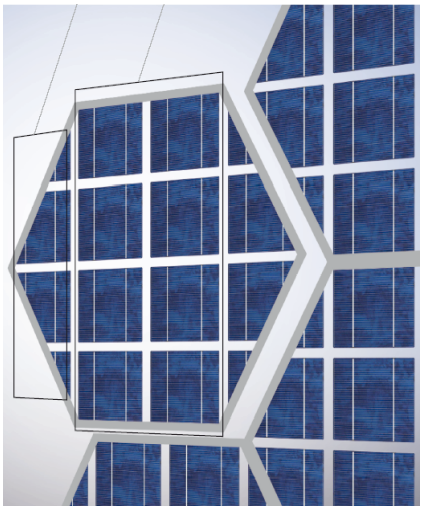
Efficiency	approx. 22.2 %
Power	180 Wp/m² at 100 % coverage density

Due to the rapid technical progress in the development of new cell types and sizes, it may be that a specific type of cell is no longer available at a later date.

The inherent colour and the brightness of crystalline cells is not a defined property. Therefore, colour differences may occur within a module and between different modules.

Further technical information regarding the various cell types and their specific key data can be requested directly from OKALUX.

Planning instructions



OKACELL provides the greatest possible freedom in design and development of building integrated photovoltaic. In addition to offering an appealing architectural aesthetic due to the arrangement of individual cells, it is also possible to configure complex model panels. Furthermore, OKACELL generates environmentally friendly electricity from solar power, which means it helps to reduce CO_2 production. The generated energy means that the building shell pays for itself over time. The electrical yield from a PV system is dependent on numerous factors. We offer extensive support in planning and optimising your OKACELL facade.

Factors that influence the electrical yield from a PV system are:

- Cell type and cell coverage density
- Geographical location of the building
- Orientation, pitch, azimuth angle of the facade / roof
- (Partial) shading
- Efficiency of the inverter

Efficiency of difference cell types

Crystalline cell		Thin film	
Polycrystalline	15 % - 18 %	Amorph	6 % – 8 %
Mono-crystalline	20 % - 23 %	CIS/CIGS	13 % – 15 %

Solar irradiation

The intensity of insulation at the limits of our atmosphere is 1367 W/m² (solar constant). The insulation and therefore the radiation energy available at the Earth's surface is heavily dependent on the weather and the time of year. In Germany, the radiation intensity per m² on a fine summer's day is about 1000 - 1200 W/m², dropping to only about 50 - 150 W/m² on an overcast winter's day. The mean annual radiation energy in Germany is 1000 - 1200 kWh/m^2. However, the local insulation depends on the location. One source for the regional insulation values in Europe can be found at: http://re.jrc.ec.europa.eu/pvgis/apps3/pvest.php

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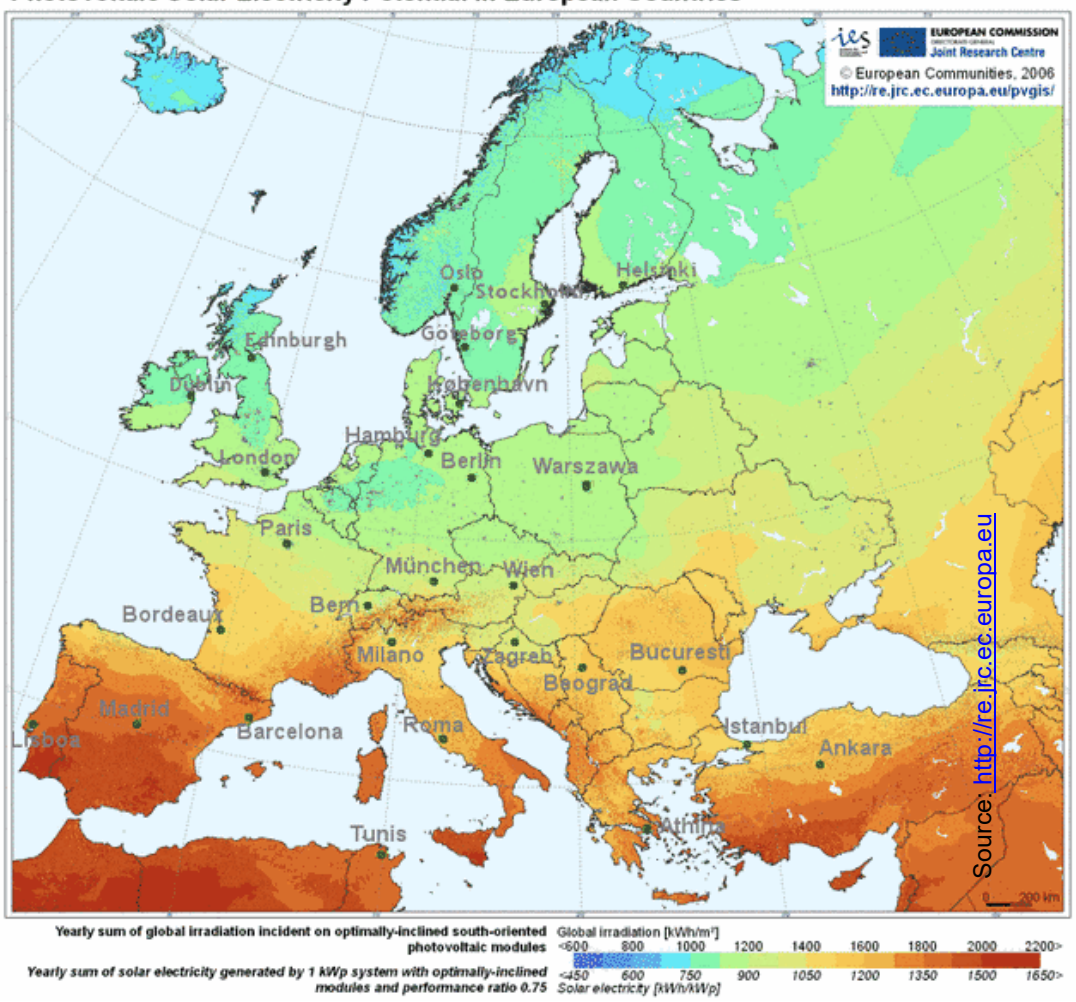
Quelle: http://re.jrc.ec.europa.eu

Photovoltaic Solar Electricity Potential in European Countries



Quelle: http://re.jrc.ec.europa.eu

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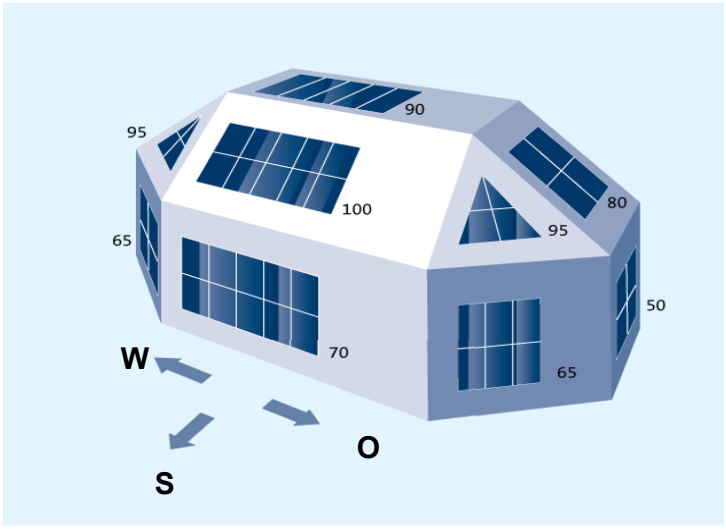
The dependency between the orientation and pitch of the particular building side is shown in the following illustration. Basically, a tilted orientation in the southerly direction should offer the greatest electricity yield. If the building does not permit this to be achieved and the OKACELL facade is thus pointing in a different direction, then this is not especially problematical. Even a vertical facade with a westward or eastward orientation will still achieve 50% of the potential yield.



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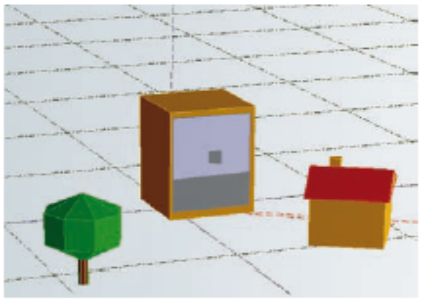

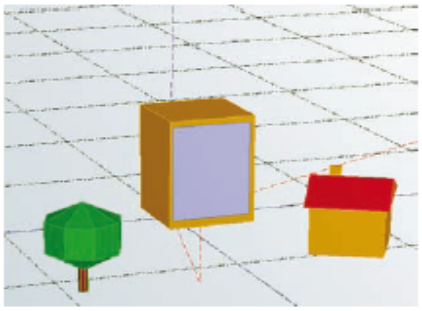

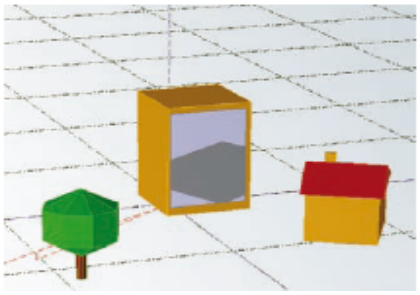

When a PV module is partly shaded, it can lose a significant amount of power. All other modules connected in series within the same circuit will also be affected and will be reduced to the same low power output level as the shaded module. Therefore, shading of the OKACELL element should be avoided as far as possible. Potential casters of shadow can include:

- Topography, vegetation
- Adjacent buildings
- Electricity pylons and cables
- Aerials, chimneys
- Roof overhangs

In order to avoid undesirable partial shading throughout the largest possible part of the year, it may be sensible to simulate the surroundings of the building in 3D as shown in the pictures. If partial shading cannot be avoided then the affected areas can be grouped into a separate circuit with its own inverter.

A rough value for the electrical yield of a PV system per m^2 can be obtained by multiplying three values:

1. Annual insulation onto the facade or roof in question:

   e.g. vertical south-facing facade in Freiburg, Germany
   70% of 1100 kWh/m^2 = 770 kWh/m^2

2. Module efficiency as a product of the efficiency of the cells used and the occupancy level of the module with cells:

   e.g. 6" mono-crystalline cells (blue) with an efficiency of 22 % and 80 % occupancy produces a module efficiency level of: 22 % • 0.80 = 17.6 %

3. Efficiency of the systems (inverter, cable, etc.):

   e.g. Q-factor 85 %

The estimated electricity yield per m² and per year is obtained by multiplying the aforementioned figures:

770 kWh/m^2 • 0.176 • 0.85 = 115 kWh/m^2

Further technical information about the various cell types and their specific key data can be requested directly from OKALUX.

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®
Cleaning instructions for OKALUX gen.
Guideline for visual quality