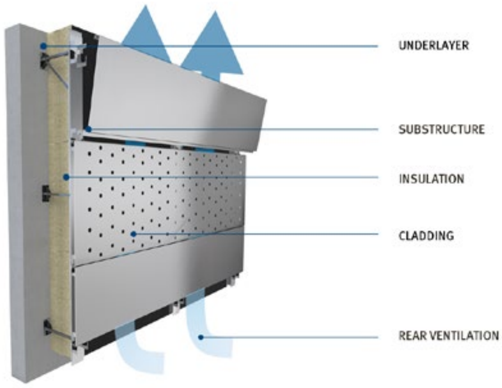
MAKE BIG ENERGY SAVINGS WITH THE RIGHT SUBSTRUCTURE

SUSTAINABILITY STARTS WITH
THE RIGHT SUBSTRUCTURE

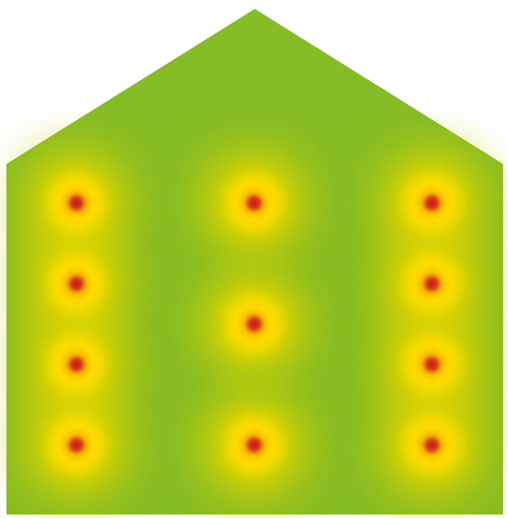
RVF CONSTRUCTIONS BUILT THE RIGHT WAY WHILE SAVING MONEY AND ACTING SUSTAINABLY

In recent years, energy-saving construction has gained hugely in importance. In addition to all the usual measures, the focus here is primarily on the insulation of walls and roofs, windows and floor panels. The building envelope in particular has an **enormous savings potential – in both new build and refurbishment projects.** Rear-ventilated wall façades (RVF) not only impress with their durability, they also provide protection against the building interior becoming hot in the summer and becoming cold and losing heat in the winter – making them exceptionally energy-efficient.



Unfortunately, the individual components of RVF structures are often only considered in isolation – but only a **clever overall system can realise the full savings potential**. In addition to the thermal insulation and cladding, the substructure is one of the components that can save the most energy.

What is known as the U-value is used to compare building components in terms of their energy-saving potential. This value indicates the heat flow that passes between the inside and outside, measured at a temperature difference of one Kelvin per square metre. This results in the unit watt per square metre and Kelvin, or W/(m²K) for short. **The better the thermal insulation, the lower the U-value.**



WHY DOES THE SUBSTRUCTURE HAVE SUCH A BIG INFLUENCE ON THE U-VALUE?

With a rear-ventilated façade (RVF), the building is wrapped with the use of thermal insulation and the substructure is generally constructed in two parts. This means that there are individual panels which are attached to the anchoring base (masonry, concrete, etc.) and to which vertical or horizontal support profiles are then adjusted and attached. This ensures a perfectly levelled surface for the subsequent rear-ventilated façade cladding.

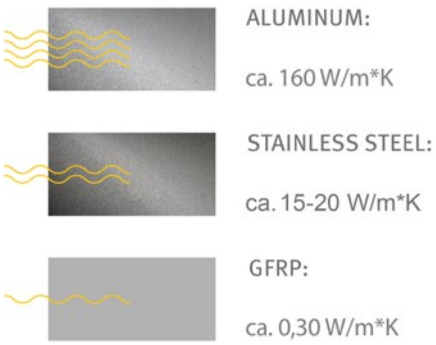
The **substructures (punctual wall brackets/panels) have an exceptionally large influence on the thermal insulation** and therefore on the U-value of the wall structure. The substructure penetrates the insulation, and is the only element that connects hot with cold. They form what are known as punctual or linear thermal bridges. Thermal bridges are all the points in building components that are more permeable to heat than other components – the heat is therefore transported more quickly, and unwanted losses of heat occur. There are material-related, structural (e.g. roller shutters) and geometric thermal bridges (e.g. building corners).

BUT WHY IS THIS THE CASE AND WHY IS IT RELEVANT?

Unwanted thermal bridges in the façade are usually due to the properties of the materials that are used. In general, panels made from steel, stainless steel, aluminium or plastic are used. **And that's where the big differences are: with the thermal conductivity of the material used.**

Aluminium, for example, has a thermal conductivity of 160 W/(mK) or more. Steel has approximately 50, and stainless steel approximately 15-20 W/(mK). Plastics only have a thermal conductivity of approx. 0.3-0.4 W/(mK), but have the disadvantage that they are not fire-resistant and are structurally less resilient in the façade. (Due to these disadvantages, we do not consider plastic substructures in the following example calculation.)

THERMAL CONDUCTIVITY OF SUBSTRUCTURES



THE RIGHT CHOICE OF MATERIAL FOR INSULATION AND SUBSTRUCTURE IS CRUCIAL. A GOOD OVERALL CONCEPT IS THE KEY.

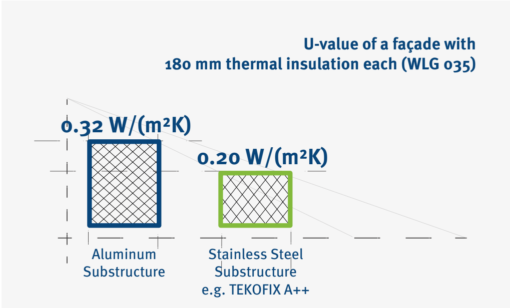
If these properties are now compared with an equally large point surface to the anchoring base, it quickly becomes clear that there are **differences between the thermal conductivities with the factor of 3 to 150**.

In comparison with stainless steel, aluminium dissipates heat approx. 10 times faster with the same panel base area, and is therefore a major thermal bridge. This means that aluminium dissipates considerable amounts of heat and cools the building permanently. In the summer, the opposite occurs and considerable amounts of heat penetrate the building through the thermal bridges, heating the building up.

RVF substructure with TEKOFIX A++ made of stainless steel

WHAT DOES THIS MEAN IN SPECIFIC TERMS, AND HOW HIGH ARE THE LOSSES, THOUGH?

As a specific example, let's look at a reference building measuring 30 m x 40 m, which is 10 m high and with 20% windows. This gives us a façade area of approx. 1,120 m². The U-value of the façade with a stainless steel UK (e.g. TEKOFIX A++ passive house certified) and 180 mm thermal insulation (WLG 035) is approx. 0.20 W/(m²K). If, on the other hand, a conventional and highly thermally conductive aluminium substructure is used, the U-value is as much as approx. 0.32 W/(m²K) with the same insulation material: the U-value is approx. 60% worse with an aluminium substructure and the heat losses are very high.



Energy losses with the example of the location of NRW – what could the solution look like in terms of the thermal insulation of the façade?
To illustrate the energy losses for a year, we looked at the location of NRW (North-Rhine Westphalia in Germany, where most people live and which has a good average temperature) and the average Kilo-Kelvin hours (KKH) per year. The unit describes the temperature difference per year which has to be balanced out by the heating. This value varies from region to region and can be queried using tables and the building physicist. The average value for NRW is 80 KKH.

Let's take our reference building with a façade area of approx. 1120 m² and a conventional and frequently used aluminium substructure. As we already know, aluminium brackets create huge thermal bridges.

THE ANNUAL SAVINGS POTENTIAL WITH STAINLESS STEEL UK IS AROUND €4,000 – €4,300!

Here is the calculation:
A façade solution with an **aluminium substructure** results in the following:
0.32 W/m²K x 80 KKh x 1,120 m² = **28,672 kWh energy per year.**
A façade solution with a **stainless steel substructure** (e.g. TEKOFIX A++) results in the following:
0.20 W/m²K x 80 KKh x 1,120 m² = **17,920 kWh energy per year.**
The use of an aluminium substructure therefore consumes 10,752 kWh more energy per year than a stainless steel panel (28,672 kWh-17,920 kWh=10,752 kWh)!

Calculated over a timespan of 10 years, that is 107,520 kWh! According to the German Association of Energy and Water Industries (BDEW), electricity currently costs 37.30 cents/kWh for households (as of July 2022) and 40.05 cents/kWh for industry. **The annual savings potential is therefore roughly 4,000 - 4,300 euros – over 10 years, 40,000 - 43,000 euros.**

This doesn't include the cost of cooling the building in the warmer months of the year, however, as the aluminium substructure also brings heat into the building during the summer.

SO WHAT IS THE SOLUTION?

It's quite simple:

_ **make sure you use the correct substructure.** Choose the right substructure system in consultation with the experts, and always calculate the effective U-value including the substructure.
_ Only use panels and systems that are passive house certified, for example.
_ Never simply work out the insulation material with the thickness, but always calculate the effective U-value including the associated substructure with the respective thermal bridges.

Saving energy together and making the world a better place can be so easy: **Use the effective U-value as the basis for comparison** and save both energy and costs.

USE THE RIGHT SUBSTRUCTURE.

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