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Final measurements and assessment of the real building situation

Once the contract has been awarded, the ongoing work needs to be checked against the tender documents. This is to avoid bad workmanship. For this purpose, the situation on site shall be surveyed and all window reveals shall be measured. In case of renovations in old buildings, the determination of the structural facts is particularly important. This is necessary because the installation has to be made according to the state of the art, and because the VOB/B (German Construction Tendering and Contract Regulations/Part B), § 4, No. 3, stipulates that the contractor shall survey the correct execution of the preceding works and inform the customer in writing of any failings.

Above that is the dispensation of justice by the German Federal Supreme Court of Justice (BGH). It requires the solving of any question of doubt, i.e. the duty to inquire before the tendering. In view of extended product liability, it is also important not to jeopardize the performance capability of the windows and doors through pre-existing obvious failings at the building structure.

Documentation about the condition of the building and defects

For the inspection of the constructional situation on site and for possibly required notifications on deficiencies to planners, design engineers or the awarding authority, the following procedure is recommended:

- Do the materials used on site and the construction of the external walls correspond to the plans? They are the basis for the choice of the fasteners!
- What is the type and condition of the wall covering (plaster, clinker bricks, tiles etc.)? This is the basis for the choice of the internal and external sealing system and the determination of secondary works.
- Which kind of wall construction (solid walls or cavity walls, with or without rear ventilation) exists? This is the basis for the choice of the connection type and installation position.
- Information on potential building movements in the connection area shall be obtained from the designer. This is decisive for the choice of the connection profiles and for the formation of the expansion joints.
- The strains to be expected, i.e. wind load, driving rain, live loads etc., have to be determined. They are the basis for the dimensioning of the reinforcements and for the choice of the gaskets, the drain system (grooves etc.), the hardware and the glass thickness.
- Are there any reference markers for the height (benchmarks)?
- Are there any thermal bridges or points where penetration of moisture is discernible?
- Are further safety measures necessary for the installation?

Any nonconformity with the plan shall be reported in writing to the awarding authority!

According to the requirements of the German State Building Codes, windows have to be fastened in the building structure in such a way that they neither endanger the life and health of people nor impair public safety.

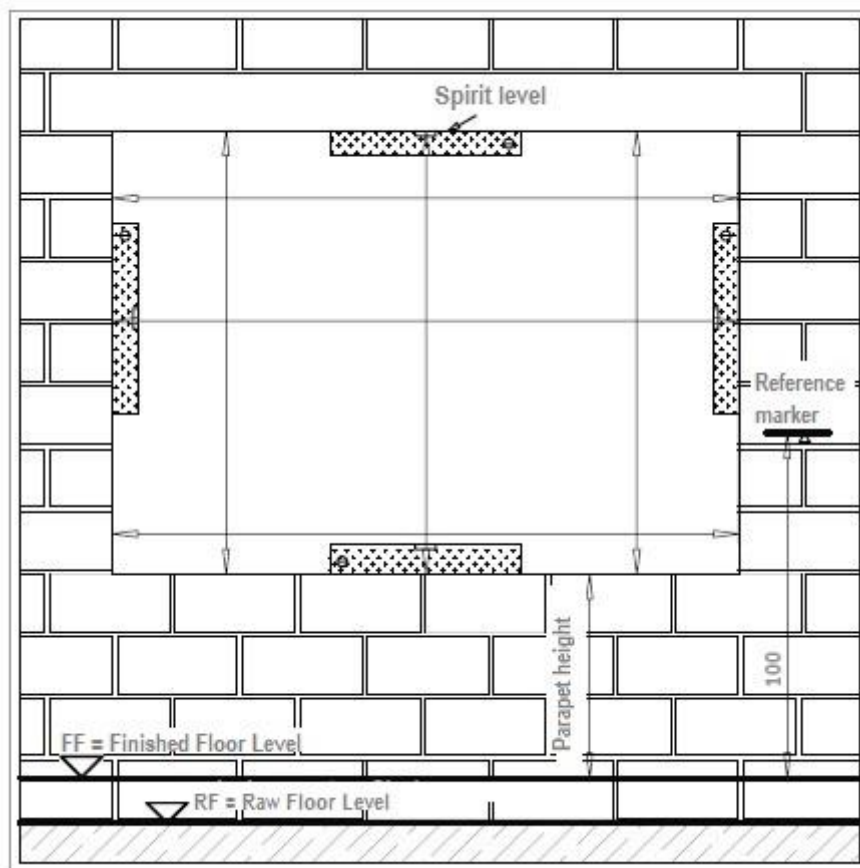
Final measurements of building openings

Before the fabrication of the window, the dimensions of the reveals are to be measured on site (in the building carcass). For this purpose, the window openings are to be measured in the height (left, centre, right) and in the width (on top, centre, at the bottom). The smallest measure is critical for the fabrication.

Planning of the installation

Once the measurements have been taken, the installation works can be planned. Two points have to be kept in mind:

- For a smooth workflow, responsibilities have to be divided and appointed clearly. (Is the installation crew responsible for all the sealing works? Are plaster works included? etc.)
- In general, when measuring the reveals, secondary performances and special services offered in the tender should be assessed critically.
- Particularly in renovation projects, the condition of the window reveal below the window to be installed is crucial for the choice of the fasteners.
- Moreover, it is important to clarify whether the dismantling of the old window and its disposal by the window fabricator is considered a secondary work or a special service.



Planning of the installation

Unless stated otherwise, all elements are to be installed in true horizontal, vertical and flush alignment. The exact position of the windows and doors in the building structure (if not yet specified) shall be agreed in writing with the customer or planner.

For window walls according to DIN 18056, a testable structural analysis must be performed for the construction and the fastening. The fastening may be performed only with fastening means approved by the building authority. Windows are considered window walls according to DIN 18056 if:

- the surface area is larger than or equal to 9 m², and
- the smallest length is larger than or equal to 2 m.

General principles

The fastening must be done mechanically. Foams, adhesives or similar agents are not permissible as fastening means. The fastening means must not impair the expansion of the profile due to temperature changes. Loads caused by movements in the building structure must not be transferred to the windows.

Determination of installation details

Respect the structural requirements:

- DIN 1055
- Maximum deflection caused by wind load $l/300$ or max. 8 mm per insulating glazing unit.
- DIN 18056, window walls
- Choose couplings according to structural requirements,
- Take into consideration the fastening to the reveal
- Take into consideration the fastening of the frame when there is a roller shutter mounted

Requirements concerning building physics:

- Thermal insulation and representation of isotherms
- Sound insulation
- Moisture proofing
- “Airtightness”, ventilation vs. Blower-Door test
- Thermal expansion, keep the clearance

Fasteners:

- Screw fastening with and without dowel
- Buttstraps
- Mounting systems

Sealing:

- Sprayable sealants
- Impregnated cellular plastic strips
- Sealing webs
- Sealing tapes

Insulation:

- PU foam insulation
- Mineral wool
- Mineral fibrous insulating strips
- Sprayable cork

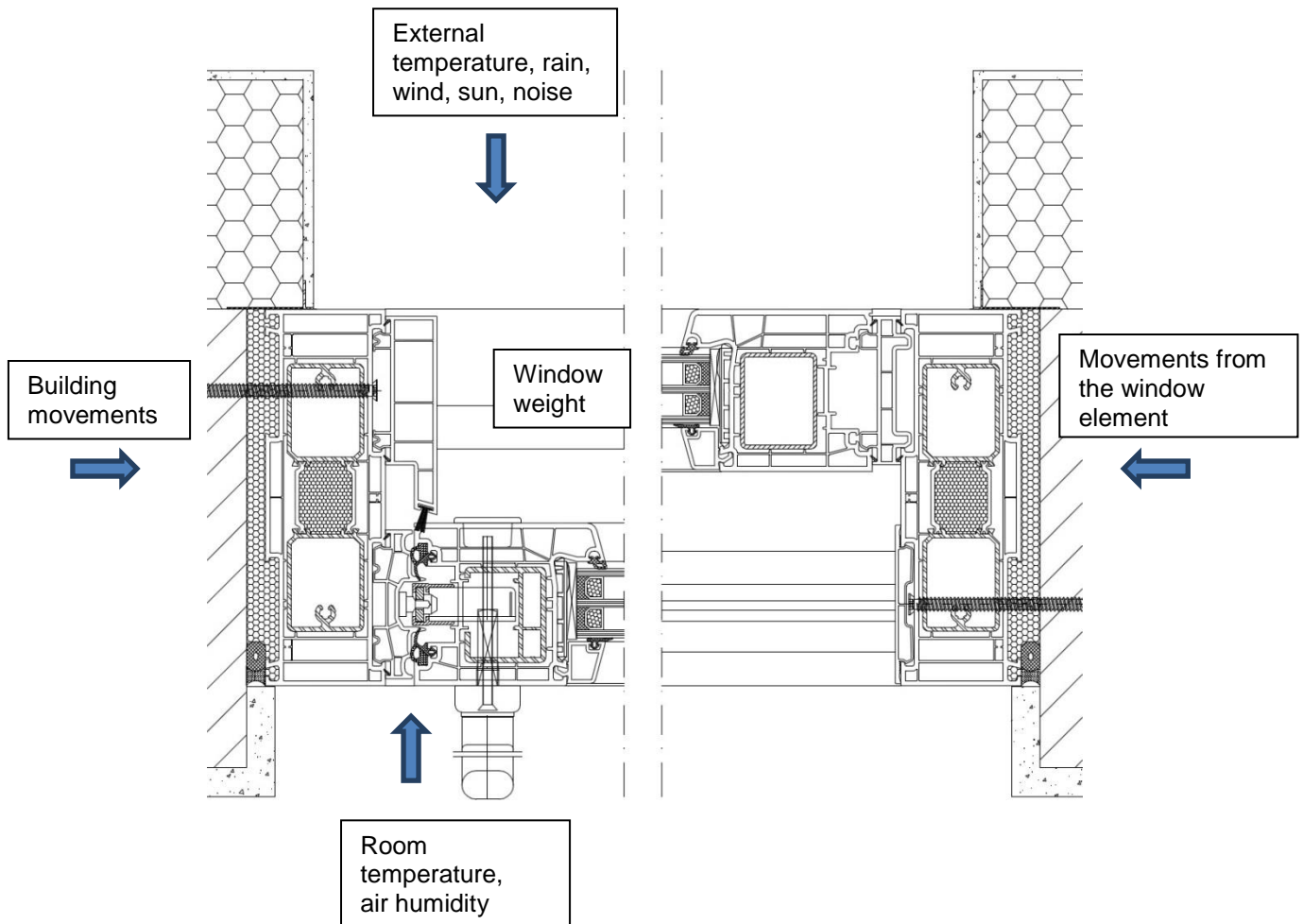
Burglar protection

Connection details

- Roller shutter box (built-on element, or box already in place)
- Window sills (connection and insulation, ensure proper drainage of the frame, ensure proper sealing etc.)
- Additional fasteners for folding shutters, French balconies or awnings

The installation

The quality of windows depends crucially on the connections to the wall. For this reason, professional fastening and the soundness of the connection joint are of vital importance. All forces acting on the window from the point of view of construction physics have to be considered (see figure).



In addition to the aforementioned strains from wind load, live load and dead load, the occurring forces are also influenced by (among others):

- the flexural rigidity of the frame profiles,
- the position and number of the fastening points,
- the temperature difference between inside and outside,
- the thermal expansion coefficient of the window frame material,
- the flexibility (spring rigidity) of the fasteners.

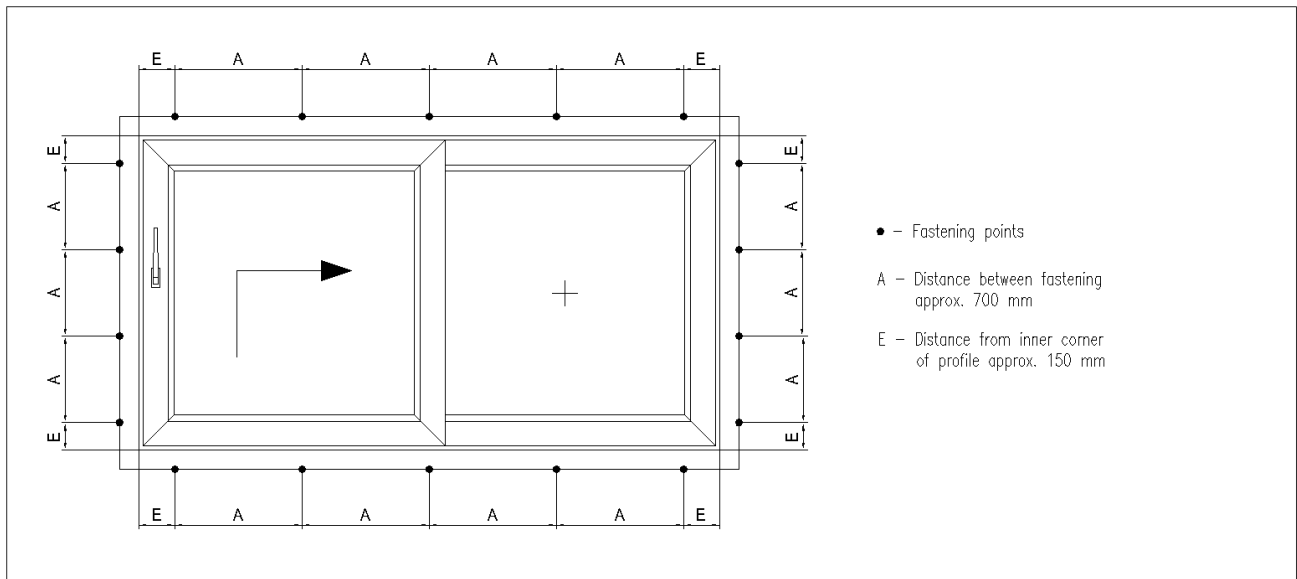
Failure to consider these factors may result in damages of the frame material (e.g. cracks in the corners) or failure of the fasteners.

Fastening

In order to ensure the performance capability of windows, doors and facades over a long period of time, all regular forces affecting the window must be transferred to the building.

The following forces occur:

- Wind load,
- Live load (also loads due to the user),
- Dead load.



Distances for the fastening of plastic windows

General information about the window fastening

- Drill correctly. Do not use a drill with hammer action (except in case of concrete).
- In case of masonry, drill into the mortar joint if possible.
- Consider the load capacity and the length of the dowels taking into account the wall construction and the manufacturer's instructions.
- Use screws, anchors, fixing brackets, installation systems etc. appropriate to the dowel system.
- Blow off the drill holes.
- The centre distances and the distances from the edge given by the dowel's manufacturer, depending on the building material, must be followed.
- Tighten screws equally and with regard to the frame without force (use drilling screwdriver and striking mechanisms with torque limiter).
- Aim to use a combination of block and fastening element.
- The use of nails including special types is not permitted.

Fasteners

The type of fasteners to be used will depend on the particular building. The fasteners must be appropriate for the masonry type. By all means the manufacturer's instructions are to be considered, according to figure 4, e.g.:

- given shearing loads,
- max. distance between frame and masonry
- maximum effective length d_a ,
- minimum anchor depth h_v ,
- dowel distance to edge,
- borehole diameter drilled d and borehole depth t_d ,
- dowel length l .

→ Dimensions for fastening -> ->

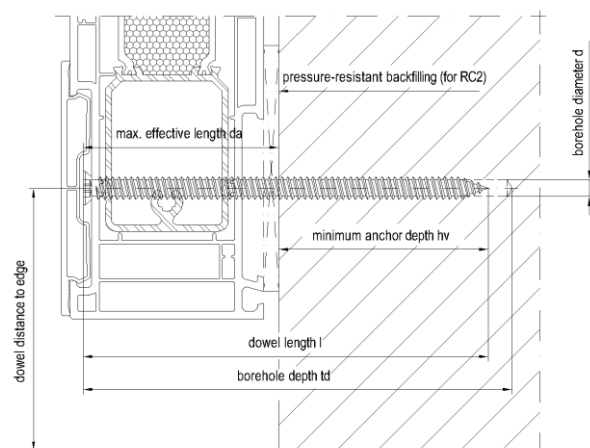


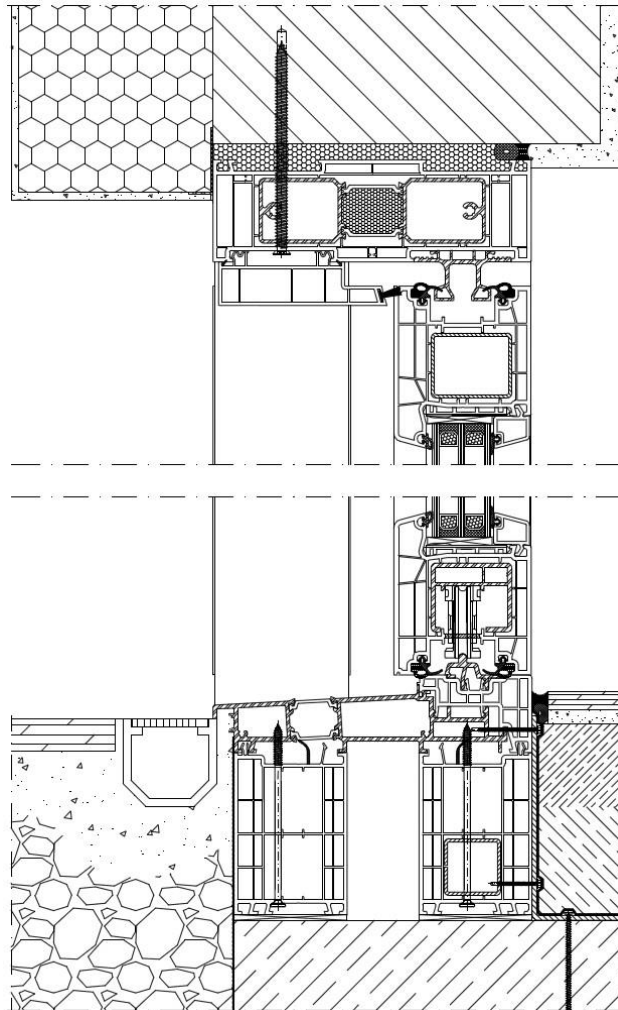
Figure 4

Note

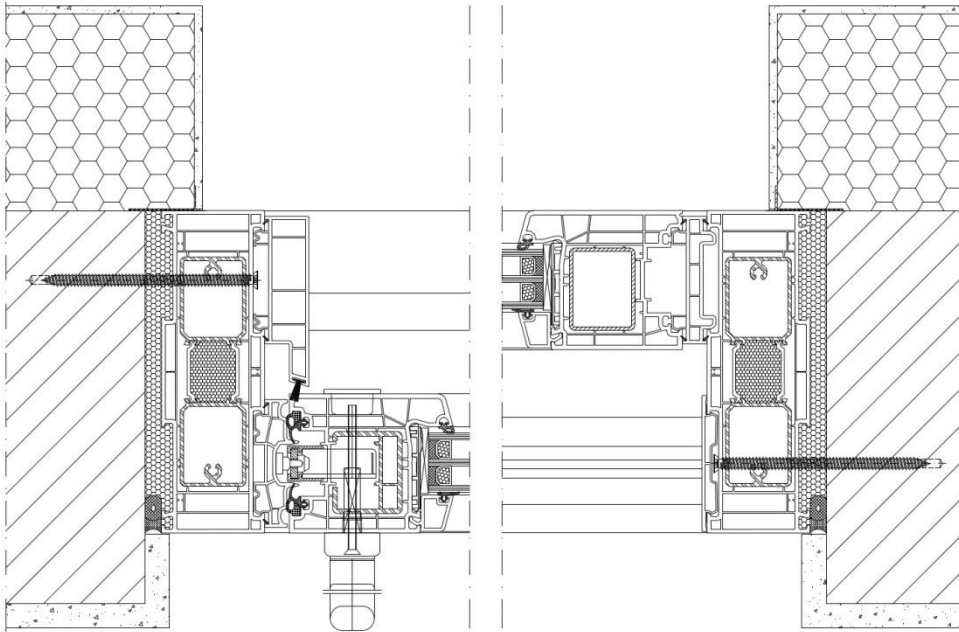
For the fastening of burglar-resistant lift-and-slide door elements, e.g. classes RC2 / RC2 N:

- ➔ The gap between wall and frame profile - under each fastening point - is to be filled with a pressure-resistant backfilling! (Distance between backfillings see page 15)

Vertical Section

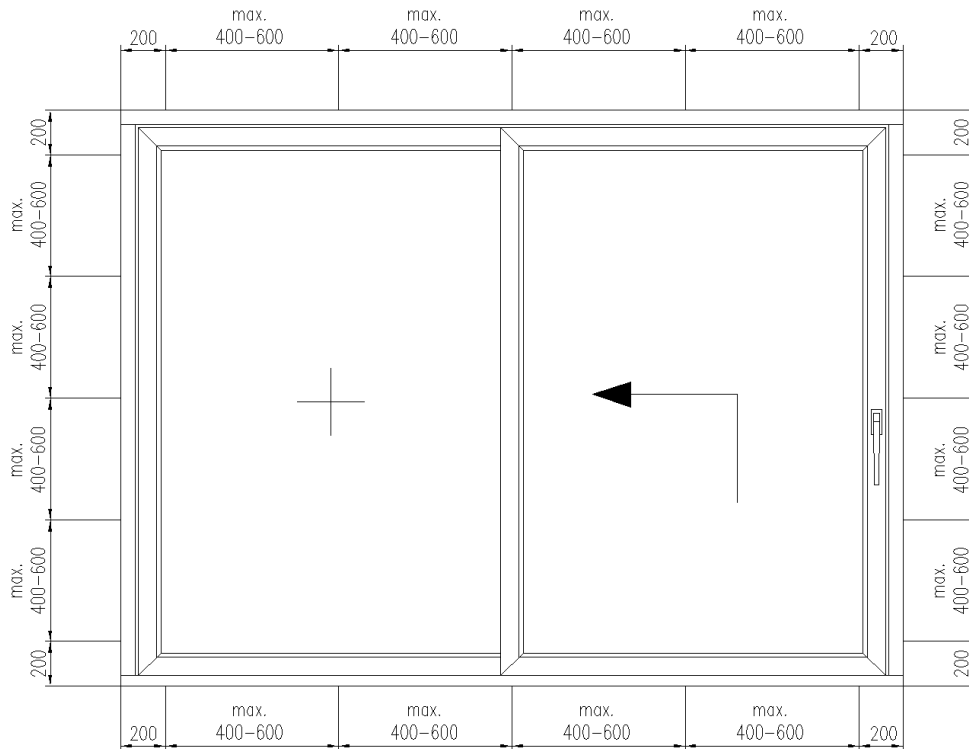


Horizontal Section



Additional information on the installation of burglar-resistant lift-and-slide doors

Maximum distance of fastening points



Connection to the wall

After inserting the dowels or screws, the space between frame and wall in the area of the locking and fastening points must be filled with pressure-resistant unplasticised PVC or hardwood.

Fastening

For the fastening of the frame, use special screws, e.g. BTI toptec spacer screws 7/11.5 or Würth Amo-3 screws Ø 7.5 for dowel-less fastening.

Alternative: Metal sleeve dowel (Ø 10 mm) with pressure-resistant backfilling!

- Max. distance between fastening points 400 - 600 mm
- Max. distance to edge 200 mm

Keep the rebate clearance (chamber dimension)!

Glazing

Windows of the resistance class RC 2 are to be glazed with glazing units according to DIN EN 356 P4A, with a glazing thickness of 30 mm and a maximum glass weight of 130 kg.

Surrounding walls

Requirements concerning the walls according to the following table:

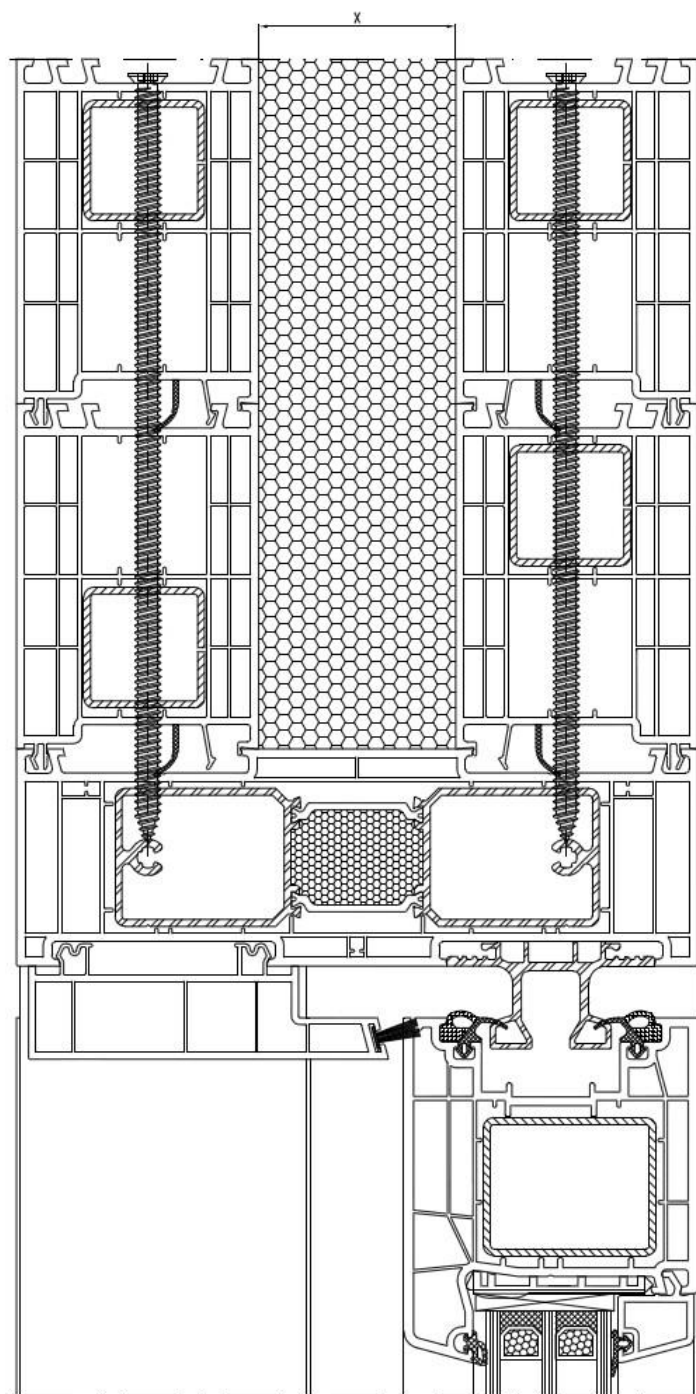
Resistance class of component according to DIN EN 1627	Walls						Glazing to be used according to DIN EN 356 (DIN 52290-3)		
	Masonry according to DIN 1053-1				Reinforced concrete according to		Data according to DIN	Glass thickness mm min.	Weight kg max.
	Wall thickness (without plaster) mm	Compressive strength class of bricks (DFK)	Bulk density class of bricks (RDK)	Mortar group	Nominal thickness mm min.	Strength class min.			
RC 1 N	≥ 115	≥ 12	-	min. MG II / DM	≥ 100	B 15	Standard window glass		
RC 2 N							P4A	≥ 24	≤ 130
RC 2									

Additional notes

- The lock cylinder must be flush with the keyhole cover.
- Dead bolts must completely enter the door lock openings. This must be ensured during installation.

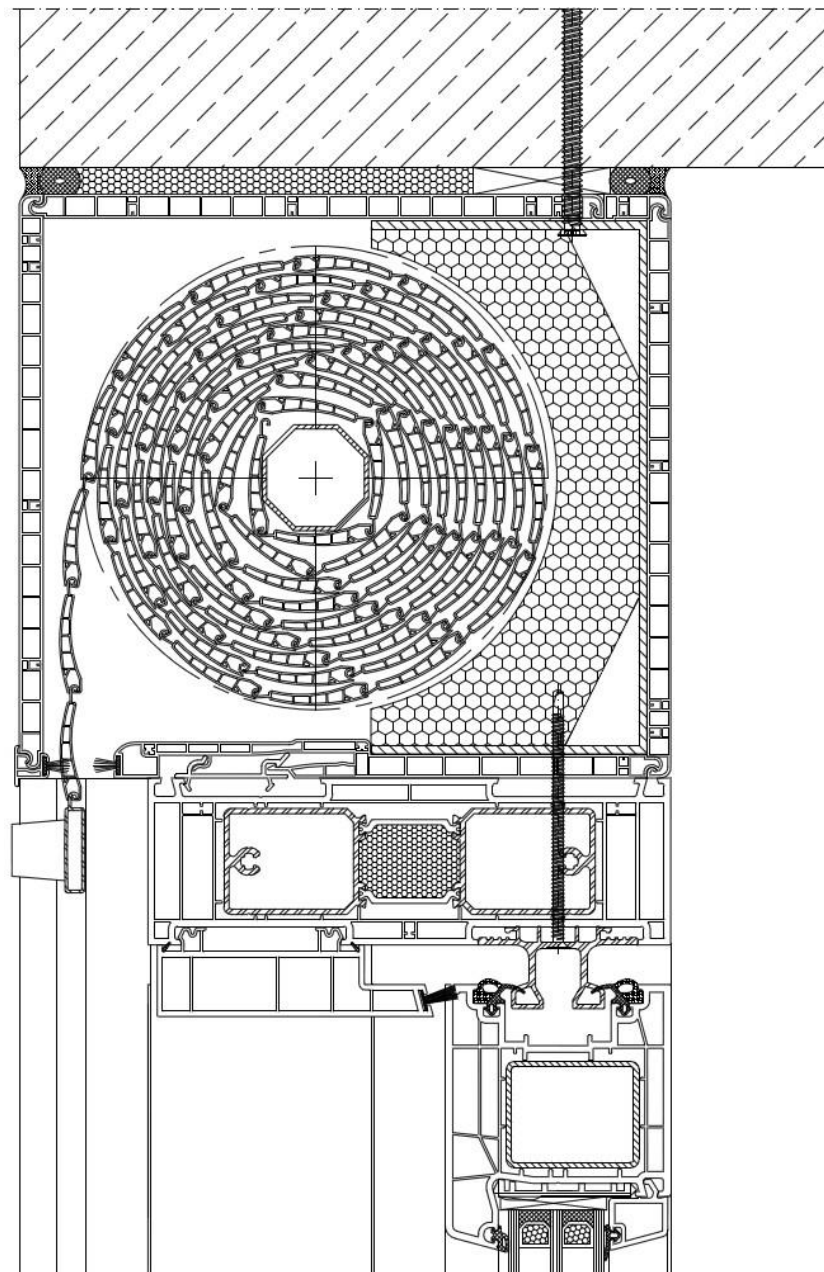
Fastening of extensions on the lift-and-slide door

If extensions are installed to connect the lift-and-slide door element with the wall, these extensions must be screwed together as shown in the figure below. Where necessary, they must be fastened to the wall with angles (see drawing on page 11).

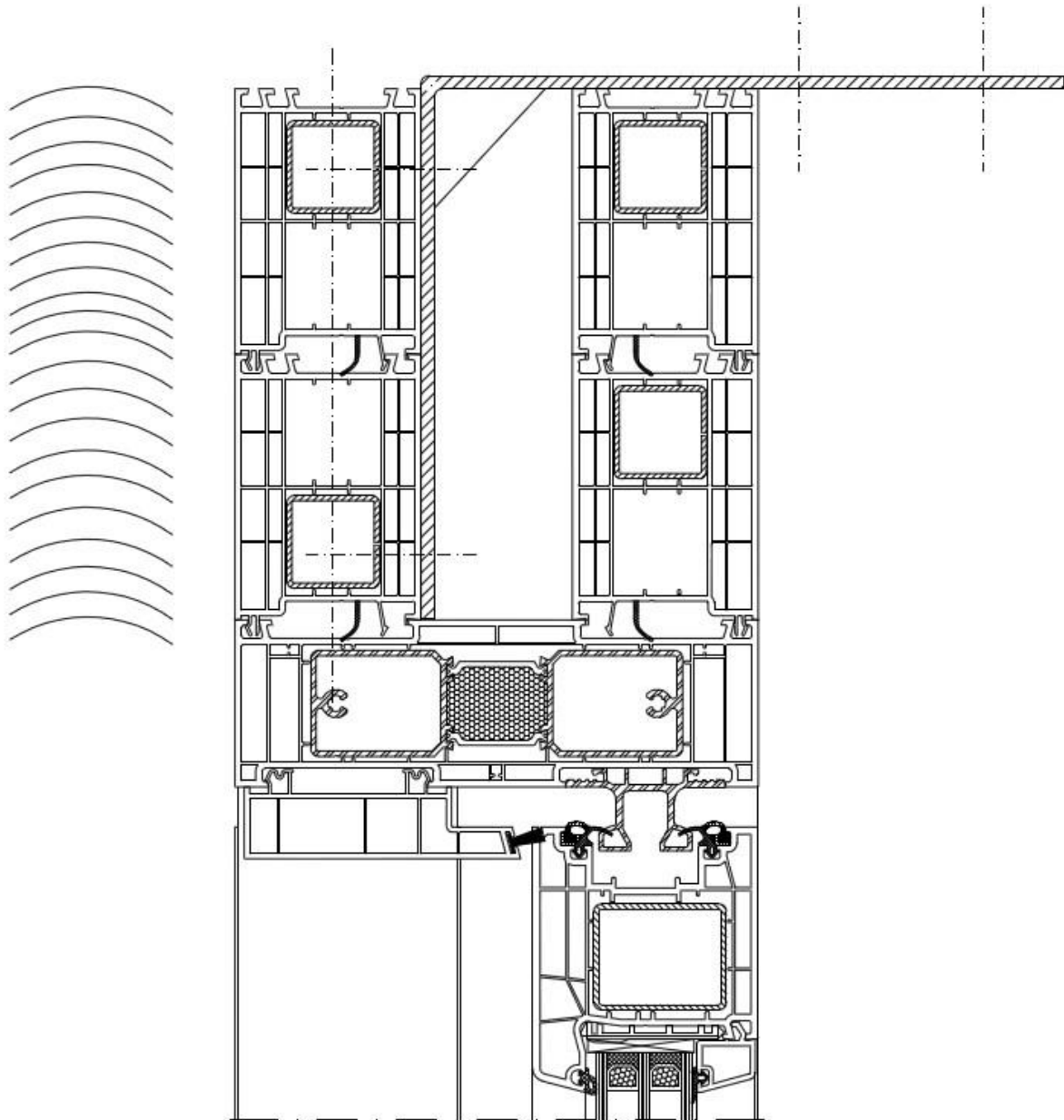


Upper fastening of the lift-and-slide door in combination with built-on roller shutter boxes or Venetian blinds

In the case of lift-and-slide doors with built-on roller shutter boxes or Venetian blinds, proper fastening to the upper wall must be ensured by all means. Usually, the manufacturer offers appropriate anchors for the fastening of the built-on roller shutter box to the upper reveal. Otherwise, the fastening to the upper reveal must be done with a console solution as shown in the drawing below. In this example, the occurring strains (wind load, live load, ...) are transferred from the element to the building. Depending on the structural dimensioning, one additional fastening of such a console in the centre is usually sufficient if the element can be fixed regularly in the remaining peripheral wall sides.



If Venetian blinds are to be installed in combination with extension packages attached to the upper frame profile, the fastening to the upper reveal can be done with e.g. angled plates for proper load transfer. The angled plates must be appropriately rigid to transfer the occurring loads. The extensions must be screwed to the frame profile, preferably through the steel reinforcement of the extension profile. In order to hide the unsightly angled plate, it can be inserted between the interior and exterior extensions as shown in the drawing below:



Joint sealing

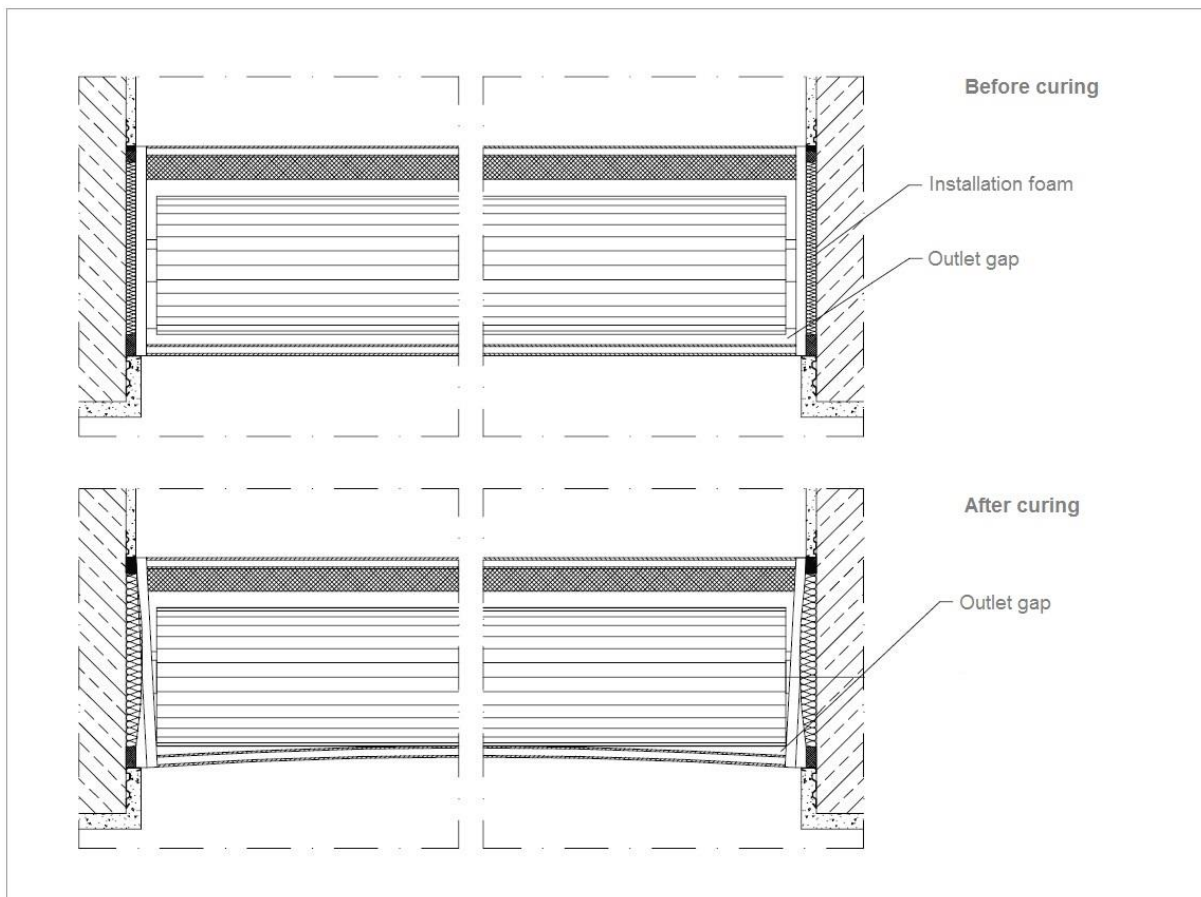
The following materials (among others) can be used for sealing:

- 1-component PUR foam
- 2-component PUR foam
- Glass wool,
- Stone wool,
- Sprayable cork,
- Sealing tapes.

Attention:

Pay attention that the sealing materials used stay dry during installation. Otherwise, they will not maintain their insulating function. PUR foams expand and establish more or less pressure during the curing. This pressure has to be absorbed by the window construction.

Open additional profiles in the window layer shall be closed to the room. This applies particularly to built-on roller shutter boxes on the side of the head end and in the area of the exterior cover plate. The curing and expanding PUR foam must not cause any deformations. Respect the manufacturer's instructions.



Cross-sectional drawing of insulation in the area of the roller shutter box

Formation of joints

The sealing has the functions to keep humidity away from the joint between window and wall. This includes both rain water from the outside and indoor air humidity.

The building joint has to:

- be windproof,
- sound-insulating,
- heat-insulating,

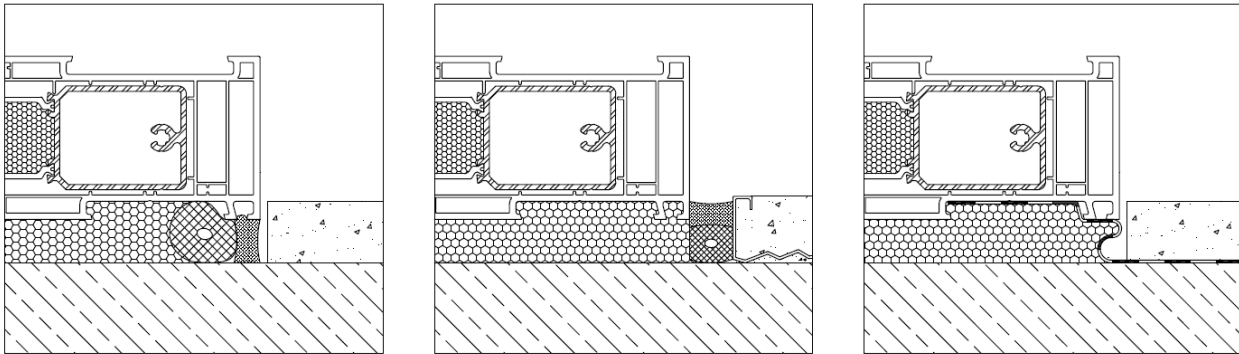
- take building movements and movements as a result of expansion and contraction,
- be non-ageing to avoid cracking and delamination.

A distinction is drawn between the

- Functional plane 1: The inner sealing separates room air conditions and the external climate.
- Functional plane 2: The fastening at the building structure and sound and heat insulation
- Functional plane 3: The outer sealing for the weather protection

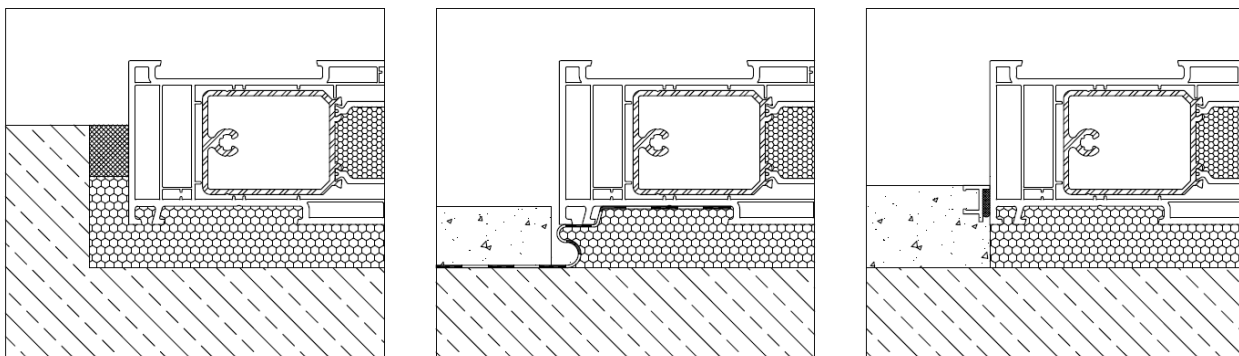
To the functional planes 1 and 3, the following principle applies: **Inside more leak-proof than outside!!!**

Examples for functional layer 1, inside:



The functional plane 3 must be permanently waterproof and driving-rain resistant; the functional plane 1 separates the inside air conditions from the outdoor climate. In the functional plane 2, the insulating materials have to be inserted in such a way that they are circumferentially closed. Use paste-like adhesives on surfaces that are not smooth.

Examples for functional plane 3, outside:

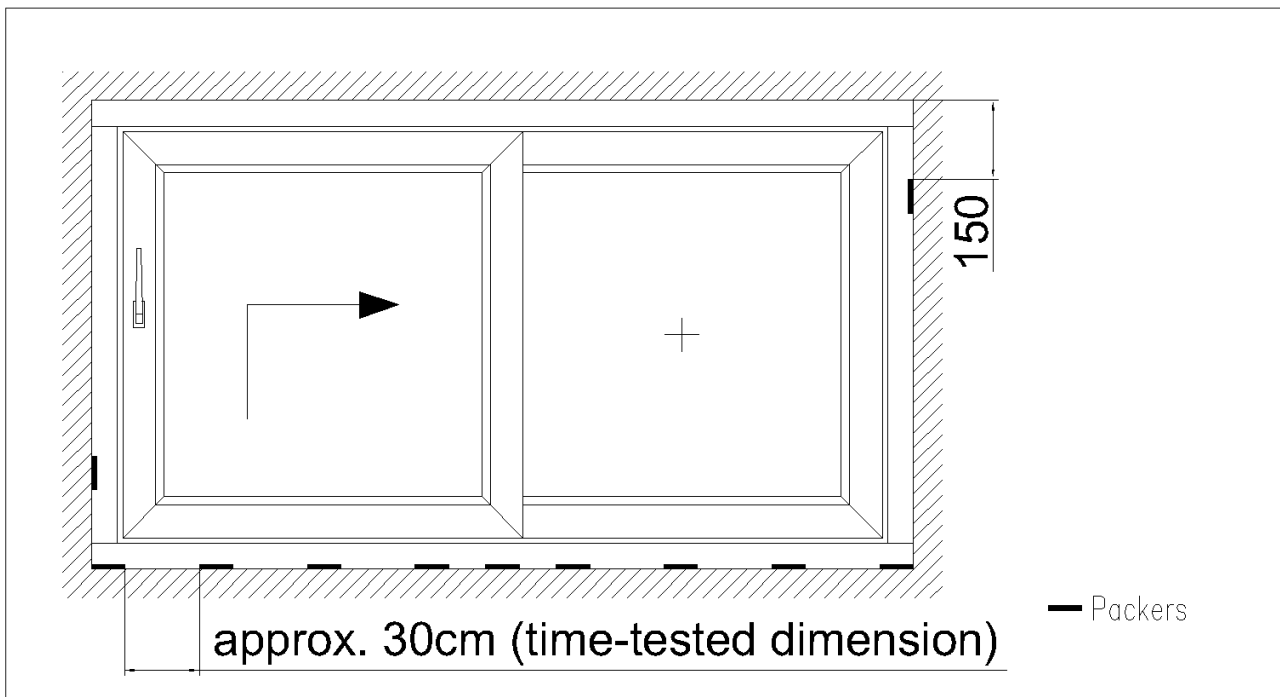


The choice of the sealing material is further determined by the connection to the wall. Selection criteria are the joint geometry and the material of the masonry. The manufacturer's instructions, e.g. the correct application of sprayable sealing compounds, are to be followed. This applies primarily to the surface moisture, the pressure resistance, the temperature, the material compatibility and the surface adhesion. According to the conditions, surfaces may have to be pre-treated with a primer.

Load transfer

Fastening must be done mechanically in order to guarantee the defined load transfer. The choice of the fasteners depends primarily on the occurring loads. These loads in turn depend on the geographical location, the building height, the terrain category, the given building situation and the system of the connection to the

wall. The fasteners absorb and transfer primarily the strains caused by wind load and live load. According to the state of the art in building technology, PUR foams, sprayable sealants and other sealing and insulating materials are not considered as fasteners.



Glazing blocks in the bottom part of the lift-and-slide doors

The following points are to be followed:

The packers have to consist of suitable materials (e.g. uPVC).

The position of the packers must not impair the expansion and contraction of the element to an inadmissible extent.

The packers must remain in the joint for permanent load transfer.

Elements that are installed in front of the masonry must be fastened with correspondingly rigid steel angles or corbels.

The key requirement is always the sufficient flexural rigidity of the frame profile.

The packers must not impair the subsequent works.

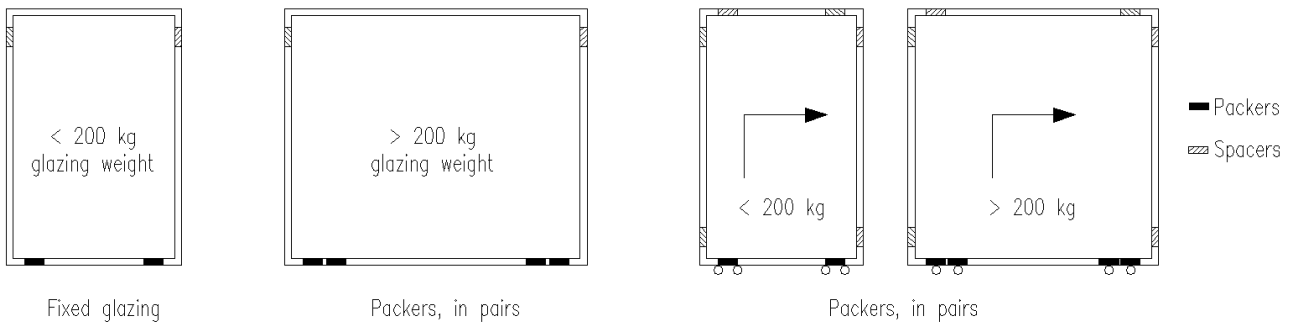
Note

For the fastening of burglar-resistant lift-and-slide door elements, e.g. classes RC2 / RC2 N:

- ➔ The gap between wall and frame profile – under each fastening point – is to be filled with pressure-resistant backfilling (information on distances on page 7)!
- ➔ Further information is also given in the corresponding test certificates.

Glazing / Glazing packers

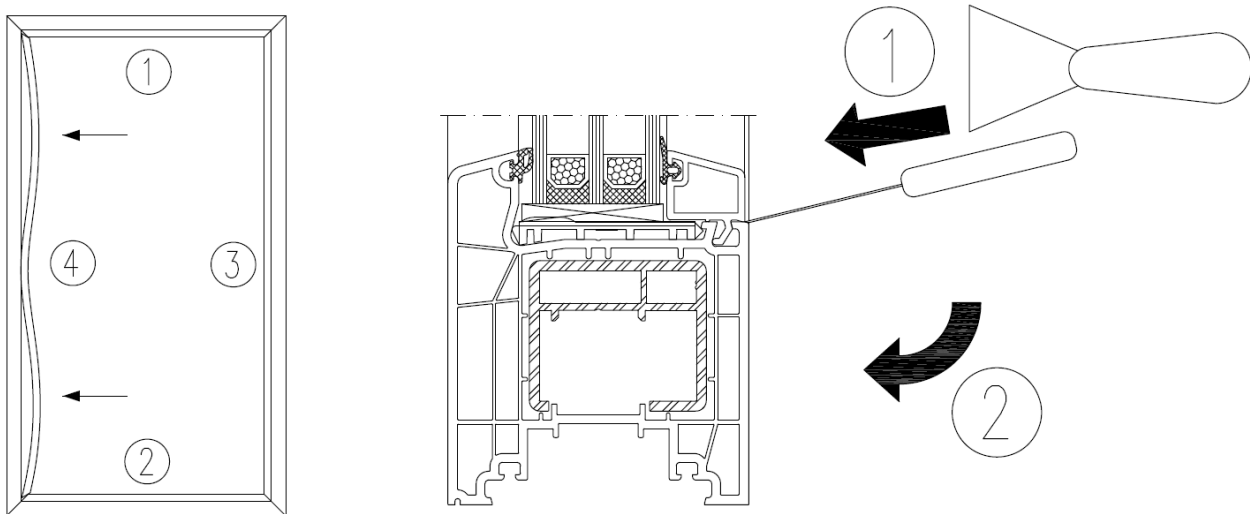
The position of the packers depends on whether it is a fixed sash or a sliding sash:



The maximum admissible weight of one glazing unit for lift-and-slide doors is 400 kg. Sashes with a weight of up to 200 kg require one packer of 100 mm length in each bottom corner (left and right). Elements heavier than 200 kg require two packers of 100 mm length side by side in each bottom corner (left and right). The bottom packers in sliding sashes are to be placed directly above the track rollers (in the case of double track rollers in centre between the two roller axes).

Mounting and demounting of the glazing beads

First of all, insert the upper glazing bead into the groove of the sash profile. After that, insert the bottom glazing bead. The next glazing bead (no. 3) is then inserted as shown in the drawing: First, press the corners (at the bottom and top) into the groove, then proceed to the centre (same as with no. 4). Finally, press the entire glazing bead profile into the groove. Glazing bead no. 4: Proceed as with glazing bead no. 3. Make sure that the mitred corners of the glazing beads are closed properly once the process is completed.

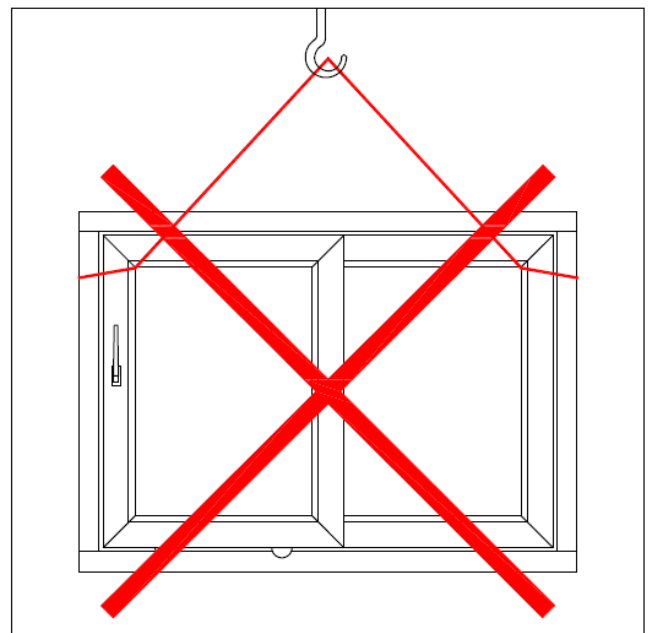
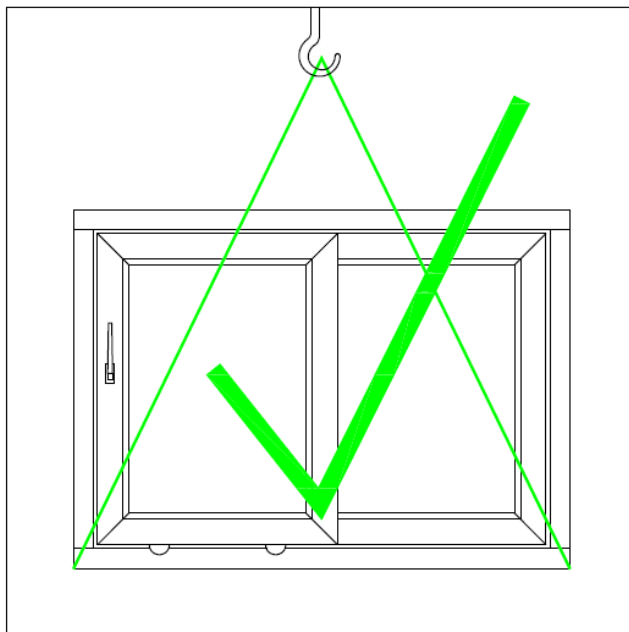


For demounting the glazing beads use a wide, thin yet rigid putty knife (special suitable tools are available in the glass and glazing trade); insert it in centre into the gap between glazing bead and sash. After that, press the putty knife carefully to the bottom in order to lever off the glazing bead. The glazing bead will partially slide off the groove. Proceed as described using the putty knife to lever off the glazing bead, continuing from the centre to the left and right side. Finally, the glazing bead can be removed easily. When demounting the glazing beads, proceed in reverse order to mounting, i.e. starting with the vertical glazing beads.

Transport and storage

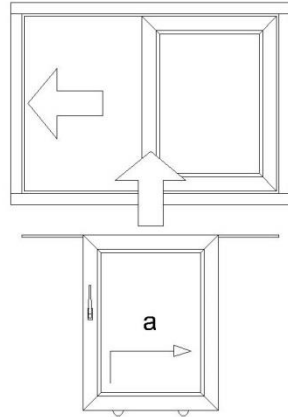
Along with the proper storage of the window elements on site, safe transportation is of great importance. Pay attention to the following:

- The window elements shall be transported and stored in an upright position.
- It must be guaranteed that the elements are in a safe position and securely fastened during transportation. They must not slide, collide, bend or change their position in any way.
- The elements shall be protected against soiling and damages.
- If several elements are to be transported, suitable spacers shall be used; the elements must not lean against each other.
- Protect the elements from direct sunlight; do not use transparent or black protective foils to cover the elements. If a protective foil is required, use a white one and provide sufficient ventilation holes in the foil to avoid excessive heat accumulation.
- In the event of a crane transport, use suitable hoisting slings. The hoisting slings must not be tied directly to the profile. Instead, use a sustainable base or beam on which the lift-and-slide door can rest during the transport.

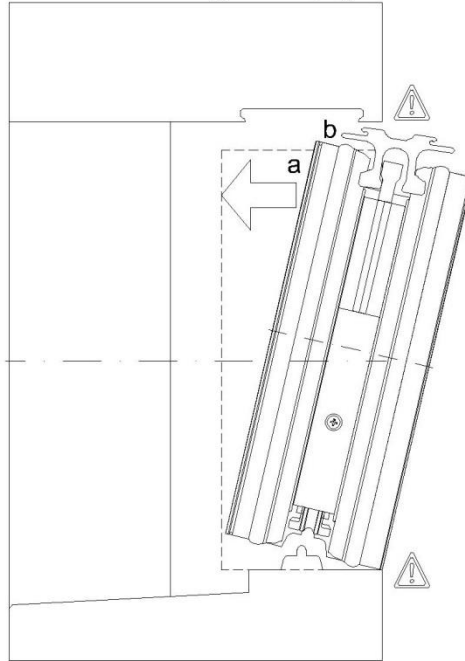


Mounting of the sliding sash in the lift-and-slide door

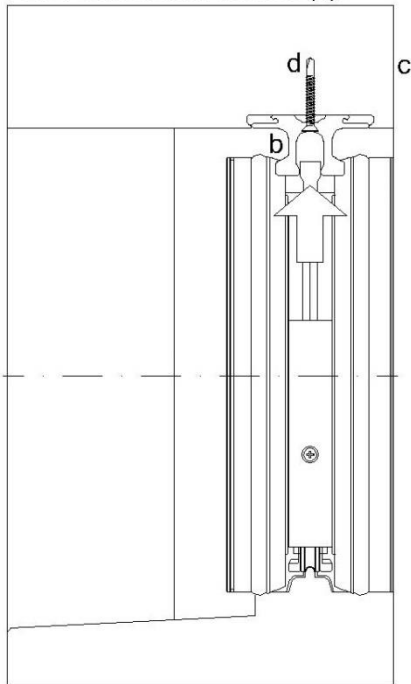
Mounting



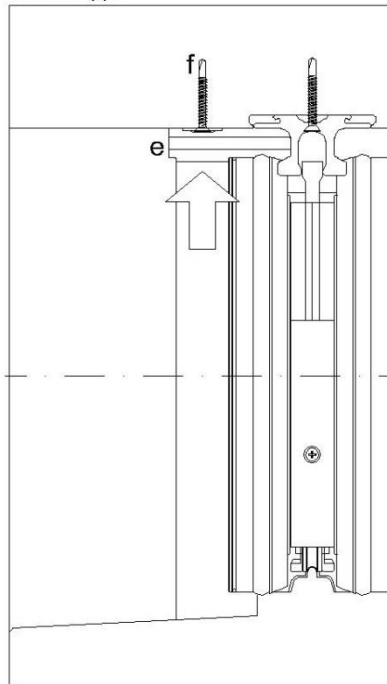
1. Position the tilted sliding sash (a) with the inserted guide rail (b), then set the sliding sash upright.



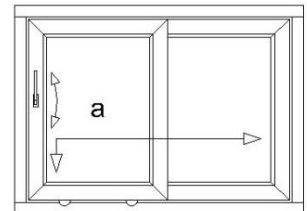
2. Position the guide rail (b) in the frame (c) and fix it with FD21 3.9x32mm screws (d).



3. Insert the gasket pad (e) laterally and fix it with a FD21 3.9x32mm screw (f).



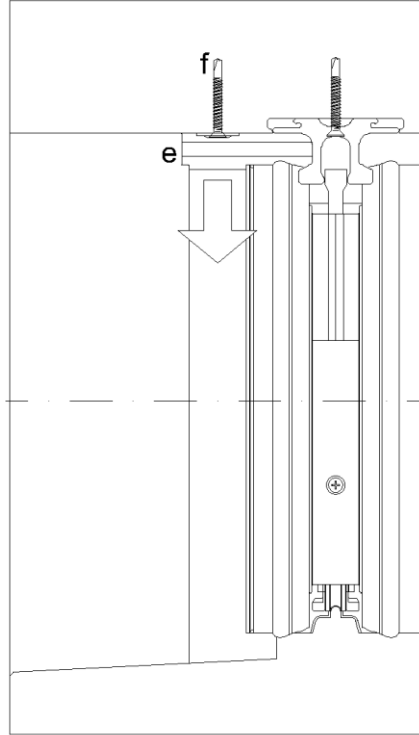
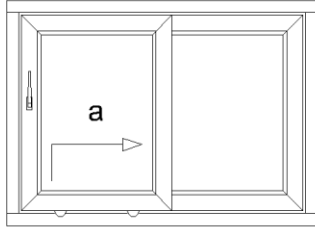
4. Check the sliding sash's (a) functionality.



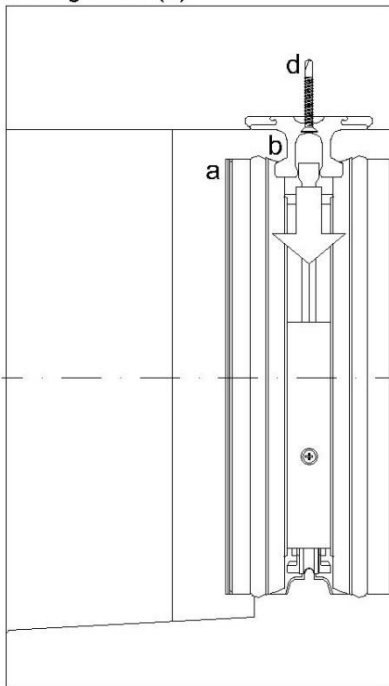
Dismounting of the sliding sash in the lift-and-slide door

Dismounting

1. Remove the screw (f) and the gasket pad (e) laterally.



2. Remove the screws (d); the guide rail (b) remains in the sliding sash (a).



3. Tilt the sliding sash (a) with the guide rail (b) and remove the sliding sash.

