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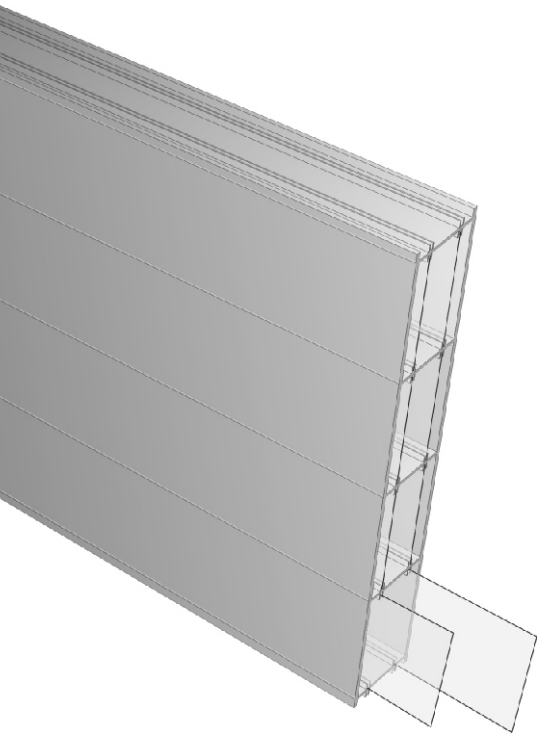
# Technical Information on the Butzbach Façade Cladding System VARIOPLANplus (1)



**Panel Description**
Two wearing surfaces made of fibreglass reinforced plastic are connected with a perspex bar. Special lugs in these bars allow the utilization of separating foils that make an improved UV value and noise insulation possible.

**Surface Protection**
The fibreglass surface on both sides of the panel is permanently protected against weathering and surface erosion by using a special procedure.
At the same time this surface treatment provides a particularly high natural daylight yield.

**Warranty**
The special two-side surface treatment that reliably prevents weathering and thus uncovering of glass fibres provides best resistance when panels are permanently utilized.

Butzbach gives an extended warranty against uncovering of glass fibres (acc. to warranty declaration) of

***10 years***

for the fibreglass panels.

**Heat Insulation U-value**
According to structure and design of the fibreglass panel an $U_G$-value of up to 0.6 W/m$^2$K can be achieved (by using Nanogel®).

**Light Transmittance**
The special surface and the structure of the fibreglass panels allow a light transmittance of up to 78 %. This value is only slightly below the value for insulating glass panes. An examination of an independent and renowned light laboratory confirms that the light density of the fibreglass panels is sufficient to meet increased visual requirements even in 12 meters space depth.

**UV Transmittance**
The UV transmittance of fibreglass panels equals 0 % up to 380 nm. Thus sensitive goods and items are reliably protected against fading out and other damages caused by UV light.

**Solar Energy Transmittance**
The value characterizes the passive solar energy yield. With a g-value of approx. 42 %, fibreglass panels are almost like dark glass.

**Behavior in Case of Fire**
The fibreglass panels are classified according to DIN EN 13501-1 as:

**E** **normal inflammability, not dripping off when burning**

The behavior of the fibreglass reinforced plastic in case of fire is very favorable.

There are
- no halogenated products, as there are no halogens (F, C, Br, I) contained
- no nitric oxides ($NO_2$) or hydrocyanic acid (HCN)
- no sulphur dioxide ($SO_2$)
- no heavy metals

The operative temperature range of the fibreglass panels is between -20 and +70° C.

**Resistance Category**
The fibreglass panels are classified as anti-attack glazing stage A3 according to P4A according to DIN EN 356.

**Radar Reflection**
Two expert statements of the Military University of Munich and the University of Karlsruhe confirmed that the fibreglass panels are radar reflection-free and thus particularly suitable for utilization in airport areas.

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# Technical Information on the Butzbach Façade Cladding System VARIOPLANplus (2)

**Colors**
***Brilliant*** - for highest light transmission, color neutral
***Emerald-Green*** - for high light transmission, pleasant light shades
***Sapphire-Blue*** - for high light transmission, more intensive light shades

Apart from the three basic colors that may be chosen, inserted colored foils may be used to create interesting effects.
As standard the RAL-like colors
1028 (melon yellow),
5015 (sky blue) and
5022 (night blue) are available.
Special colors are also available for areas of 400 $m^2$ and more.

**Varnishing and Coating**
Upon request the fibreglass panels can be varnished or provided with a special anti-graffiti coating.

**Side-brazed Closure**
The standard four-side lamination of the fibre-glass panel sides together with a pressure test protects the panel reliably against permeation of water and dust.

**Condensing Water**
Only under very extreme weather conditions air humidity condensates in the fibreglass panels. This can then be seen from milky darkening that usually disappears when the weather conditions return to normal.

**Expansion and Shrinking**
Fibreglass reinforced plastic also underlies temperature-dependent changes in length and width. These changes are in the range of 0.023 mm/mK and correspond to the expansion coefficient of aluminum.

**Storage and Transport**
When the fibreglass panels are handled, special care has to be taken with corners and edges. Shifting of the panels must be avoided. Hard items may damage the surface. Lifting between the laminates may damage the panels. The panels are to be stored protected from rain and solar radiation. When the panels are stored in stacks, heat may accumulate under solar radiation and lead to massive panel damage. Pallets with fibreglass panels may not be stacked one upon the other.

**Damage of Surface**
Extreme spot loads may lead to the formation of cracks. In general this is only a visual effect; the density and static of the fibreglass panel normally remains unaffected.

**Cleaning**
Generally all aqueous cleaning agents are suitable. Due to the special surface treatment also acidic and alkaline agents can be used. Aggressive solvents such as chlorinated hydro-carbons, ketones, ester and similar agents must not be used.

In case of doubt contact Butzbach before usage.

**Visual Appearance and Changing of Color**
The special composition of the material and the pertaining production procedure when the fibreglass panels are manufactured may lead to visual irregularities that do not constitute a reason for complaint.

As any other organic material also fibreglass reinforced plastic underlies certain changes of color over time. The utilization of high-quality
raw material, special additives and a modern production procedure helps to reduce such changes to an absolute minimum. The degree of the color change depends on the geographical location and the meteorological conditions (radiation intensity, temperature and air humidity).

**Other**
The right to technical changes is reserved. The information provided in this data sheet has been compiled to today's state of knowledge and does not claim for completeness.

Butzbach does not accept any liability for the correctness of values given by any third-party manufacturer.

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# Technical Information on the Butzbach Façade Cladding System VARIOPLANplus (3)

**Product Description VARIOPLANplus**
The façade cladding system VARIOPLANplus consists of highly weatherproof fibreglass panels that are installed into a specific profile construction.
A special panel surface finishing reliably prevents weathering. The circulating lamination of the front and longitudinal panel sides together with a pressure test on the part of the manufacturer helps to protect the panel reliably against permeation of water and dust.

**Product Advantages**
- High translucency without hard shadow
- Low dead weight
- High spans
- Good insulation properties
- Individual design options

**Operative Range for VARIOPLANplus**
The façade cladding system VARIOPLANplus is excellently suitable to be used in production and storage facilities, hangars, dockyard halls and office buildings.

Anywhere where substantial daylight transmission without hard shadows is required, VARIOPLANplus is the right solution.

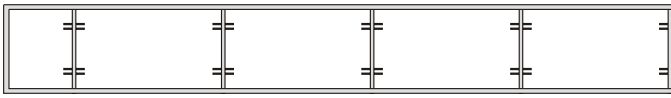
**Mounting**
The façade cladding system VARIOPLANplus may be mounted both vertically and horizontally. A special inhouse-developed profile system allows trouble-free installation of doors, windows, ventilation and other clamping elements.
Structural widths and heights of up to 1,000 mm are possible, dependent on the way of mounting. Naturally also any other intermediate dimensions are possible. However, ideally 500 or 1,000 mm should be chosen.

The systems 40/60s, 40/60sX and 40/60w are available, whereby the s-variant is a vertical façade for single windows strips. The sX-variant provides, when vertically mounted, the option to integrate windows and doors; the w-variant offers the same functionality, however, when horizontally mounted.

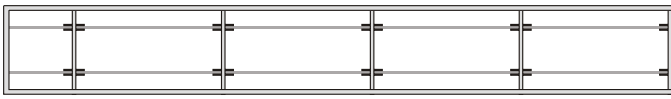
**Permissible Spans**
Corresponding to the system free spans of up to 5000 mm may be achieved, depending in which wind zone the building is located and which part of the building is considered.

According to the new DIN 1055 Part 4:2005-03 maximum permissible free spans can only be calculated if the dimensions of the building (length x width x height) are known.

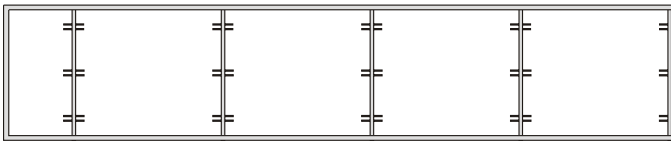
There are different free spans for sections A-E of a building. These permissible free spans are then to be calculated individually.



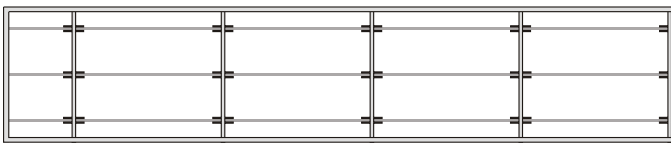
**Fibreglass 40** - thickness of panel 40 mm (without foils)



**Fibreglass 40** - thickness of panel 40 mm (with 2 foils)



**Fibreglass 60** - thickness of panel 60 mm (without foils)



**Fibreglass 60** - thickness of panel 60 mm (with 3 foils)

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# Technical Information on the Butzbach Façade Cladding System VARIOPLANplus (4)

| Technical Data | | Fibreglass 40 without foils | Fibreglass 40 with 2 foils | Fibreglass 60 without foils | Fibreglass 60 with 3 foils | Fibreglass 60 with 5 foils | Test Standard |
|---|---|---|---|---|---|---|---|
| **Panel thickness** | | 39,0 mm ± 1,0 mm | | 59,0 mm ± 1,0 mm | | | |
| **Panel weight** | | max. 8,0 kg/m² | | max. 10,0 kg/m² | | | |
| **Deliverable length** | | up to15,00 m | | | | | |
| **Linear extension coefficient** | | approx. 23 x $10^6$ 1/K (longitudinal direction) | | | | | |
| **Operative temperature range** | | -20°C up to +70°C | | | | | |
| **Heat transmission coefficient** | | 2,5 W/m²K | 1,7 W/m²K | 2,5 W/m²K | 1,4 W/m²K | 1,1 W/m²K | DIN EN 674 |
| **Airborne noise insulation** | | 25 dB | 27 dB | 25 dB | 27 dB | 28 dB | DIN 52210-2 |
| **Light transmittance $\tau_v$** | Brilliant panel | 78% | 63% | 78% | 57% | 46% | DIN EN 410 |
| | Emerald panel | 74% | 60% | 74% | 54% | 43% | DIN EN 410 |
| | Sapphire panel | 65% | 53% | 65% | 47% | 38% | DIN EN 410 |
| **UV transmittance up to 380 nm $\tau_{UV}$** | | 0% | | | | | DIN EN 410 |
| **Solar energy transmittance g-value** | | 42 % vertical incidence (2 foils) | | | | | DIN 67507 |
| **Behavior in case of fire** | | E (not dripping off when burning) | | | | | DIN EN 13501-1 |
| **Anti-attack glazing** | | P4A | | | | | DIN EN 356 |
| **Artificial weathering** | | 2000 h (DIN 6174) $\Delta E = 1,1$ (SST); $\Delta E = 3,8$ (WST) | | | | | DIN EN ISO 4892-2 |

**Radar reflection:** Two investigations of the reflection behavior for radar waves were performed. High reflection insulation means that the reflected intensity is low, e.g. the higher the insulation value, the more transparent the panel for radar beams.
Expert statement Professor Kaes, Military University Munich: The reflection insulation of 20 dB for angles of incidence up to 40° (requirement of Federal Institute of Air Traffic Control) is fulfilled if there are no metallic link components between individual panel elements (clamping profile).
Expert statement Professor Dr.-Ing. Wiesbeck, University of Karlsruhe: The measured fibreglass panels are almost transparent at 1.03 GHz with respect to radar beams. The little material losses have the effect that heavily reflecting metal parts are well visible behind a fibreglass panel.