Knowing the difference

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The continuous improvement in U values in daylight systems very much favours sustainable construction, although it does currently pose a problem regarding communication on the market.

This is because sales arguments and advertising indiscriminately use U_g values, U_W values, or often even a U value which is not a standard certification designation. So, which particular thermal transmittance coefficient value is appropriate for determining a building's energy balance?

We asked the ift Rosenheim, the German Institute for Window Technology, in its capacity as a recognised, independent research institute and received the following answer from Konrad Huber, Head of the Heat and Light Engineering Laboratory:
'The thermal transmittance coefficient U_W indicates the main influence on a building's energy balance and thermal comfort.'

If this is so evident, why is it not standard practice to clearly and transparently communicate a system component's U_W value? Why do advertising and price lists often rely on U or U_g values (according to EN 673) to present their sales arguments? The reason is quite simple: the U_g value, the thermal transmission coefficient for glazing, is often lower than the actually relevant and meaningful U_W value and thus more advantageous for manufacturers for advertising purposes.
So, how is the U_W value calculated? Konrad Huber at the ift Rosenheim also provided us with information on this aspect:

'The U_W value basically consists of the thermal transmittance coefficients for all components in a light architecture element, i.e. the U_g value for glazing and all U_f and ψ values for all bar, frame and surround profiles in the system. All this is then related to the surface area to give the U_W value, which is the appropriate value for a thermal rating.'*

*ψ (psi) = linear thermal transmittance coefficient

This means that the whole structure must be taken into account when making calculations. On the right, we have given calculations for a continuous rooflight as an example.

We are convinced that customers will only be satisfied if communication is transparent. This has been LAMILUX's policy for over 100 years.

Calculation of the U_W value for daylight elements according to EN ISO 10077-1 / ETA-09/0347

shown on a continuous rooflight as an example

Our engineers will carry out calculations on your behalf:

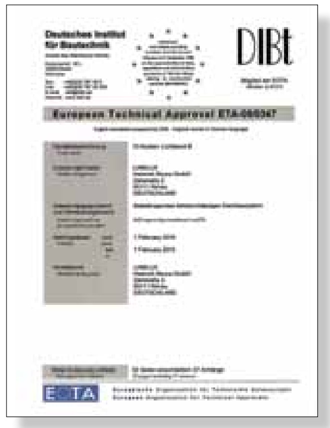
$$U_W = \frac{U_g \times A_g + \sum (U_{fi} \times A_{fi}) + \psi_i \times l_i + \chi_i}{A_g + \sum A_{fi}}$$

U_W = thermal transmittance rate for the entire continuous rooflight without frame
A_W = total heat-emitting surface in the continuous rooflight ($A_W = A_g + \sum A_{fi}$)
U_g = thermal transmittance coefficient for glazing in horizontal installation position
A_g = glazing surface area
U_f = thermal transmittance coefficient for frame components
A_f = surface area covered by frame components
ψ = heat loss coefficient for a linear thermal bridge
χ = heat loss coefficient for a point thermal bridge (used for flaps and load converters)

This process is the only way to reveal how the thermal transmittance coefficient in the individual components have a direct impact on a building's energy balance.

LAMILUX offers you free calculation of the specific U_W value for each CI System Continuous Rooflight B. This takes into account the different thermal transmittance coefficients in individual components, such as bar, frame and surround profiles. **The calculation thus complies with the standard defined by ift Rosenheim, the German Institute for Window Technology, and required by the DIBT, the German Institute of Building Technology.**

The continuous rooflight's specific U_W value is verified in a quality certificate, which guarantees that the installed product conforms with its approval.

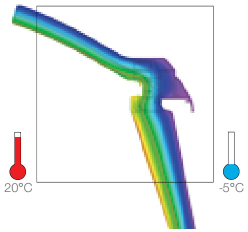


Reliable, meaningful isothermal characteristics

Isothermal lines indicate points in a structure featuring the same temperature and reveal a measurable customer benefit in a thermal diagram. As a result, isothermal characteristics are increasingly shown by manufacturers to provide proof of effective thermal insulation. However, colourful charts do not always actually mean anything. To ensure a diagram is relevant,

- the diagram must clearly state what particular **general conditions**[1] the calculations were based on.
- the **10° isothermal line**, a variable used in building physics, must run through **the structure** as a steady, flawless outline. This is the only way to guarantee that the risk of condensation is minimised under the specified conditions.

It is only then that reliable evidence can be provided of thermal behaviour and, consequently, of the structural element's real energy efficiency rating.



Example: isothermal characteristic of a 10° isothermal line, shown in red, in a triple-glazed LAMILUX CI System Rooflight Dome F100 under specified boundary conditions. The isothermal line is featured as a steady outline within the structure – the risk of condensation is minimised.

The interaction of energy between individual system components, a crucial factor in determining the U_W value, is clearly visible in isothermal characteristics.

Our CI Systems enable us to find the best solution for each customer's specific installation requirements on an individual basis.

The **CI ENERGY TIP** label denotes complete thermal insulation in the overall system for our products. This enables us to guarantee excellent, certified U_W values.

[1]Inside temperature +20°C, outside temperature -5°C.
Analytical models for calculating thermal bridges: EN ISO 10211-1, EN ISO 10211-2, EN ISO 10077-2 and EN 13947
Materials: EN ISO 12524, EN ISO 10077-2, EN ISO 6946 and EN ISO 673; Boundary conditions: EN ISO 6946 and EN ISO 10077-2.

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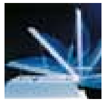
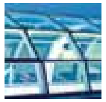
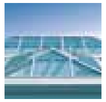

ROOFLIGHT DOME F100


CONTINUOUS ROOFLIGHT B


GLASS ARCHITECTURE KWS 60 / M


GLASS ARCHITECTURE F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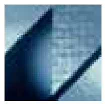
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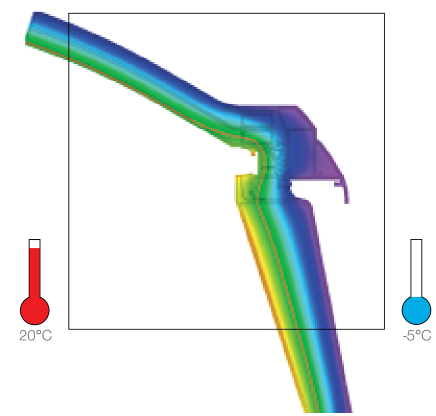

U_W – The value which really counts.

LAMILUX CI ENERGY

- Conserving energy
- Saving energy
- Generating energy
- Controlling energy