

Window and Door Technology



The Glazing Guide

Principles of Professional Glazing



Imprint

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Packer tasks.....	5
Packer variants	6
Packer versions for standard solutions	8
Packer versions for customised solutions	9
Packer version	12
Packer stability	14
Packer dimensioning and position.....	15
Packer properties.....	16
Packing proposals for level panes of glass.....	18
Mechanical packer load	20
Glued window systems	21
Packing proposals for special cases.....	22
Packing proposals for locking-point packing ..	24
Pitched glazing /Overhead glazing.....	26
Packing on panel windows.....	27
Compensating blocks	28
Additional technical regulations	29
General information	30
References	31

Packing is no small issue!

Packing is a small, but very important factor in the professional installation of glass. It ensures not only that the window operates as it should, but also guarantees that the glazing is installed securely, properly and without any force for the entire service life of the system. In addition to the positioning of the packers, the width, length, stability, compatibility and material hardness also play a major role here. The packer makes not only a vital connection between the frame and the edge of the glass, it also assumes the decisive tasks in ensuring the function is permanently retained. The most important packer tasks are:

- Supporting rebate area ventilation and vapour pressure compensation.
- Protecting the glass edge and the edge composite.
- Proper operation of the element.

Today, it is no longer possible to get by with just one packer material, one packer width and one packer thickness. Different frame designs and support conditions require individual packer solutions.

The regulations have also been heavily involved in the subject during the course of the past few years. The high number of damage cases has clearly illustrated that the packers are no longer just a small issue.

With this edition of our glass packer fasteners, we hope to provide interested parties with an overview of the problems that may be involved, suitable solution options, current guidelines and developments in the area of glazing technology.

Basically, the packer tasks must be evaluated when installed. The following points should be observed so that the packing process does not overload the glass edge and the edge composite:

- The packers ensure that the glass edges do not make contact with the frame at any time to avoid any damage.
They keep the frame and the sash in the correct position, while also ensuring proper operation.
- Depending on the sash opening type involved, the packers have a support function, while also ensuring zero-stress installation.
- The packers distribute the weight of the glass in the frame and compensate for it.
- The design must be sufficiently dimensioned so that the weight of the glazing units can be borne without any problems.

The packers have to assume different functions, therefore we thought that it was important to define the packers and how they work.

- **Support packers**

channel the weight of the glazing unit into the frame structure.

- **Spacer packers**

maintain the spacing between the edge of the glass and the rebate base while also ensuring force-free installation. They temporarily adopt the role of support packers when the function of the sash changes.

- **Locking point packers**

prevent any excessively-large bending flexure of the sash profiles when loads are mechanically applied (such as, e.g. in burglar-inhibiting designs).

- **Compensating blocks**

are used for profile compensation (system-specific) while also providing a level support. The glass rebate inserts form the basis for the tested packer material. They are not a substitute for glazing packers. Compensating blocks support the rebate area ventilation.





Glas-Tec GL-SV

- For all standard glazing
- Material compatibility according to TG3 Guideline
- Resistant to ageing
- Temperature resistant



Glas-Tec GL-B

- The packer with two brake membranes for fixing in place
- Resistant to sustained pressure and load-bearing capability due to asymmetrical profile leg system
- Material compatibility according to TG3 Guideline
- Resistant to ageing
- Temperature resistant



Glas-Tec GL-IB

- For triple glazing
- Professional installation of glazing thicknesses up to 60 mm
- Secured load division with special guidance of ventilation duct
- The required vapour pressure compensation in the rebate area is not impaired by the packer
- Material compatibility according to TG3 Guideline
- Resistant to ageing
- Temperature resistant



Glas-Tec GL-UK

- Elastic support
- Resistant to sustained pressure and load-bearing capability due to asymmetrical profile leg system
- Resistant to ageing
- Material compatibility according to TG3 Guideline
- Temperature resistant
- Extended packer length (120 mm)
- For improved load-bearing capacity from a width of 80 mm



Glas-Tec GL-UKS with stainless-steel insert

- Resistant to ageing
- Material compatibility according to TG3 Guideline
- Temperature resistant
- Also usable with protruding substructures
- High inherent stability

With stainless-steel packing, support packers are used, that are supposed to transfer the glass weight of each glazing unit to the frame structure. Open joints must be sealed off immediately after packing!

The appropriate use of individual packer versions and, in particular, material compatibility to match the terms of use are to be verified and defined by a specialist on an individual basis. Please refer to the Glazing Trade Technical Guidelines, Part 3.

Pressure deformation of glazing packers

Results:

GL-SV



Breaking load:

- 20° C 2039 kg
- + 23° C 1223 kg
- + 80° C 336 kg

Procedure:

In order to determine the pressure deformation characteristics, the glazing packers were loaded vertically relative to the surface up to the specified limit values. The limit values were defined as 5 N/mm² (≈ 306 kg), 15 N/mm² (≈ 917 kg) or as plastic deformation. The force at the transition from elastic to plastic deformation was defined as the "breaking load".

GL-B



Breaking load:

- 20° C 2039 kg
- + 23° C 1376 kg
- + 80° C 398 kg

Test:

The tests were conducted at the following temperatures, from +23°C, +80°C and -20°C, with uniform feed speeds of 1mm/min.

GL-IB



Breaking load:

- 20° C 2039 kg
- + 23° C 1223 kg
- + 80° C 377 kg

Test set-up:

The glazing packers were placed on a flat steel surface and loaded with a steel sword with a width of 6 mm over the entire packer length of 100 mm.

Results:

GL-UK



Breaking load:

- 20° C 1325 kg
- + 23° C 917 kg
- + 80° C 306 kg

GL-UKS*



Breaking load:

- 20° C 1806 kg
- + 23° C 890 kg
- + 80° C 902 kg

Summary:

The glazing packers shown here obtain the following results in the tests described above.

Technical Guideline No. 3 "Packing Glazing Units" Chapter 4.2, specifies a permissible pressure per unit area of min. 5N/mm² (≈ 306 kg) for "sufficiently pressure-resistant glazing packers." During the tests conducted no permanent deformations were determined on the glazing packer for the specified load.

Test Reports No. 50938119/1-5 from the ift certification body based in Rosenheim, Germany are available.

* As it was not possible to plastically deform the GL-UKS due to its design, a maximum deformation of 2 mm was defined.

Material selection:

The compatibilities of various materials must be ensured (avoid any migration). If necessary, ventilation ducts must be provided. Ensure compressive strength with at least 5 N/mm² pressure per unit area is given.

Dimensioning:

Width of the packers is at least thickness of glazing unit + 2 mm. With glazing gaskets, the distance to the packer width must also be added (End stop packing). The thickness is approx. $\frac{1}{3}$ of the glazing rebate height, it should not be less than 5 mm (Avoid any adherence of water drops). The length is usually 100 (80) mm.

Basic conditions:

The rebate base must be suitable. In profile systems use an appropriate glazing rebate insert. The entire system must be capable of assuring vapour pressure compensation. Ventilation and drainage openings must remain functional. Glass edges must not make contact with the frame.

Packing:

Distribute the weight so that the design can bear the glazing. Dissipate the applied forces through the packers, to the hardware and on through the support construction into the masonry. Ensuring uninhibited movability. The position of the packers must be guaranteed by a suitable fastening method (through the type of packers involved or through suitable non-migrating mass). The specifications of TG3 and all other manufacturers must be observed.

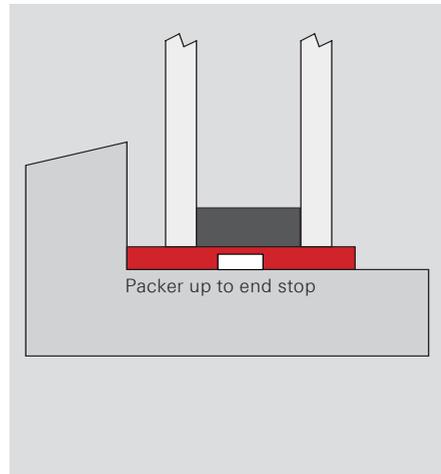
Installation example

Corner of a Tilt&Turn window with final packing.



End-stop packing

This method of packing prevents any displacement of the packers in terms of rebate depth. This ensures that the packer's total contact surface is used.



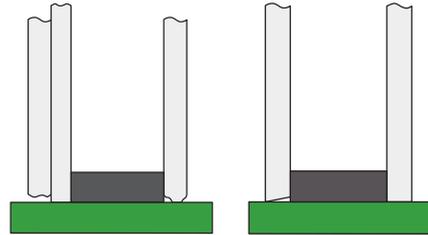
Packer stability

The load-carrying capacity is geared not only towards the packer material and length, it is also dependent on packer design.

The actual load-transferring surface is calculated using the examples shown below. The smaller the load-bearing surface, the greater the load on the edge of the glass. In the event of any unfavourable overlapping, for example, offset glass edges or non-orthogonal glass edges, the risk of glass fracture can increase.

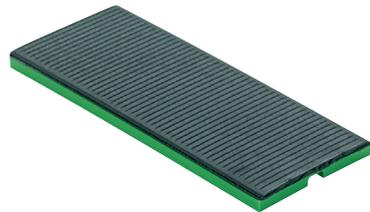
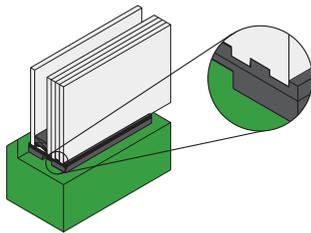
Adapt and compensate offset of glass edge using packer stiffness

Not this way, please:



Glass edge offset

Non-orthogonal glass pane edge



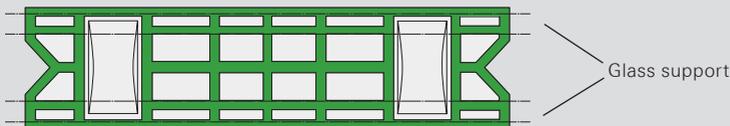
Glas-Tec GL-UK :

Solution for panes with glass edge offset

Comparison examples for packer designs with 100 mm length:

Glas-Tec GL-B

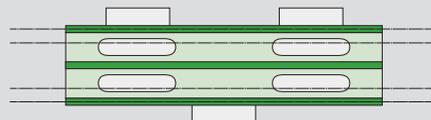
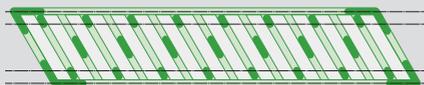
Bearing surface: 466mm²



Other designs

Bearing surface: 153.6mm²

Bearing surface: 196mm²



Packer dimensioning and position

Packer arrangement is dependent on the window function and type of opening (see also page 18/19). Generally, the distance between the packer and the corner of the glass unit should be roughly one packer length. With customised frame designs (width, fixed units, e.g. display windows) the support packers must be located over the frame attachment points. This means that the packer can protrude up to a max. 250 mm out of the corner. The packer thickness is dependent on the window-pane spacing. Generally, packer thickness should be 5 mm. For smaller-sized panes, with edge lengths of up to approx. 500 mm, the packer thickness can be reduced to 3 mm. The packer width is dependent on the thickness of the glazing unit.

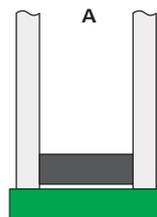
It should be approx. 2 mm wider than the glazing unit (see sketch A). Openings outside must always be left open. For specific glass products or glazing, the specifications of the glass or insulating glass manufacturers must be observed. When packing alarm glass, care must be taken to ensure that the cable and cable connections are not jammed or damaged. The packer lengths should generally be 100 mm, to reduce any local loading and the risk of fractures in the insulating glass unit. Our long-standing experience has shown that generally, packer materials with lengths of 100 mm are not subjected to excessive stresses on the various types of windows and openings.



Example of proper packing
with 5 mm packer thickness and 100 mm packer length, taking correct location and correct spacing into consideration.

(*) Comment:

In exceptional cases the distance may be reduced to approx. 20 mm, where the installation situation permits.



Generally, the packer should be selected to be wider than the thickness of the glazing unit

Packer properties

For glazing without any sealing compound in the rebate area, the packers must be secured against moving or slipping, so that the glass edge does not make contact with the frame. The material used to secure the packers must be compatible with the edge composite and the packer.

Suitable sealing compound must be used to set glazing packers. Packers with self-adhesive properties should be preferred here (e.g. GL-B).

For smooth rebate bases, packers with a ventilation duct are required, to ensure that the vapour pressure can be compensated. There must be no sealed air gaps created (e.g. GL-SV).

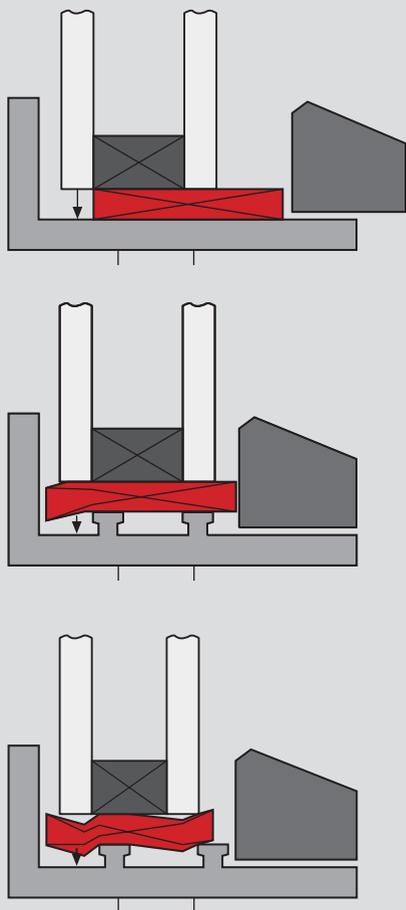
Similarly, the rebate area without sealing compound must be open to the outside. The packers must not impede or prevent the vapour pressure compensation here.

We recommend the multi-purpose packer for units made of laminated glass or laminated security glass. The flexible packer surface (approx. 70° Shore A) compensates for the manufacturer-specific pane offset.

System sketches:

Incorrect packer position

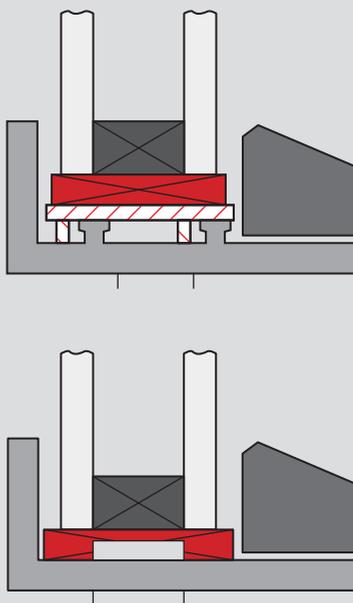
The packer is frequently located incorrectly, below the edge of the insulating glass. The following sketches illustrate schematically, how the risk of glass fracturing is increased or how the edge composite can be damaged.



System sketches:

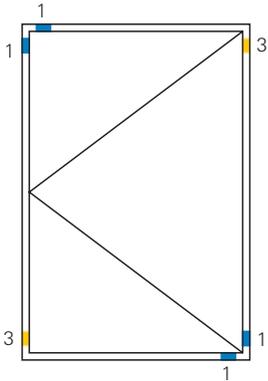
Correct packer position

The use of suitable packer systems coupled with an appropriate selection, assures the glazing function.

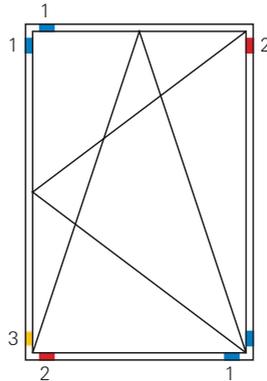


Packing proposals for level panes of glass

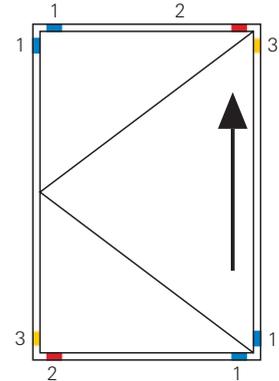
Turn-Only sash



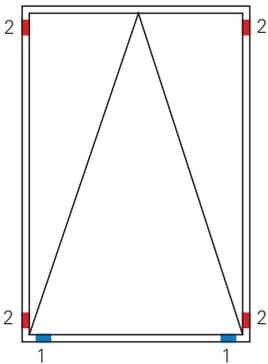
Tilt&Turn sash



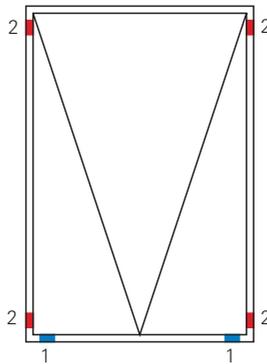
Lift&Turn sash



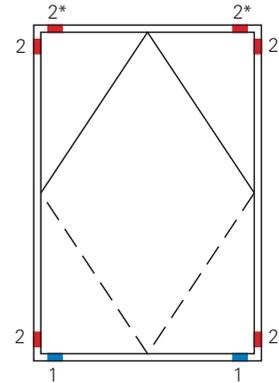
Tilt-Only sash



Top-hung shutter



Pivoting windows



With pivoting windows made of PVC profiles, it is advisable to ask the profile or frame manufacturer for the recommended type of packing to be used on the pivot bearing. Doubled-up packing may be required above and below the bearing.

- 1** Support packers
- 2** Spacer packers
- 3** When using brake packers, counter packing = spacer packer is recommended.

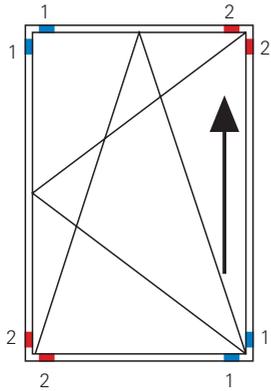
1* For glazing unit widths in excess of 1 m, 2 support packers with a length of at least 10cm, should be mounted above the turn-only bearing.

Recommendation:

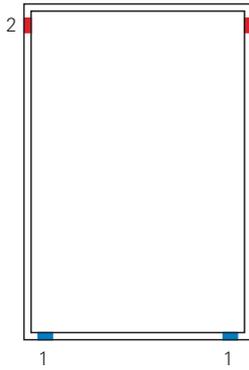
** Spacer packers with flexible support (60°–80°Shore "A")

2* Turn into support packers when sash is swung round.

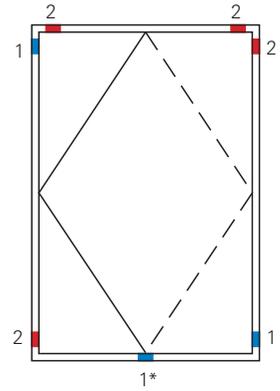
Lift-Tilt&Turn sash



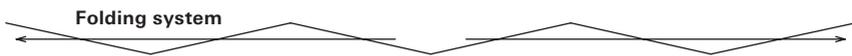
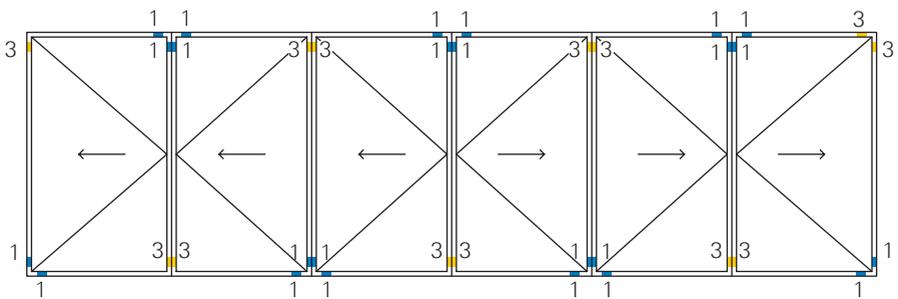
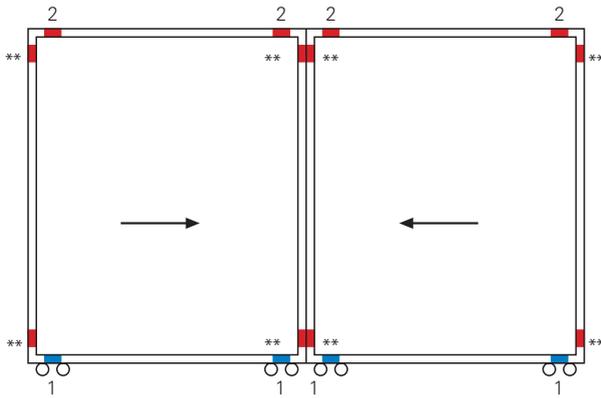
Stationary glazing



Pivoting sash



Sliding door

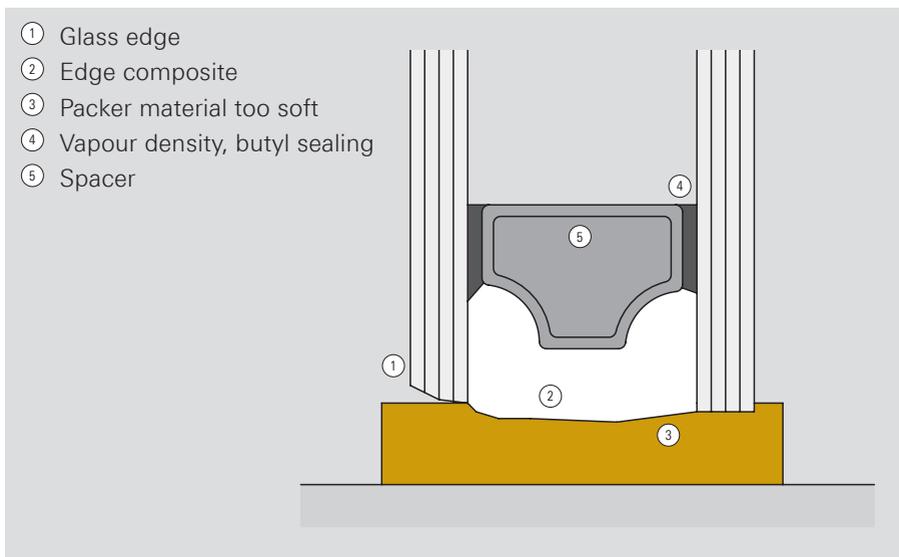


Mechanical packer and edge composite load

When packing, care must be taken to ensure that the transfer of the glass weight to the support packer does not lead to uncontrolled, local pressure loads (force concentrated on one point of surface) on the glass edge and edge composite.

As load increases, frictional forces constantly act through climatic loads (exposure to heat or cold) as well as wind loads (pressure/suction) on the area of the glass edge and the insulating glass's edge composite.

If the packer material is too soft or if the degree of filling for the edge composite is too high (warpage of edge composite over glass edges), pressure loading and deformation may occur. The edge composite area may be damaged because of this.



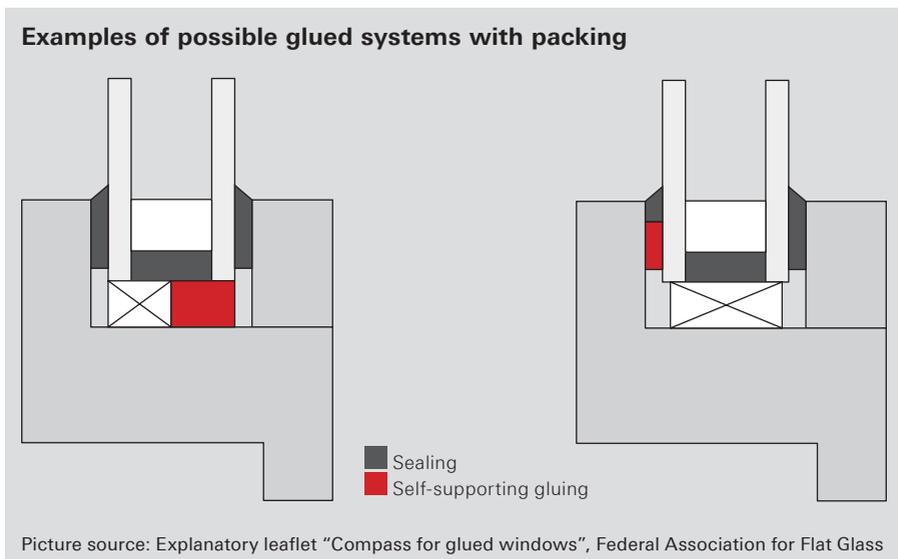
Glued window systems

When gluing windows, the rigidity of the glass or the insulating glass should be utilised by means of a static-acting bonding process between the glass and the sash profile, whereupon the window should be rendered rigid and non-settling as a connecting element.

It is important here to regard the window as an “integral system”. The system supplier must have specified, checked and coordinated all the components with each other (e.g.: glass, packers, sealing compound, connections etc.). A general statement on packing, extending beyond the basically valid requirements, is therefore not possible, because it is dependent on each specific system.

The window fabricator is responsible for ensuring that development of the glued window design is conducted overall and in close cooperation with, in particular, the manufacturers of the insulating glass, glue, frame material and hardware, taking existing standards and guidelines into account.

Additional information is available in the research report published by ift in May 2010 “Durability of glued insulating glass”.



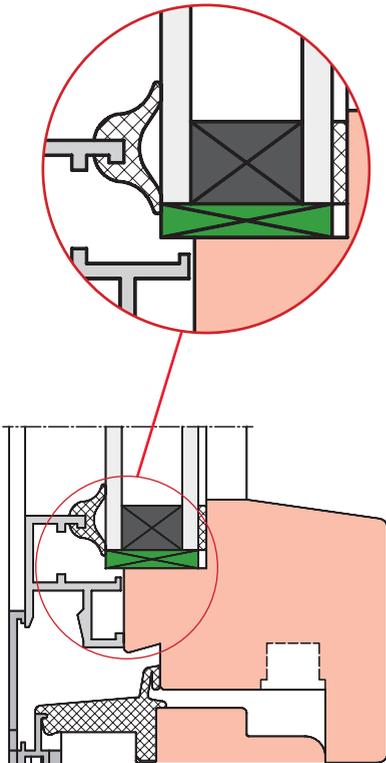
Supporting glazing unit over entire thickness

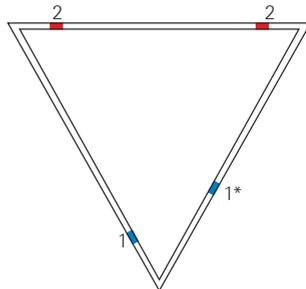
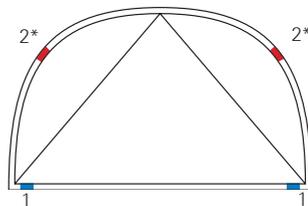
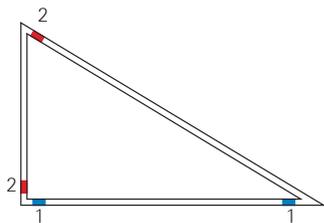
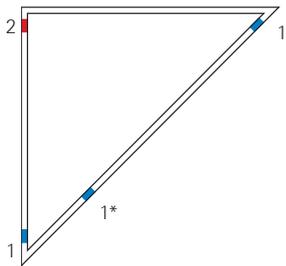
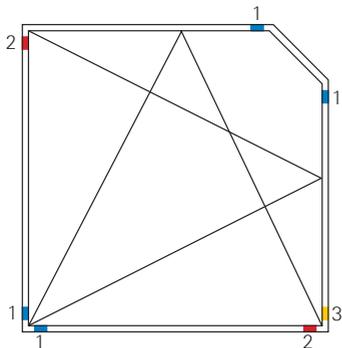
The glazing unit must be supported over the entire thickness to ensure that an optimum load transfer is achieved. A vital basic requirement for this is a correspondingly strong base. If the base is displaced (inherent to the system) or in the event of any overhanging packing, a packer with steel core is required to enable bending/shearing forces to be absorbed.

Practical example

Glass support too narrow, packer too small. Glass edges are only partially supported.

Result: Overload!





Additional special window shapes

The listed possibilities are examples only. Decisions shall have to be taken on an individual basis for designs not listed. The general packing regulations should be observed here.

- 1** Support packers
- 2** Spacer packers
- 3** When using brake packers, counter packing = spacer packer is recommended.

Packing proposals for locking-point packing and for supporting burglary inhibition

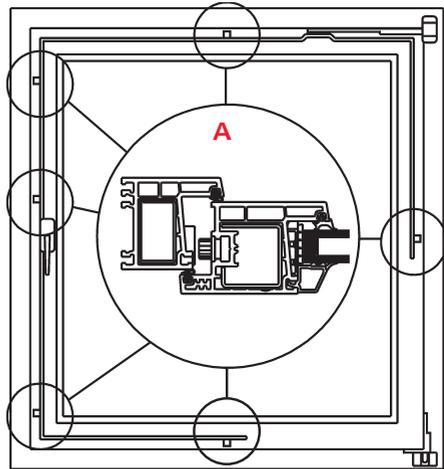
Additional packing is required at the locking points to reduce the risk of jemmying. Locking-point packing is a spacer packing process and it fills the clearance area. Here, we recommend our Glas-Tec GL-UK.

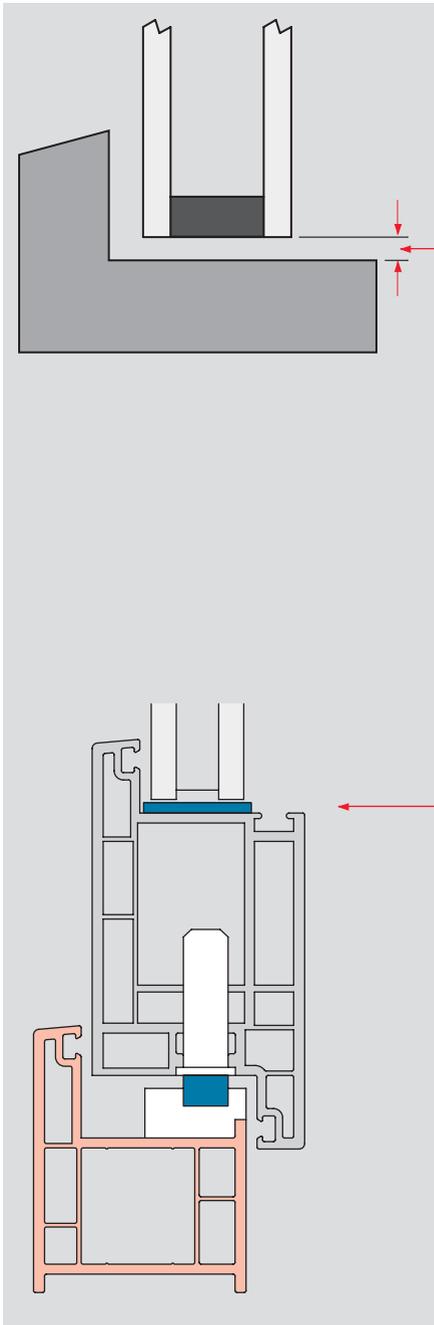


A

Locking point = Packing point
Please note the basic requirement, whereby the glass edge must not be overloaded or damaged. Example using a PVC window (also transferable to other frame materials).

Please also observe the hardware manufacturer's specifications.





Locking points can also be packed for PVC windows.

Locking point packer thickness =
Clearance area / rebate area

Free rebate area:

The movement determines the clearance area between the locking lugs and the striker plate.

A spacer packer is mounted immediately above the locking point.

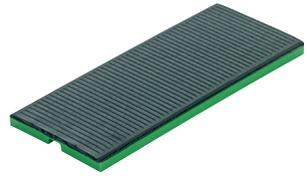
Caution:

Locking-point packing is conducted at the end and it is a spacer packer.

Pitched glazing / Overhead glazing

Special care must be taken with overhead glazing (TRLV) to ensure that the weight of the glass above the packing point is transferred through the frame design, without overloading the glass edges. A special reference is made to these design details, in particular, in the technical rules for "Overhead glazing", as specified by the "Deutsches Institut für Bautechnik (DIBt)" (civil engineering competence centre) located in Berlin. There must be no contact between the glass and the frame (e.g. glass and metal or glass and glass).

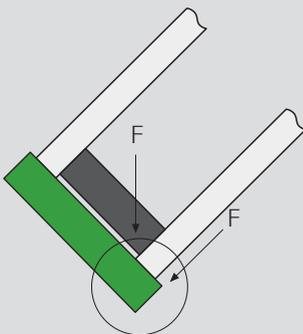
Recommendation:
Glas-Tec GL-UK



Spacer packers should be used to prevent the window pane from slipping. They are not generally used to transfer loads, unless this has been coordinated and approved with the relevant glass manufacturer. The function of the packer is then altered here. A flexible bearing at 60°–80° Shore "A" of the pane edge is advisable here because of the special requirements involved. The special regulations of the glass and frame manufacturers must also be taken into account here.

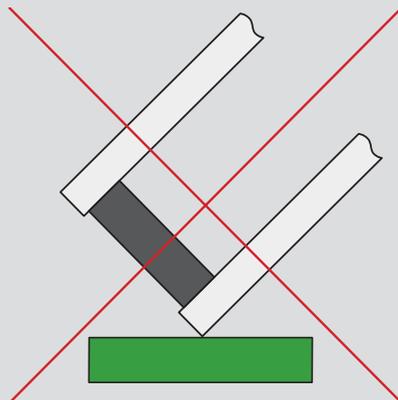
Requirements for pitched or overhead glazing

Correct



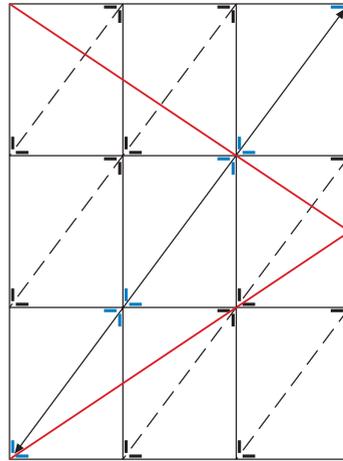
F = Application of glass weight
onto/into packer

Incorrect



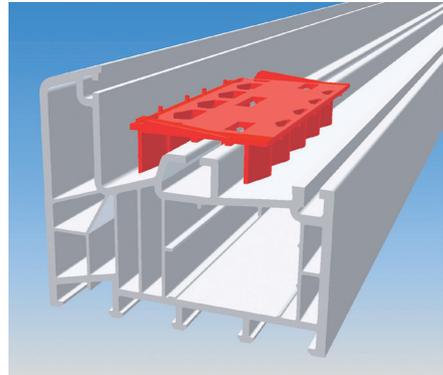
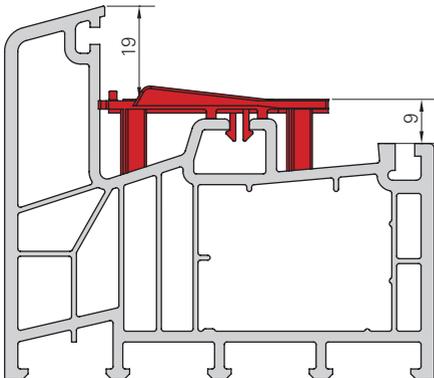
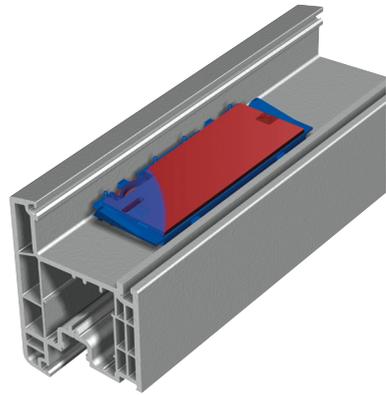
Example for packing on panel windows

In glazing with design panels, each field must be individually packed to match the type of opening involved. A start is made with the diagonals, matching the opening type. Every field must be packed.



Compensating blocks

Compensating blocks are used for profile compensation (system-specific) while also providing a level support. They form the basis for the tested packer material, but they are not a substitute for a glazing packer. The inserts are available as a clamp-fitting version (see sketch). They support the rebate area ventilation and load transfer.



Technical Guidelines of the Glazing Trade

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- Manufacturer guidelines from insulating glass manufacturers and profile-system manufacturers
- Approved testing institute
- ATV DIN 18361 Glazing works, current date of issue
- Technical rules for use of linear mounted glazing, Deutsches Institut für Bautechnik, Berlin, current date of issue

With stainless-steel packing, support packers are used, that should transfer the glass weight of each glazing unit to the frame structure. Open joints must be sealed off immediately after packing!

The appropriate use of individual packer versions and, in particular, material compatibility to match the terms of use are to be verified and defined by a specialist on an individual basis. Please refer to the Glazing Trade Technical Guidelines, Part 3.

Quality information:

Glazing packers from Roto Frank AG are checked for compatibility in accordance with TG3. Laboratory tests are available and they are continuously updated.

Important note

Roto glass packer fasteners are not a substitute for approved rules. They should help to highlight tried-and-tested solution proposals for professional packing. Many years of practical experience have shown that in the area of packing, in particular, compromises should be allowed for. Therefore, consultations with the insulating-glass manufacturers and system suppliers should be held.

Note

This Glazing guide does not absolve you from the responsibility to plan and design the packing. It is understood to be a recommendation for professional packing, but not the only one. We would remind you that these specifications are based on our knowledge and experience, in particular, proposals regarding the processing and use of our products. Because of the given working conditions that are beyond our sphere of influence, we advise you to ensure that the processing purpose is a suitable one. No liability can be assumed from the information we provide or the advice we give, unless malice or gross negligence was involved.

Technical Guideline No. 3 “Packing Glazing Units”

Picture source: Explanatory leaflet “Compass for glued windows”, Federal Association for Flat Glass

Additional information material:

TG3: Packing Glazing Units

TG9: Visual testing and assessment principles for construction-site glazing

TG17: Professional installation of insulating glass

In consultation instances please contact the Technische Kompetenzzentrum des Glaserhandwerks-Institut für Verglasungstechnik und Fensterbau (Technical Competence Centre of Glazer Trade Institute for Glazing Technology and Fenestration Industry).

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