# Technical values for VELUX windows in combination with blinds, awning blinds and shutters.

**TABLE 1: Thermal transmittance of external accessories according to EN 12567-2, ref. GPL S08/SK08**

| Type of window/glazing | | Blind only |
|---|---|---|
| **Window without accessory, $U_W$ [W/m$^2$K)** | | |
| **Type of accessory** | **Variant (type of fabric)** | DeltaR [m2K/W] |
| Awning blinds, M--, MSLS | 5060 (standard) | 0,06 |
| Rollershutter, S-L, S-LS | 0000 (standard) | 0,15 |
| Softshutter, SSS, SSSS | All variants | 0,15 |

**TABLE 2: Solar energy transmittance ($g_{tot}$-value), shading factor (Fc), light transmittance (τ-value) and ultraviolet transmittance (τuv-value) for VELUX sloped roof windows with accessories. According to EN 52022-3, boundary condition: summer, EN410 and EN14501.**

| Type of window/glazing | | 62 | | | | 66 | | | | 67 | | | | 69 | | | | 70 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Variant (colour of fabric)** | $g_{tot}$-value | Fc-value | τ-value | $\tau_{uv}$-value | $g_{tot}$-value | Fc-value | τ-value | $\tau_{uv}$-value | $g_{tot}$-value | Fc-value | τ-value | $\tau_{uv}$-value | $g_{tot}$-value | Fc-value | τ-value | $\tau_{uv}$-value | $g_{tot}$-value | Fc-value | τ-value | τuv-value |
| | | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] |
| Glazing without accessory | | 0,47 | - | 0,68 | 0,05 | 0,44 | - | 0,62 | 0,05 | 0,44 | - | 0,62 | 0,05 | 0,27 | - | 0,57 | 0,05 | 0,46 | - | 0,68 | 0,05 |
| Roller blinds, R-L, RFY | | | | | | | | | | | | | | | | | | | | | |
| Bright | 1028,1086,4155, **4166**, 4951, 4952 | 0,35 | 0,74 | 0,25 | 0,00 | 0,33 | 0,75 | 0,23 | 0,00 | 0,33 | 0,75 | 0,23 | 0,00 | 0,19 | 0,70 | 0,21 | 0,00 | 0,33 | 0,72 | 0,25 | 0,00 |
| Semi bright | 4161, 4163, **4164**, 4165, 4167, 4168, 4169, 4171, 4953 | 0,38 | 0,81 | 0,15 | 0,00 | 0,36 | 0,82 | 0,14 | 0,00 | 0,36 | 0,82 | 0,14 | 0,00 | 0,22 | 0,81 | 0,12 | 0,00 | 0,36 | 0,78 | 0,15 | 0,00 |
| Dark | 4162, **4069**, 4170, 9050, 4954 | 0,42 | 0,89 | 0,05 | 0,00 | 0,39 | 0,89 | 0,04 | 0,00 | 0,39 | 0,89 | 0,04 | 0,00 | 0,24 | 0,89 | 0,04 | 0,00 | 0,39 | 0,85 | 0,05 | 0,00 |
| Blackout blinds, D-L, DKY | | | | | | | | | | | | | | | | | | | | | |
| Bright | 0705, 1025, 1085, 4556, 4564, 4574, 4575, 4576,4578,4579,4580, **4581**, 8801, 4902, 4903 | 0,31 | 0,66 | 0,00 | 0,00 | 0,30 | 0,68 | 0,00 | 0,00 | 0,30 | 0,68 | 0,00 | 0,00 | 0,17 | 0,63 | 0,00 | 0,00 | 0,28 | 0,61 | 0,00 | 0,00 |
| Dark | 1100, **3009**, 4559, 4577, 4901, 4904 | 0,41 | 0,87 | 0,00 | 0,00 | 0,39 | 0,89 | 0,00 | 0,00 | 0,39 | 0,89 | 0,00 | 0,00 | 0,24 | 0,89 | 0,00 | 0,00 | 0,38 | 0,83 | 0,00 | 0,00 |
| Venetian blinds, P-L** | | | | | | | | | | | | | | | | | | | | | |
| All, closed+normal incidence | 7001, **7057**, 7064, '7062, 7063, 7065 | No values available | | | | | | | | | | | | | | | | | | | |
| Pleated blinds, F-L | | | | | | | | | | | | | | | | | | | | | |
| Bright | **1016**, 1256,1259, 1283, | 0,35 | 0,74 | 0,38 | 0,00 | 0,34 | 0,77 | 0,36 | 0,00 | 0,33 | 0,75 | 0,36 | 0,00 | 0,19 | 0,70 | 0,32 | 0,00 | 0,33 | 0,72 | 0,38 | 0,00 |
| Semi bright | 1277, 1279, 1281, 1284, **1285** | 0,40 | 0,85 | 0,41 | 0,01 | 0,38 | 0,86 | 0,38 | 0,00 | 0,37 | 0,84 | 0,38 | 0,00 | 0,23 | 0,85 | 0,34 | 0,00 | 0,38 | 0,83 | 0,41 | 0,00 |
| Dark | **1274**, 1275, 1276, 1278, 1280, 1282, 1284, 1286 | 0,44 | 0,94 | 0,06 | 0,00 | 0,41 | 0,93 | 0,06 | 0,00 | 0,41 | 0,93 | 0,06 | 0,00 | 0,25 | 0,93 | 0,05 | 0,00 | 0,41 | 0,89 | 0,06 | 0,00 |
| Blackout energy blinds, FHC | | | | | | | | | | | | | | | | | | | | | |
| Bright | 1045, **1047**, 1049, 1155, 1163, 1165, 1166, 1167, 1168, 1169, 1171, 1172 | 0,19 | 0,40 | 0,00 | 0,00 | 0,19 | 0,43 | 0,00 | 0,00 | 0,19 | 0,43 | 0,00 | 0,00 | 0,09 | 0,33 | 0,00 | 0,00 | 0,14 | 0,30 | 0,00 | 0,00 |
| Dark | **1173**, 1156, 1164, 1170 | 0,24 | 0,51 | 0,00 | 0,00 | 0,24 | 0,55 | 0,00 | 0,00 | 0,24 | 0,55 | 0,00 | 0,00 | 0,12 | 0,44 | 0,00 | 0,00 | 0,20 | 0,43 | 0,00 | 0,00 |
| Insect screen, ZIL | | | | | | | | | | | | | | | | | | | | | |
| Standard screen | **8888** | 0,46 | 0,98 | 0,44 | 0,01 | 0,43 | 0,98 | 0,40 | 0,00 | 0,43 | 0,98 | 0,40 | 0,00 | 0,27 | 1,00 | 0,37 | 0,00 | 0,44 | 0,96 | 0,44 | 0,00 |
| Awning blinds, M--, MSLS | | | | | | | | | | | | | | | | | | | | | |
| Net | **5060** | 0,12 | 0,26 | 0,12 | 0,00 | 0,13 | 0,30 | 0,11 | 0,00 | 0,11 | 0,25 | 0,11 | 0,00 | 0,09 | 0,33 | 0,10 | 0,00 | 0,14 | 0,30 | 0,12 | 0,00 |
| Shutters, S-L/SSLS/SSS | | | | | | | | | | | | | | | | | | | | | |
| Roller shutter | **0000**, 0700 | 0,03 | 0,06 | 0,00 | 0,00 | 0,04 | 0,09 | 0,00 | 0,00 | 0,03 | 0,07 | 0,00 | 0,00 | 0,05 | 0,19 | 0,00 | 0,00 | 0,06 | 0,13 | 0,00 | 0,00 |
| Soft shutter | 0000 | 0,03 | 0,06 | 0,00 | 0,00 | 0,04 | 0,09 | 0,00 | 0,00 | 0,03 | 0,07 | 0,00 | 0,00 | 0,04 | 0,15 | 0,00 | 0,00 | 0,07 | 0,15 | 0,00 | 0,00 |
| Awning blind, M-L L & Blackout blinds, D-L | | | | | | | | | | | | | | | | | | | | | |
| Bright | **D-L** (0705, 1025, 1085, 4556, 4564, 4574, 4575, 4576,4578,4579,4580, **4581**, 8801) **MHL** (**5060**) | 0,09 | 0,19 | 0,00 | 0,00 | 0,09 | 0,20 | 0,00 | 0,00 | 0,08 | 0,18 | 0,00 | 0,00 | 0,07 | 0,26 | 0,00 | 0,00 | 0,10 | 0,22 | 0,00 | 0,00 |
| Dark | **D-L** (1100, **3009**, 4559, 4577) **MHL** (**5060**) | 0,10 | 0,21 | 0,00 | 0,00 | 0,10 | 0,23 | 0,00 | 0,00 | 0,10 | 0,23 | 0,00 | 0,00 | 0,08 | 0,30 | 0,00 | 0,00 | 0,12 | 0,26 | 0,00 | 0,00 |
| Awning blind, M-- & Blackout energy blinds FHC | | | | | | | | | | | | | | | | | | | | | |
| Bright | **FHC** (1045, **1047**, 1049, 1155, 1163, 1165, 1166, 1167, 1168, 1169, 1171, 1172) **MHL** (**5060**) | 0,06 | 0,13 | 0,00 | 0,00 | 0,06 | 0,14 | 0,00 | 0,00 | 0,06 | 0,14 | 0,00 | 0,00 | 0,05 | 0,19 | 0,00 | 0,00 | 0,07 | 0,15 | 0,00 | 0,00 |
| Dark | **FHC** (**1173**, 1156, 1164, 1170) **MHL** (**5060**) | 0,07 | 0,15 | 0,00 | 0,00 | 0,08 | 0,18 | 0,00 | 0,00 | 0,07 | 0,16 | 0,00 | 0,00 | 0,06 | 0,22 | 0,00 | 0,00 | 0,08 | 0,17 | 0,00 | 0,00 |

**TABLE 3: Solar energy transmittance (gtot-value), shading factor (Fc), light transmittance (τ-value) and ultraviolet transmittance (τuv-value) for VELUX flat roof windows CFU, CVU with accessories. According to EN EN 52022-3, boundary condition: summer, EN410 and EN14501.**

| Type of glazing | | IGU 20/25 | | | | | | | | IGU 25/25A | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of dome | | ISU 1093 | | | | ISU 2093 | | | | ISU 1093 | | | | ISU 2093 | | | |
| | Variant (type of fabric) | $g_{tot}$-value | Fc-value | τ-value | $\tau_{uv}$-value | $g_{tot}$-value | Fc-value | τ-value | $\tau_{uv}$-value | $g_{tot}$-value | Fc-value | τ-value | $\tau_{uv}$-value | $g_{tot}$-value | Fc-value | τ-value | $\tau_{uv}$-value |
| | | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] |
| Glazing without accessory, g [-] | | 0,52 | - | 0,69 | 0,05 | 0,52 | - | 0,68 | 0,05 | 0,49 | - | 0,63 | 0,05 | 0,49 | - | 0,63 | 0,05 |
| **Blackout blind, DKU** | **4550** | 0,06 | 0,12 | 0,00 | 0,00 | 0,06 | 0,12 | 0,00 | 0,00 | 0,06 | 0,12 | 0,00 | 0,00 | 0,06 | 0,12 | 0,00 | 0,00 |
| **Awning blind, MSU** | **5070** | 0,21 | 0,40 | 0,23 | 0,00 | 0,21 | 0,40 | 0,23 | 0,00 | 0,21 | 0,43 | 0,22 | 0,00 | 0,21 | 0,43 | 0,22 | 0,00 |

**TABLE 4A: Solar energy transmittance (gtot-value), shading factor (Fc), light transmittance (τ-value) and ultraviolet transmittance (τuv-value) for VELUX flat roof windows CVP, CFP, CXP, CSP with accessories. According to EN 52022-3, boundary condition: summer, EN410 and EN14501.**

| Type of glazing | | 73U | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of dome | | ISD 0000 Clear acrylic | | | | ISD 0100 Opaque acrylic | | | | ISD 0010 Clear polycarbonate | | | | ISD 0110 Opaque polycarbonate | | | |
| | Variant (type of fabric) | $g_{tot}$-value | Fc-value | τ-value | $\tau_{uv}$-value | $g_{tot}$-value | Fc-value | τ-value | $\tau_{uv}$-value | $g_{tot}$-value | Fc-value | τ-value | $\tau_{uv}$-value | $g_{tot}$-value | Fc-value | τ-value | $\tau_{uv}$-value |
| Blackout blinds, DKL, DKY | | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] |
| Glazing without accessory, g [-] | | 0,54 | - | 0,72 | 0,05 | 0,19 | - | 0,23 | 0,05 | 0,52 | - | 0,70 | 0,05 | 0,20 | - | 0,21 | 0,05 |
| With awning blind, MSG | | | | | | | | | | | | | | | | | |
| Bright | **6090** | 0,13 | 0,24 | 0,13 | 0,13 | - | - | - | - | 0,13 | 0,25 | 0,13 | 0,13 | - | - | - | - |
| With pleated blind, FMG | | | | | | | | | | | | | | | | | |
| Bright | **1016**, 1259 | 0,38 | 0,70 | 0,39 | 0,39 | 0,16 | 0,84 | 0,16 | 0,16 | 0,36 | 0,69 | 0,39 | 0,39 | 0,17 | 0,85 | 0,14 | 0,14 |
| Dark | **1265** | 0,46 | 0,85 | 0,00 | 0,00 | 0,18 | 0,95 | 0,00 | 0,00 | 0,45 | 0,87 | 0,00 | 0,00 | 0,19 | 0,95 | 0,00 | 0,00 |
| With double pleated blind, F-K | | | | | | | | | | | | | | | | | |
| Dark | 1045, **1047** | 0,23 | 0,43 | 0,00 | 0,00 | 0,11 | 0,58 | 0,00 | 0,00 | 0,22 | 0,42 | 0,00 | 0,00 | 0,11 | 0,55 | 0,00 | 0,00 |
| Combination | | | | | | | | | | | | | | | | | |
| MSG + FMK | All variants | 0,08 | 0,15 | 0,00 | 0,00 | - | - | - | - | 0,08 | 0,15 | 0,00 | 0,00 | - | - | - | - |
| MSG + FMG | All variants | 0,12 | 0,22 | 0,09 | 0,09 | - | - | - | - | 0,12 | 0,23 | 0,09 | 0,09 | - | - | - | - |

Dictonary and method of determination, please see page 4.

**TABLE 4B: Solar energy transmittance (gtot-value), shading factor (Fc), light transmittance (τ-value) and ultraviolet transmittance (τuv-value) for VELUX flat roof windows CVP, CFP, CXP, CSP with accessories. According to EN 52022-3, boundary condition: summer, EN410 and EN14501.**

| Type of glazing | | 73QV | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of dome | | ISD 0000 Clear acrylic | | | | ISD 0100 Opaque acrylic | | | | ISD 0010 Clear polycarbonate | | | | ISD 0110 Opaque polycarbonate | | | |
| | Variant (type of fabric) | $g_{tot}$-value | Fc-value | τ-value | $\tau_{uv}$-value | $g_{tot}$-value | Fc-value | τ-value | $\tau_{uv}$-value | $g_{tot}$-value | Fc-value | τ-value | $\tau_{uv}$-value | $g_{tot}$-value | Fc-value | τ-value | $\tau_{uv}$-value |
| | | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] | [-] |
| Glazing without accessory, g [-] | | 0,53 | - | 0,72 | 0,05 | 0,20 | - | 0,25 | 0,05 | 0,50 | - | 0,70 | 0,05 | 0,23 | - | 0,26 | 0,05 |
| With awning blind, MSG | | | | | | | | | | | | | | | | | |
| Bright | 6090 | 0,12 | 0,22 | 0,12 | 0,00 | - | - | - | - | 0,12 | 0,24 | 0,12 | 0,00 | - | - | - | - |
| With pleated blind, FMG | | | | | | | | | | | | | | | | | |
| Bright | **1016**, 1259 | 0,36 | 0,68 | 0,39 | 0,00 | 0,15 | 0,74 | 0,15 | 0,00 | 0,35 | 0,70 | 0,38 | 0,00 | 0,16 | 0,68 | 0,13 | 0,00 |
| Dark | **1265** | 0,44 | 0,83 | 0,00 | 0,00 | 0,16 | 0,81 | 0,00 | 0,00 | 0,43 | 0,86 | 0,00 | 0,00 | 0,17 | 0,75 | 0,00 | 0,00 |
| With double pleated blind, F-K | | | | | | | | | | | | | | | | | |
| Dark | 1045, **1047** | 0,23 | 0,43 | 0,00 | 0,00 | 0,10 | 0,52 | 0,00 | 0,00 | 0,22 | 0,44 | 0,00 | 0,00 | 0,11 | 0,48 | 0,00 | 0,00 |
| Combination | | | | | | | | | | | | | | | | | |
| MSG + FMK | All variants | 0,08 | 0,15 | 0,00 | 0,00 | - | - | - | - | 0,07 | 0,15 | 0,00 | 0,00 | - | - | - | - |
| MSG + FMG | All variants | 0,10 | 0,20 | 0,09 | 0,00 | - | - | - | - | 0,10 | 0,20 | 0,09 | 0,00 | - | - | - | - |

**DICTIONARY**

**Thermal transmittance**
**R** is a measure for the thermal resistance of an object and indicates the ability of the object to block heat.
**U-value** is a measure for the thermal transmittance (heat transfer) through a construction. It is the sum of the combined thermal resistances of all elements in a construction. The lower the U-value, the better the heat insulating properties of the construction. The U-value for a window is called Uw.
**U-value reduction ΔU** is the reduction of thermal transmittance for a window with closed accessories then compared to the window alone.

**Solar energy transmittance**
**g** is the total solar energy (heat) transmittance through an object which indicates the percentage of the solar energy hitting the object that passes through it. g is between 0 and 1, equal to 0 to 100 % transmittance.
**gIGU** is the total solar energy transmittance for a pane.
**gtot** is the total solar energy transmittance for a pane with a closed accessory.
**Fc** (in some countries known as z) is the shading factor and a measure of how well the accessory shades the solar energy. The value expresses the relative reduction of solar energy transmittance for the pane with accessory then compared to the pane alone (gtot/gIGU) Fc is between 0 and 1, equal to 0 to 100 % solar shading.

**Light transmittance**
**τ** (pronounced Tau) is the total light transmittance through an object indicating the percentage of the visible light hitting an object that passes through it. The higher the τ value, the more light enters the room. Normally, a person can see the difference in the light transmittance properties of two different objects if the difference of light transmittance is about 10 % or more. τ is between 0 and 1, equal to 0 to 100 % transmittance.
**τuv** is the ultra violet transmittance through an object and is a measure of how much of the ultraviolet light hitting an object that passes through it. The ultraviolet light has an influence on interior surfaces since it makes coloured objects fade. Ultraviolet light is invisible to the human eye. τuv is between 0 and 1, equal to 0 to 100 % transmittance.

**METHOD OF DETERMINATION**

Standards:
**gtot, τ, τuv, Fc and U-values** of various accessories are determined through standardised tests and calculations, all in compliance with the international standards EN 12567-2, EN 52022-3 and ISO 15099. Please note that the values only apply if the accessories are closed and cover the window completely.

**TABLE 1**
Two different methods are used.
1) The accessories are divided into groups with similar properties regarding thermal transmittance. From each group of accessories, one product is selected, (indicated with * in the table), and a physical test is performed in accordance with EN 12567-2 to determine the U-value on a given window (GPL, size SK08) both with and without accessories.
2) DeltaR is calculated from thermal resistance of the cloth and air permeability classification of the full product, in accordance with EN 13659.
With these results, the additional thermal resistance (ΔR) can be determined for the accessory alone and the U-value can be determined for the accessory in combination with any other glazing. The U-value reduction ΔU in terms of thermal resistance ΔR is then determined as: ΔU=Uw - 1/(1/Uw+ΔR).

**TABLES 2**
The accessories are divided into groups with similar properties regarding optical properties. From each group of accessories one or two products are selected, (indicated with * in the table), and the optical properties are measured (spectral solar and light transmittance & reflectance) according to EN 52022-3 and ISO 15099.
When the spectral properties of the accessories are known, the spectral performance (gtot,τ and τuv-value) of the accessory in combination with different panes can be calculated through simulation. The calculations are performed in compliance with international standards ISO 15099 and EN 52022-3 and done with the Ift Rosenheim certified calculation tool WinSLT.
The Fc-value is calculated on the basis of gtot values.