Working of a

SUNLUX® SUNSCREEN

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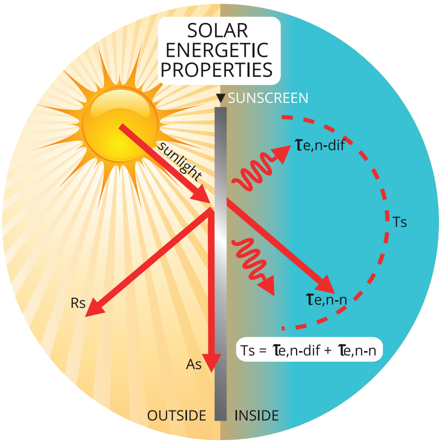
Sunscreen = protection against sunrays

Sunscreen means protection against the sunrays, so the function is the protection against light and heat, which is expressed in several properties.



Rs	Solar reflectance
As	Solar absorptance
Ts	Solar transmittance
$\tau_{e,n-dif}$	Diffuse solar transmittance
$\tau_{e,n-n}$	Normal solar transmittance

Classes indicate effect of a sunscreen

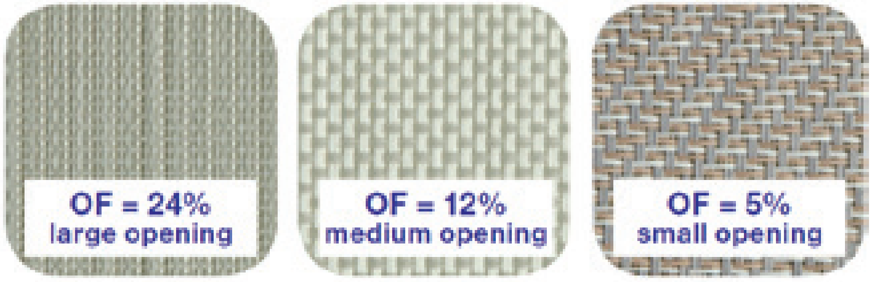
Based on certain properties, the screen can be split up in classes, from 0 to 4.

Those classes are used, starting from the norm EN 14501, to indicate the effect of a certain sunscreen.

influence on thermal and visual comfort	
Class 0	very little effect
Class 1	little effect
Class 2	moderate effect
Class 3	good effect
Class 4	very good effect

Sunlux® Visual Properties

OPENNESS FACTOR



The openness of a screen is indicated by the openness factor = **OF.**

The openness coefficient is the relative area of the openings in the fabric seen under a given incidence. The openness factor is seen under a normal incidence.

LIGHT TRANSMITTANCE

The sunrays are subdivided in: **Visible light, UV-light and IR-light.**

Visible light (55% of the sun-energy) is that part for which our eyes are most sensitive. The larger the light intensity, the more detrimental for our eyes. The factor **Visible Light Transmittance = Tv**, is the ratio of visible light that will be transmitted. The lower this factor can be kept, the better for the eyes.

UV-light (3% of the sun-energy) is the part of radiation which is detrimental for our health. This factor is indicated by the **UV Transmittance = Tuv**. This is the quantity UV-light transmitted by the sunscreen.

IR-light is invisible. This is however 42% of the sun-energy. These rays care for the reheating of solid substances and gases.

INFLUENCE OF COLOURS

The choice of the colour has direct influence on the criteria which justify the use of sunscreen protection:

- Protection against visible light, expressed by the factor **Tv.**
- Protection against sun-energy, expressed by the **G** value.
- Protection against secondary heat, expressed by the factor **Qi.**
- Protection against UV-light, expressed by the factor **Tuv.**

Sunlux® Visual Properties: CLASSES

GLARE CONTROL

The capacity of the solar protection device to control the luminance level of openings and to reduce the luminance contrasts between different zones within the field.

τv,n-n	τv,n-dif			
	τv,n-dif < 0,02	0,02 ≤ τv,n-dif < 0,04	0,04 ≤ τv,n-dif < 0,08	τv,n-dif ≥ 0,0
τv,n-n > 0,10	0	0	0	0
0,05 < τv,n-n ≤ 0,10	1	1	0	0
τv,n-n ≤ 0,05	3	2	1	1
τv,n-n = 0,00	4	3	2	2

PRIVACY AT NIGHT

Night privacy is the capacity of an internal or external blind or a shutter in the fully extended position or fully extended and closed position to protect persons, at night in normal light conditions from external view.

External views means the ability of an external observer located 5m from the fully extended and closed product, to distinguish a person or object standing 1m behind the protection device in the room.

τv,n-n	τv,n-dif		
	0 < τv,n-dif ≤ 0,04	0,04 < τv,n-dif ≤ 0,15	τv,n-dif > 0,15
τv,n-n > 0,10	0	0	0
0,05 < τv,n-n ≤ 0,10	1	1	1
τv,n-n ≤ 0,05	2	2	2
τv,n-n = 0,00	4	3	2

VISUAL CONTACT WITH THE OUTSIDE

Visual contact with the outside is the capacity of the solar protection device to allow an exterior view when it is fully extended. This function is affected by different light conditions during the day.

τv,n-n	τv,n-dif		
	0 < τv,n-dif ≤ 0,04	0,04 < τv,n-dif ≤ 0,15	τv,n-dif > 0,15
τv,n-n > 0,10	4	3	2
0,05 < τv,n-n ≤ 0,10	3	2	1
τv,n-n ≤ 0,05	2	1	0
τv,n-n = 0,00	0	0	0

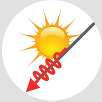
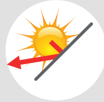
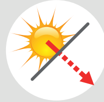
DAYLIGHT UTILISATION

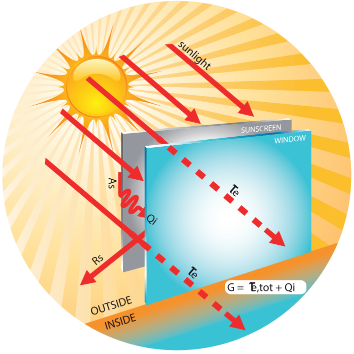
Daylight utilisation is characterised by:
- the capacity of the solar protection device to reduce the time period during the artifi cial light is required.
- the capacity of the solar protection device to optimise the daylight which is available.

CLASS	0	1	2	3	4
τv,dif-h	τv,dif-h < 0,02	0,02 ≤ τv,dif-h < 0,10	0,10 ≤ τv,dif-h < 0,25	0,25 ≤ τv,dif-h < 0,40	τv,dif-h ≥ 0,40

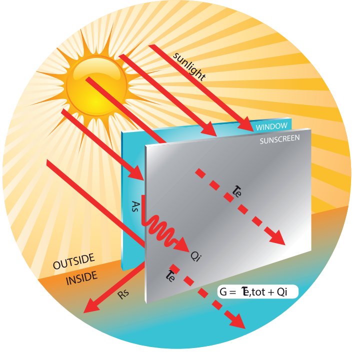
FABRIC

Energy radiated by the sun will be split up in 3 factors:

Factor 1	Factor 2	Factor 3
 **As = Solar absorptance** is the ratio of the absorbed flux to the incident flux.	 **Rs = Solar reflectance** is the fraction of the incident solar radiation that is directly reflected by the component.	 **Ts = Solar transmittance** is the sum of the (normal) direct solar transmittance and the diffuse solar transmittance. This is the fraction of the total transmitted energy to the total incident solar radiation.
These 3 factors together are always 100%		



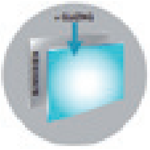
EXTERIOR SUNSCREEN



INTERIOR SUNSCREEN

Rs	Solar reflectance
As	Solar absorptance
Ƭe	Direct solar transmittance
Qi	Secondary heat transfer factor
G	G-factor = total solar energy transmittance

EXTERIOR SUNSCREEN



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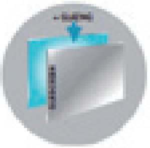

THE G-FACTOR

Sunscreens are always used in combination with a glazing. These together will prevent a large quantity of energy, sent by the sun to the earth, which is indicated by the: Total Solar Energy Transmittance, or **G-factor**.

The G value is the ratio between the total solar energy transmitted into a room through a window and the incident solar energy on the window. The **Gtot** is the solar factor of the combination of glazing and solar protection device. The **Gv** is the solar factor of the glazing alone.

The shading coefficient is defined as the ratio of the solar factor of the combined glazing and solar protection device **Gtot** to that of the glazing alone **Gv**.

The total solar energy transmitted through a window consists of two parts:

1) Radiation: measured by the solar transmittance: **Ƭe,tot**
2) Heat: measured by the secondary heat transfer: **Qi**

G =Ƭe,tot + Qi

The factor **Ƭe,tot**, is the quantity of energy, which will pass the combination solar protection device and window.

The factor **Qi** is the quantity of heat which is released by the absorption of energy in the sunscreen protection system = combination sunscreen + glazing.

The **G-factor** is the most important factor to explain the efficiency of a combination sunscreen + glazing, as protection against the energy of the sun. The **G-factor** divided into his components explains the difference in efficiency between exterior and interior sunscreen.

The direct solar transmittance **Ƭe,tot** is the same for interior and exterior use of sunscreens.

The secondary heat factor **Qi** for interior sunscreen is bigger then for exterior sunscreen. For interior use, the heat, produced by the absorption of energy, will be transmitted to the room inside. By exterior use, the heat will be transmitted to the outside, without any inconvenience at the inside.

Also the colour of the sunscreen has an infl uence on the **G-factor**. Dark colours will absorb a lot of sun energy and will transmit this to heat. If the screen is used for exterior, heat will have no infl uence inside the room, contrary to a screen used for interior. This is why a darker screen is ideal for exterior use and a lighter screen for interior use.

Thermal Comfort: CLASSES

TOTAL SOLAR ENERGY TRANSMITTANCE = G-FACTOR

CLASS	0	1	2	3	4
Gtot	Gtot ≥ 0,50	0,35 ≤ Gtot < 0,50	0,15 ≤ Gtot < 0,35	0,10 ≤ Gtot < 0,15	Gtot < 0,10

SECONDARY HEAT TRANSFER = QI

CLASS	0	1	2	3	4
Qi	Qi ≥ 0,30	0,20 ≤ Qi < 0,30	0,10 ≤ Qi < 0,20	0,03 ≤ Qi < 0,10	Qi < 0,03

NORMAL SOLAR TRANSMITTANCE = PROTECTION AGAINST DIRECT TRANSMISSION

The ability of a solar protection device to protect persons and surroundings from direct irradiation is measured by the direct/direct solar transmittance of the device in combination with the glazing. e,n-n is used as measure for this property.

CLASS	0	1	2	3	4
τe,n-n	τe,n-n ≥ 0,20	0,15 ≤ τe,n-n < 0,20	0,10 ≤ τe,n-n < 0,15	0,05 ≤ τe,n-n < 0,10	τe,n-n < 0,05