

Understanding window U-values and how window film can help.

In the current climate with high energy costs demand for reducing energy consumption and emissions to help the environment, keeping your home or Office cooler in the Summer and warmer in the winter has become front and centre in most people's minds.

Solarshield have a range of window films that can help with both of these concerns. This document explains the insulation and low emissivity performance of our window films and how it can improve the performance of your existing glazing.

How does modern glazing compare with older glazing.

Over the years the technology in glass, glazing and window films has improved dramatically and it is surprising the improvements in performance of something we take for granted every day.

For example the U-value of single glazing pre 1970 was 5.8 however the latest standard in new dwellings has improved to a U-value of 1.2, with Passivehaus having a U-value as low as 0.8 which is a 500% improvement of insulation performance in glass and glazing.

What are U-values in relation to glazing.

The U-value is a performance parameter that represents the heat transfer through a glazing system, it is generally given in a figure of W/m^2k (The rate of heat flow in Watts through $1m^2$ of a structure when there is a temperature difference across the structure of 1 degree kelvin). So this shows the amount of energy transferred from one side of the glazing to the other per M^2 in temperature difference.

These are represented as U-values and are the insulating performance of your glazing and generally combine the U-value of the glass (Ug) with the U-value of the glazing frame (Uf) to come up with an overall U-value of the system, the lower the U-value the better for your insulation performance.



What elements amount to heat transfer for U-value calculations.

Conducted heat – Air on the higher temperature side of the glass, is absorbed by the glass surface and transfers by conduction and then lost in the air on the cooler side of the glass.

To achieve a lower U-value for conducted heat, generally thicker glass is used plus dual or triple pane units can be used, with the addition of inert gases (such as Argon or Krypton for example).

Convection heat – This is the transfer of heat between the surface of a solid and a liquid or gas.

To achieve a lower U-value the addition of inert gases (such as Argon or Krypton) helps.

Radiant Heat – Objects such as people, furniture, radiators, heat sources and even walls emit radiant heat (This is long wave radiation we feel as heat) in the winter a building will lose more radiant heat than is absorbed from the outside.

To achieve lower U-values modern glazing systems use low emissivity coatings on one or more of the glass surfaces, these coatings help impede the loss of radiant energy, which is re-radiated back into the building rather than lost to the outside.

The application of a Low Emissivity (low E) window film to glass that does not already have a coating will work in the same way, by reflecting radiated heat back into the building, thus reducing the winter heat loss through the glazing.



So how can window films improve the U-value of glazing?

The U-value of glazing can be improved with a window film, by improving the emissivity of the inner face of the glazing, with an application of a low emissivity (low E) coated window film, reducing radiant heat loss through the glass or glazing.



What improvements can I expect with insulating window film?

Emissivity shows how much radiant energy is reflected back to it's source, for example a standard soda lime glass has an emissivity of 0.89, this indicates that only 11% of radiant energy is reflected back into a room, however low E window films applied to the room side face of glazing have an emissivity of up to 0.09 so 91% of radiant energy is reflected back to it's source.

This can mean a U-value improvement of up to 41% on single glazing and 29% on older double glazing. Below is a list of typical glazing types and improvements with Solarshield window film.

U-value improvements of various glazing systems plus low E window film.				
Glass type	No window film	Film type A	Film Type B	Film Type C
Single glazing	5.8	3.4 41%	4.1 30%	4.4 24%
Old double glazing	2.7	1.93 29%	2.2 20%	2.4 13%
Insulated double glazing	1.2	0.98 19%	1.1 9%	1.12 7%
High insulation double glazing	1	0.85 15%	0.95 5%	0.98 2%
The above is a guide for illustration purposes only, to give you an indication of the improvements potentially achieved when adding				
a low E window film, this will vary depending on your specific glass type and the chosen window film.				

Film Type A has the highest insulation performance and highest visible light transmission (VLT), with the longest warranty but highest cost. (best for buildings where high performance and minimum aesthetic change is desired).

Film Type B has Medium insulation performance and high solar performance, medium tint and a long warranty and mid installed cost. (best for all seasons reducing summer heat gain/winter heat loss).

Film Type C has the lowest performance and high VLT, with the shortest warranty and most cost effective option. (best for budget installations where an improved U-value is desired).

Final points when considering an insulating window film.

As you can see from the table above, the insulating window films are most effective on existing single glazing and older double glazed units, that do not perform as well as the modern glazing.

Where possible we would always recommend that glazing is replaced with the newest glazing systems available, as these offer the very highest performance improvements, you can find reputable installers of new glazing on the Glass and Glazing Federation website <u>ggf.org.uk or myglazing.com</u>.

However where glazing cannot be changed or budget dictates, then the installation of one of the Solarshield insulating window films will improve the U-value of glazing and reduce winter heat loss. These films will only reflect radiated heat back into the room reducing heat loss in the winter, if there is no heat to reflect back then there is nothing for the window film to work with.

The other benefits of window film that you can combine with this are reduction in Summer heat gain, reduction in the Sun's harmful UV and added privacy, as well as safety and security where you need it.