

Press Release

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VIG – Vacuum Insulating Glass, dawn of a new window era

(see picture 1)

Vacuum insulated glass - VIG - offers high insulating values for windows and glass facades. Excellent temperature and sound insulation are only two of the positive features, another one being the light weight of the <9mm slim IGU element.

- Energy saving with better U-value

Comparing the U-values ($W/m^2 \cdot K$) of VIG glass (= 1 Watt energy waist per each square metre glass window and per each degree Kelvin temperature difference inside/outside) with today's window glass, shows how much energy cost can be saved by using the right glass element.

Today, more than 60% of all new buildings worldwide are built with monolith/single glazing windows with an U-value higher than $5 W/m^2 \cdot K$.

Worldwide the rising demand for heating and cooling energy will necessitate advanced possibilities to save energy.

Presently discussed European energy saving regulations require U-values under $0.8 W/m^2 \cdot K$ for all new buildings, a goal that can only be reached by using 3 layer insulating glass elements.

- Is 'VIG' the solution?

For new buildings, the excellent temperature and sound insulating VIG pane will play an important part in the traditional double- and triple-IGU market because of its higher insulating value and smaller element thickness / facade weight.

Other application fields for VIG are vehicle glazing as well as cooling furniture. Also here, the thin and light VIG pane is superior to traditional IGUs.

- General principle of VIG:

(see picture 2)

2 panes - each of 3 mm to 4 mm thickness, either low E float glass or tempered glass
- are layered together and their edges are vacuum proof sealed.

Contrary to other IGUs, the interspace is not filled with air or gas, but the 0.7 mm interspace contains a vacuum. Thus, molecules can transfer neither temperature nor sound from the inner to the outer pane.

To avoid impacts of the atmospheric pressure, small metal distance holders are fitted in a distance of 30 mm.

Theoretically, the VIG unit offers a U value below $0.2 \text{ W/m}^2\text{K}$. However, technical problems and high processing costs tend to reduce this U value to a - still excellent - level of app. $0.5 \text{ W/m}^2\text{K}$.

- A new approach to VIG

The idea of creating a VIG pane is not new. For more than 20 years, people have experimented with producing a "vacuum flask - window", but many development projects were stopped. At present, two companies offer VIG windows, however in relatively small sizes only and with a reduced insulating capability of approx. $1.5 \text{ W/m}^2\text{K}$, the reason being that today's production technology cannot assure long time vacuum and all weather resistance of the VIG element.

Between 2004 and 2006, a German VIG-basis-project was initiated in order to analyze problems and approaches around VIG. Under the leadership of Grenzebach Maschinenbau GmbH and in cooperation with other partners, this research and development project VIG (Found. code: 0327366) was founded by BMWi (German Federal Ministry of Economics and Technology) within the „German National Innovation and New Energy Technologies Program“.

The consortium's base project resulted in a promising window design that meets all requirements. Tests of handmade samples were positive. For industrial production, many processing steps are still to be developed and tested, including new technologies which were never used in the glass industry before.

To cope with these crucial tasks, in 2007 a successor network project was started by Grenzebach Maschinenbau GmbH and other partners. This has to be completed in 2009, a fairly tight schedule. The new research and development project ProVIG (Found. code: 0327419) is again supported by BMWi (German Federal Ministry of Economics and Technology) within the „5th German National Energy Technologies Program“.

- A new high-tech VIG solution

(see picture 3)

The new approach to a VIG pane is multifaceted. The mayor difference to earlier VIG designs is the new ProVIG edge sealing:

The old solutions were based on a solid connection of both sheets. However, when temperature difference from the inner to the outer sheet is too high, the fix sealing shows stability weaknesses. Also, the solder glass process is very hot and it is not possible to use tempered or coated glass for the VIG window.

The new ProVIG uses a flexible edge bond: A metal strip is fixed around the edges of two panes. The metal forms a chemical combination with the glass, resulting in vacuum sealing of the connection glass/metal. Then both elements - prepared as described above - are paired, with distance holders placed in between. For vacuum proof closing of the VIG-unit, the metal bands of both sheets are welded together. The protruding metal edge is to be folded back. The result is a flexible and permanent edge sealing.

Another difference to earlier VIG is the ProVIG Vacuum processing:

The old VIG uses a "pump out tube" in the sealed element. While the VIG is heated up to 400°C, all humidity is extracted from the gap via the tube.

The new German ProVIG system simply pairs both panes, closes and seals them by welding, this resulting in a big vacuum chamber inside.

Before pairing and welding, all humidity on the glass surface has to be removed. This is done by sputtering it with plasma gas.

- ProVIG Status and next Outlook:

(see picture 4)

All these technologies were tested and used in the lab and the first VIG samples were produced and examined in public research institutes. At present, the ProVIG team is producing the first VIG units on a semiautomatic mono size line, which is a certainly industrial and practically oriented processing line.

In 2010, a first commercial ProVIG line is planned to be installed in a German glass processing factory and will produce VIG elements for first "real life" use.

In developing ProVIG, the German team does not only consider standard windows, but also VIG-units with laminated glass, or combinations of VIG with other panes for future use in facade elements as well as in functional elements or solar systems.

Finally, a frequently asked question about the costs for the new VIG elements: These will be in the range of today's costs for a triple insulating glass unit.

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ProVIG www.vig-info.de

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