GLASS FOR EUROPE
Building, Automotive, Solar-Energy Glass

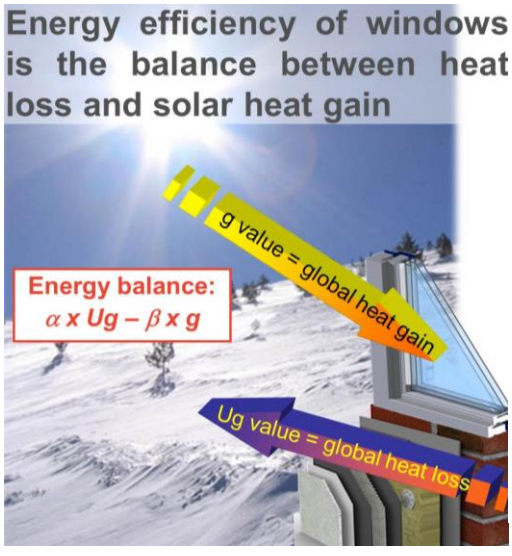
Energy balance: the right approach to assess the energy performance of window products

Unlike the opaque fabric of buildings the primary purpose of windows and facades is to let daylight into buildings and establish a visual connection with the external environment thanks to the transparency of glass. These characteristics are unique among building materials and result in many benefits such as views to the outside world and natural daylight provision, making interiors comfortable, enjoyable and healthy living spaces. Similarly, **the transparency of glass also provides free solar energy that contributes to the thermal performance of buildings.**

Indeed, as transparent component, windows provide solar heat gains to buildings. In winter these heat gains are beneficial because they warm up the interiors, thus reducing heating needs and associated energy consumption. In summer, heat gains can be significant and in some cases may lead to overheating if suboptimal glazing solutions are used. However, if adequate glazing solutions, such as solar control coated glass or electrochromic glass technologies, are used in warm climates and on southern orientations, overheating can be avoided.

It follows on from this that the energy performance of windows and facades cannot be assessed solely on the basis of their insulation characteristics (Ug value) as is the case for opaque fabrics. It needs to take into account both the solar energy gains (g value) provided by a window and its insulation properties.

This is where the concept of energy balance of windows comes in. Indeed, the energy performance of a window is determined by its energy balance. The energy balance of a window is the difference between heat losses (measured by way of the U-value) and solar heat gains (measured by way of the g-value).



This energy balance is specific to every window and is affected by:

- Its geographical location, which determines the level of solar heat gains and heat losses required for the window. This parameter is the most influential when calculating the energy balance of a window, since it has an impact on both the levels of heat gains and heat losses required.
- Its size: increasing window size increases solar heat gains per m²
- Its orientation (North, East, South or West), which primarily affects solar heat gains

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The energy balance of a window must be used to assess its energy performance. It is this balance that determines the most appropriate glazing solution for a given window. **It should be calculated with an equation that factors in the heat gains and heat losses and is weighted by the climatic conditions.** Accordingly, **the energy balance of a window must be the method used to calculate its energy performance** under the EU energy labelling scheme.

The figure below shows the difference in energy ratings of 5 modern glazing solutions for UK residential buildings according to the parameter chosen to assess the energy performance: i.e. insulation or energy balance. It demonstrates that a window performance ranking based on the insulation properties would lead to an incorrect performance assessment: although window TGU#1 offers the best, i.e. the lowest, insulation value (Uw), it is in fact a sub-optimal option in terms of overall energy balance.