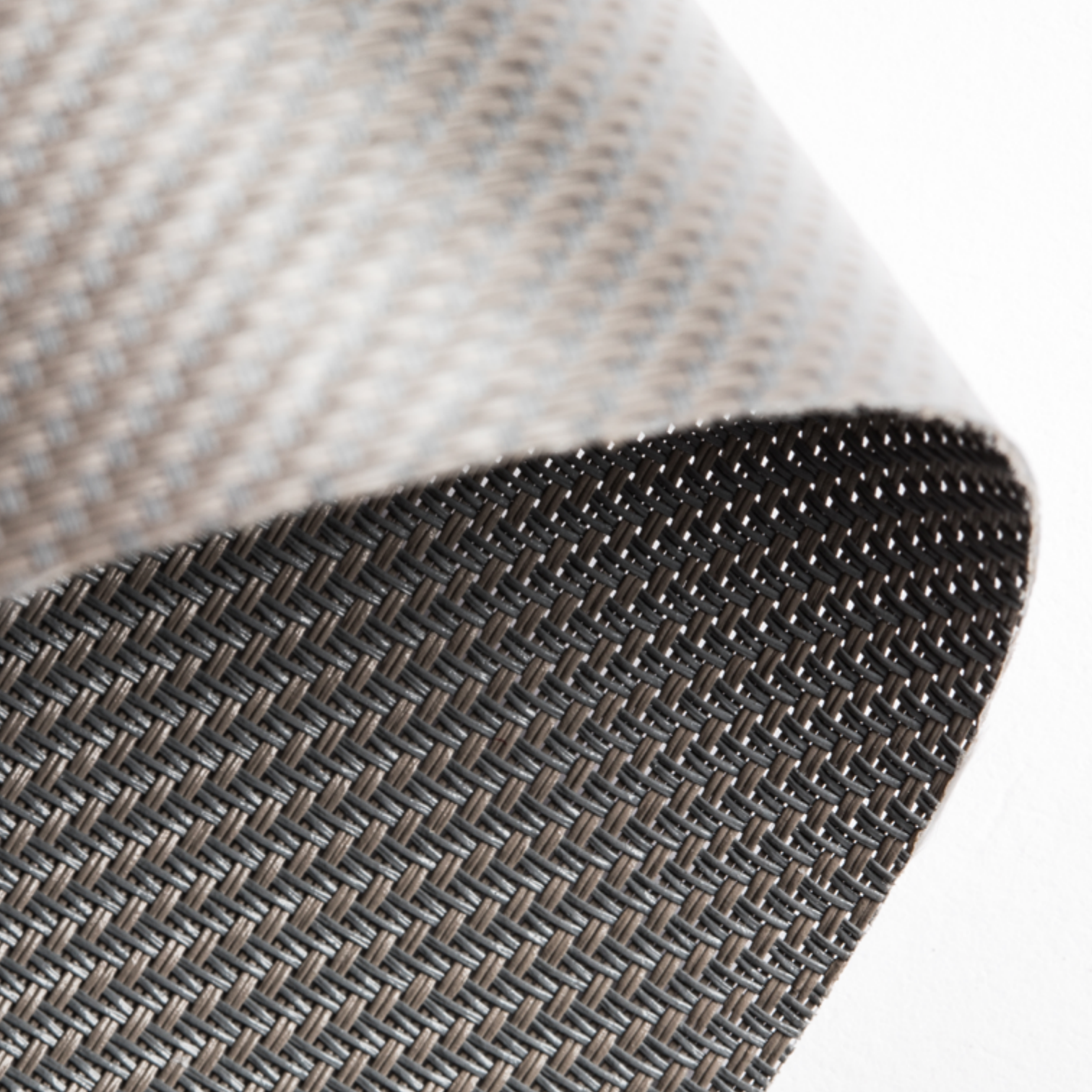
out

# Blockout Serge 600 Solar

REFLECTS SUNLIGHT OUTDOORS
BLOCKOUT
OF = 3%

copaco®
screenweavers

# Screens that reflect & absorb solar energy outside the house. Meet OUT.



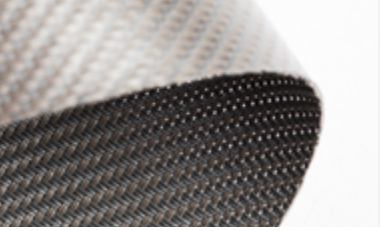
# Serge 600 BO Solar

## Technical specifications

| TECHNICAL SPECIFICATION | | UNITY | | STANDARD | RESULT |
|---|---|---|---|---|---|
| composition | | | | Fibreglass 34 % - PVC 48 % - PVC laminate 18 % | |
| openness factor | | % | | NBN EN 410 | 3% |
| weight | | g/m² | | NF EN 12127 | 645 |
| thickness | | mm | | ISO 2286-3 | 0,70 |
| density | | yarn/cm | warp | ISO 7211/2 | 18,0 |
| | | | weft | | 14,0 |
| colour fastness to artificial weathering | | | | ISO 105 B04 | >7 |
| tear strength | original | daN | warp | ISO 4674-1 method 2 | 9,0 |
| | | | weft | | 9,9 |
| elongation up to break | original | % | warp | ISO 1421 | 5,7 |
| | | | weft | | 7,0 |
| breaking strength | original | daN/5 cm | warp | ISO 1421 | 205,7 |
| | | | weft | | 169,8 |
| elongation up to break | after colour fastness to artificial weathering | % | warp | ISO 1421 | 5,9 |
| | | | weft | | 6,7 |
| breaking strength | after colour fastness to artificial weathering | daN | warp | ISO 1421 | 200,1 |
| | | | weft | | 154,6 |
| tear strength | after climatic chamber -30°C | daN | warp | ISO 4674-1 method 2 | 10,0 |
| | | | weft | | 11,0 |
| elongation up to break | after climatic chamber -30°C | % | warp | ISO 1421 | 5,5 |
| | | | weft | | 6,4 |
| breaking strength | after climatic chamber -30°C | daN/5 cm | warp | ISO 1421 | 210,0 |
| | | | weft | | 146,8 |
| tear strength | after climatic chamber +70°C | daN | warp | ISO 4674-1 method 2 | 9,8 |
| | | | weft | | 10,0 |
| elongation up to break | after climatic chamber +70°C | % | warp | ISO 1421 | 5,9 |
| | | | weft | | 6,2 |
| breaking strength | after climatic chamber +70°C | daN/5 cm | warp | ISO 1421 | 215,3 |
| | | | weft | | 147,2 |
| air permeability | | l/m².s | | ISO 9237 | 0,0 l/m²/s |
| fire classification | Europe | | | UNE-EN 13501-1:2007 | |
| | France | | | NF P92-503 | M2 |
| | Italy | | | UNI 9177 | Classe 1 |
| | Germany | | | DIN 4102 | |
| | UK | | | BS 5867 | |
| | USA | | | NFPA 701 | |
| roll length | **30 m** | | | | |
| cleaning | with soapy water | | | | |
| confection | by heat, high frequency or ultrasonic welding | | | | |

Recommendation: to be used in sunscreensystems with Zipscreens.

These properties are given as indicative and don't have any contractual value



**GLASSFIBRE** **OF = 3%**

Serge 600 BO Solar 010010 charcoal | charcoal

# Serge 600 BO Solar

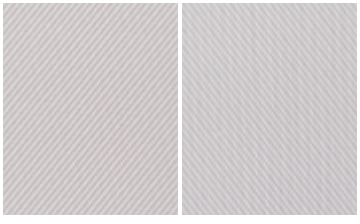
## Colours & references

front back



**Serge 600 BO Solar** 002002 white | white

front back

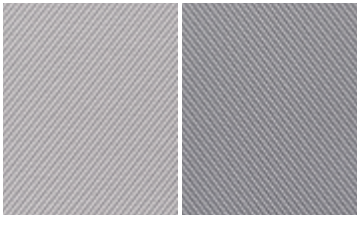


**Serge 600 BO Solar** 002007 white | pearl grey

front back

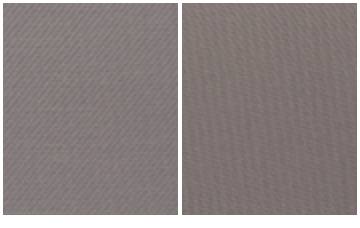
**Serge 600 BO Solar** 007007 pearl grey | pearl grey

front back



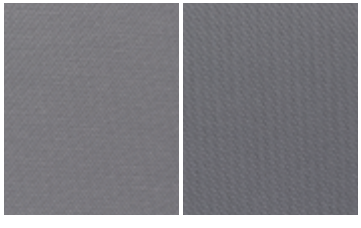
**Serge 600 BO Solar** 001002 grey | white

front back



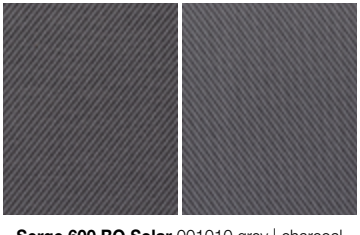
**Serge 600 BO Solar** 033001 oyster shell

front back



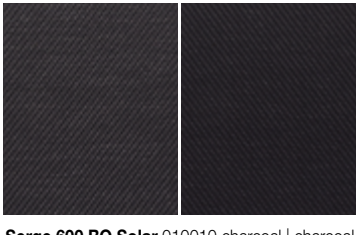
**Serge 600 BO Solar** 001001 grey | grey

back front



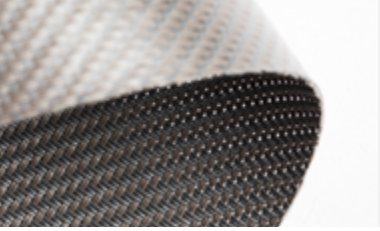
**Serge 600 BO Solar** 001010 grey | charcoal

front back



**Serge 600 BO Solar** 010010 charcoal | charcoal

| Serge 600 BO Solar | 300 cm |
|---|---|
| 002002 white \| white | • |
| 002007 white \| pearl grey | • |
| 007007 pearl grey \| pearl grey | • |
| 001002 grey \| white | • |
| 033001 oyster shell | • |
| 001001 grey \| grey | • |
| 001010 grey \| bronze | • |
| 010010 charcoal \| charcoal | • |





## Solar energetic properties

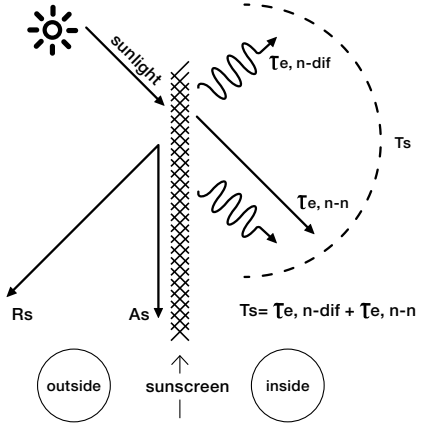
| Serge 600 BO Solar<br>European Standard EN 14501<br>Calculation G-value according to EN 13363-1, version 7.0 | | | | | SOLAR ENERGETIC PROPERTIES | | | | | | | | | | VISUAL PROPERTIES | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | FABRIC | | | FABRIC + GLAZING | | | | | | | | |
| | | | | | | | | EXTERIOR | | | | INTERIOR | | | | |
| | | | | | | | | G-factor = total solar energy transmittance | | | | | | | | |
| references | colours | front | back | | As = Solar Absorptance % | Rs = Solar Reflectance % | Ts = Solar Transmittance % | Glazing A - Gv = 0,85 - U = 5,8 | Glazing B - Gv = 0,76 - U = 2,9 | Glazing C - Gv = 0,59 - U = 1,2 | Glazing D - Gv = 0,32 - U = 1,1 | Glazing A - Gv = 0,85 - U = 5,8 | Glazing B - Gv = 0,76 - U = 2,9 | Glazing C - Gv = 0,59 - U = 1,2 | Glazing D - Gv = 0,32 - U = 1,1 | Tv = Visible Light Transmittance % | Tuv = UV Transmittance % |
| 002002 | white \| white | | | front | 28,4 | 67,3 | 4,3 | 0,08 | 0,06 | 0,04 | 0,03 | 0,31 | 0,34 | 0,35 | 0,25 | 4,5 | 0,2 |
| | | | | back | 30,9 | 64,8 | 4,3 | 0,08 | 0,07 | 0,04 | 0,03 | 0,32 | 0,35 | 0,35 | 0,25 | 4,5 | 0,2 |
| 002007 | white \| pearl grey | | | front | 41,3 | 47,7 | 11,0 | 0,16 | 0,13 | 0,09 | 0,07 | 0,42 | 0,44 | 0,41 | 0,26 | 10,3 | 0,2 |
| | | | | back | 35,8 | 53,2 | 11,0 | 0,15 | 0,13 | 0,09 | 0,06 | 0,39 | 0,42 | 0,39 | 0,26 | 10,3 | 0,2 |
| 007007 | pearl grey \| pearl grey | | | front | 60,3 | 35,1 | 4,6 | 0,13 | 0,10 | 0,06 | 0,05 | 0,47 | 0,49 | 0,45 | 0,27 | 4,8 | 0,2 |
| | | | | back | 59,6 | 35,8 | 4,6 | 0,13 | 0,10 | 0,06 | 0,05 | 0,47 | 0,49 | 0,44 | 0,27 | 4,8 | 0,2 |
| 001002 | grey \| white | | | front | 53,0 | 40,1 | 6,9 | 0,14 | 0,11 | 0,07 | 0,05 | 0,45 | 0,47 | 0,43 | 0,27 | 6,9 | 0,2 |
| | | | | back | 62,9 | 30,2 | 6,9 | 0,15 | 0,12 | 0,08 | 0,06 | 0,50 | 0,52 | 0,46 | 0,28 | 6,9 | 0,2 |
| 033001 | oyster shell | | | front | 76,9 | 18,2 | 4,9 | 0,15 | 0,12 | 0,07 | 0,06 | 0,56 | 0,57 | 0,50 | 0,29 | 4,9 | 0,2 |
| | | | | back | 73,3 | 21,8 | 4,9 | 0,15 | 0,11 | 0,07 | 0,06 | 0,54 | 0,56 | 0,49 | 0,28 | 4,9 | 0,2 |
| 001001 | grey \| grey | | | front | 77,9 | 17,3 | 4,8 | 0,15 | 0,12 | 0,07 | 0,06 | 0,56 | 0,58 | 0,50 | 0,29 | 4,8 | 0,2 |
| | | | | back | 74,8 | 20,4 | 4,8 | 0,15 | 0,11 | 0,07 | 0,06 | 0,55 | 0,56 | 0,49 | 0,29 | 4,8 | 0,2 |
| 001010 | grey \| charcoal | | | front | 85,2 | 10,5 | 4,3 | 0,16 | 0,12 | 0,07 | 0,06 | 0,60 | 0,61 | 0,52 | 0,29 | 4,5 | 0,2 |
| | | | | back | 78,8 | 16,9 | 4,3 | 0,15 | 0,11 | 0,07 | 0,06 | 0,56 | 0,58 | 0,50 | 0,29 | 4,5 | 0,2 |
| 010010 | charcoal \| charcoal | | | front | 89,8 | 5,6 | 4,6 | 0,17 | 0,13 | 0,08 | 0,06 | 0,62 | 0,63 | 0,54 | 0,30 | 4,8 | 0,2 |
| | | | | back | 85,5 | 9,9 | 4,6 | 0,16 | 0,12 | 0,08 | 0,06 | 0,60 | 0,61 | 0,52 | 0,29 | 4,8 | 0,2 |

| | |
|---|---|
| GLAZING A = clear single glazing 4 mm | Gv = 0,85 |
| GLAZING B = clear double glazing (4/12/4), space filled with air | Gv = 0,76 |
| GLAZING C = double glazing (4/16/4), with a low emissivity coating in position 3, space filled with argon | Gv = 0,59 |
| GLAZING D = reflective double glazing (4/16/4), with a low emissivity coating in position 2, space filled with argon | Gv = 0,32 |

# Working of a sunscreen

## 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 |
| **τe,n-dif** | Diffuse solar transmittance |
| **τe,n-n** | Normal solar transmittance |

## Classes indicate effect of a sunscreen

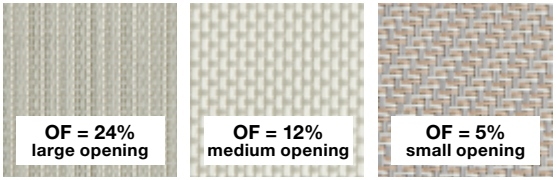
Based on certain properties, the screen can be split up in classes, from 0 to 4. Those classes are used, starting from the norm EN 14501, to indicate the effect of a certain sunscreen.

| **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 |

## 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.




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. How larger the light intensity, how more detrimental for our eyes.

The factor Visible Light Transmittance = **Tv,** is the ratio of visible light that will be transmitted. How lower this factor can be kept, how 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.**

## 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.

| $\tau_{v,n\text{-}n}$ | $\tau_{v,n\text{-}dif}$ | | | |
|---|---|---|---|---|
| | $\tau_{v,n\text{-}dif} < 0,02$ | $0,02 \leq \tau_{v,n\text{-}dif} < 0,04$ | $0,04 \leq \tau_{v,n\text{-}dif} < 0,08$ | $\tau_{v,n\text{-}dif} \geq 0,08$ |
| $\tau_{v,n\text{-}n} > 0,10$ | 0 | 0 | 0 | 0 |
| $0,05 < \tau_{v,n\text{-}n} \leq 0,10$ | 1 | 1 | 0 | 0 |
| $\tau_{v,n\text{-}n} \leq 0,05$ | 3 | 2 | 1 | 1 |
| $\tau_{v,n\text{-}n} = 0,00$ | 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.

| $\tau_{v,n\text{-}n}$ | $\tau_{v,n\text{-}dif}$ | | |
|---|---|---|---|
| | $0 < \tau_{v,n\text{-}dif} \leq 0,04$ | $0,04 < \tau_{v,n\text{-}dif} \leq 0,15$ | $\tau_{v,n\text{-}dif} > 0,15$ |
| $\tau_{v,n\text{-}n} > 0,10$ | 0 | 0 | 0 |
| $0,05 < \tau_{v,n\text{-}n} \leq 0,10$ | 1 | 1 | 1 |
| $\tau_{v,n\text{-}n} \leq 0,05$ | 2 | 2 | 2 |
| $\tau_{v,n\text{-}n} = 0,00$ | 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.

| $\tau_{v,n\text{-}n}$ | $\tau_{v,n\text{-}dif}$ | | |
|---|---|---|---|
| | $0 < \tau_{v,n\text{-}dif} \leq 0,04$ | $0,04 < \tau_{v,n\text{-}dif} \leq 0,15$ | $\tau_{v,n\text{-}dif} > 0,15$ |
| $\tau_{v,n\text{-}n} > 0,10$ | 4 | 3 | 2 |
| $0,05 < \tau_{v,n\text{-}n} \leq 0,10$ | 3 | 2 | 1 |
| $\tau_{v,n\text{-}n} \leq 0,05$ | 2 | 1 | 0 |
| $\tau_{v,n\text{-}n} = 0,00$ | 0 | 0 | 0 |

**Daylight utilisation**

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

| CLASS | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| $\tau_{v,dif\text{-}h}$ | $\tau_{v,dif\text{-}h} < 0,02$ | $0,02 \leq \tau_{v,dif\text{-}h} < 0,10$ | $0,10 \leq \tau_{v,dif\text{-}h} < 0,25$ | $0,25 \leq \tau_{v,dif\text{-}h} < 0,40$ | $\tau_{v,dif\text{-}h} \geq 0,40$ |

# Working of a sunscreen

## Thermal comfort

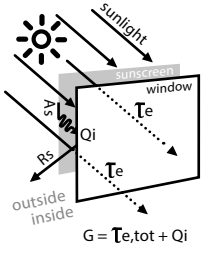
### Fabric

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

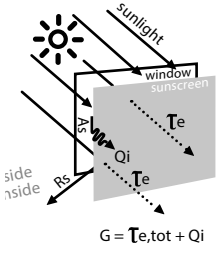
| factor 1: | factor 2: | factor 3: |
|---|---|---|
|  **As = Solar absorptance** is the ratio of the absorbed flux to the incident flux. |  **Rs = Solar reflectance** is the fraction of the incident solar radiation that is directly reflected by the component. |  **Ts = Solar transmittance** is the sum 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%** | | |

### The G-factor

**exterior sunscreen**




**interior sunscreen**




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

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: **τe,tot**
2) Heat: measured by the secondary heat transfer: **Qi**

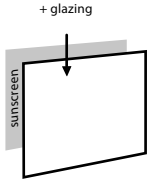
**G = τe,tot + Qi**

The factor **τe,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.

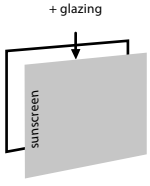
The **G-factor** is the most important factor to explain the efficiency of a combination sunscreen + glazing, as protection against the energy of the sun. The **G-factor** divided into his components explains the difference in efficiency between exterior and interior sunscreen.

**G = τe,tot + Qi**

**exterior sunscreen**




**interior sunscreen**




The direct solar transmittance **τe,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 influence 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 influence 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. τe,n-n is used as measure for this property.

copaco®
screenweavers

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