BACKGROUND

Proper installation of door and window joinery is one of the most important contributors to long-lasting, trouble-free and convenient operation of doors and windows. It ensures correct transfer of operating loads from the doors and windows to the building structure, offset for the mutual deformations of the joinery and the building members, proper thermal insulation, and prevention of inconveniences to the user during operation of doors and windows. Installation of joinery in deviation from good construction practice may result in warping of the structural members of frames or casements, jamming of locking fixtures, or (in extreme circumstances), failure of the window.

Each installation of a window must conform to the building plans and specifications. If the building plans and specifications do not include any guidelines for installation of joinery, the essential installation guidance shall be this Installation Manual for the products from PPU OLA Sp. z o.o. This Manual was produced with the best knowledge of the state of the art, years of experience acquired by PPU OLA Sp. z o.o., and the guidelines for installation of windows and balcony doors developed by ITB (the Building Research Institute in Poland).

The windows installed in perimeter walls have the following functions:

1. Shelter the indoor space from the outdoor elements.
2. Provide thermal and sound insulation with air-tightening of the window openings.
3. Transfers the operating loads from the window casements to the building wall (ref. Fig. 1).

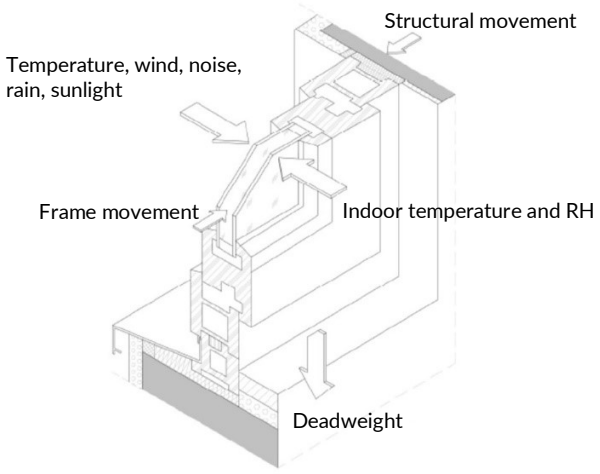

Fig. 1. Operating loads of a window

TRANSPORT AND STORAGE OF WINDOWS PRIOR TO INSTALLATION

Handle and store the windows in the intended installation orientation. Failure to comply may result in geometric deviations of the casements. The products in storage must be protected against damage, exposure to sunlight, rain, and snow. The storage location must be at least 1 m away from all heating appliances. Exposure of the products to sunlight or artificial heat sources is very likely to deform the protective film, which will absorb heat.

Before installing a window, verify that its dimensions fit the wall opening with a sufficient installation clearance (see Table 1 for the installation gaps). Prepare the installation materials which are compatible with the structure of the wall.

ALIGNMENT OF THE WINDOW WITHIN THE INSTALLATION OPENING

1. The window should be aligned in the installation opening as defined in the building plans and specifications. The location of the window in the reveal must prevent cold bridges, resulting in condensation on the inner side of the frame, on the reveal, or at the interface between the window and the wall.
2. If there are no building plans and specifications to guide how the window should be placed in the opening, follow these rules:

- For single walls without thermal insulation, align the window with the middle of the wall's width.
- For composite walls with an inner layer of thermal insulation (between the inner and outer wall structure, align the window within the thermal insulation layer.
- For walls with external thermal insulation, align the window flush with the outer face of the wall or within the thermal insulation layer.

3. Proper alignment of the window is retained with spacer and support blocks between the wall edges and the frame. The blocks are usually made of plastic, rigid EPS, XPS or hard XPS sills or beams, PVC expansion pieces, and the like.
4. The layout of spacer and support blocks is shown in Fig. 2.

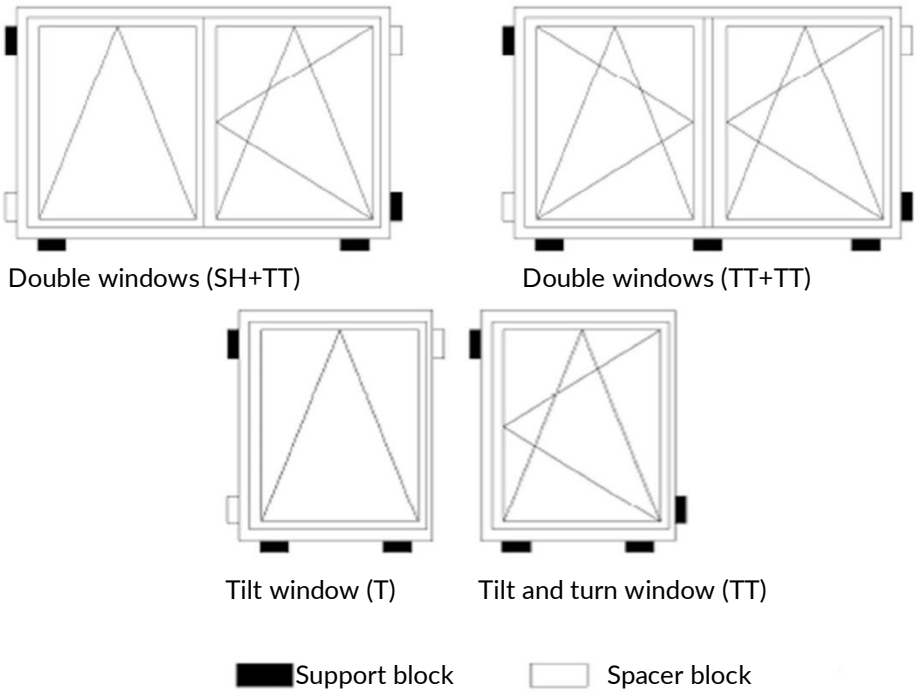

Fig. 2. Location of support and spacer blocks

5. Support and spacer blocks should be placed in an arrangement which prevents deformation of the window frame due to temperature, deadweight, and operating loads. The lower blocks should be aligned with the centre axes of the frame / post; otherwise, the bottom frame profile may sag significantly.
6. The spacer blocks should be removed with the window installed in the wall opening. The support blocks must never be removed.
7. The maximum deviation of the window from the vertical and horizontal alignment with the wall opening must not exceed 2 mm per 1 linear metre of the window frame.
8. The minimum installation gap sizes between the frame and the reveal are shown in the Table 1 below.

Profile type	Reveal w/o sideroom				Reveal w/sideroom		
	Component length (mm)						
Profile type	1500 max.	2500 max.	3500 max.	4500 max.	2500 max.	3500 max.	4500 max.
	Min. gap width (mm)				Min. gap width (mm)		
White PVC	10	15	20	25	10	10	15
Film-wrapped PVC (through-coloured)	15	20	25	30	10	15	20
Film-wrapped PVC	10	10	15	20	10	10	15
Aluminium w/thermal break, light colours	10	10	15	20	10	10	15
Aluminium w/thermal break, dark colours	10	15	20	25	10	10	15
The deformability of the caulk should be 25%							

Table 1. Minimum width of installation gaps between the frame and the reveal

9. The maximum size of the gap between the window frame and the reveal should not exceed 40 mm; when using single-component caulking foam, the maximum size is reduced to 30 mm.

FASTENING IN THE WALL OPENING

Before fastening the window to the opening, properly prepare the opening for the installation process. This depends on the planned installation method (for layered installation, it is important to have the reveal levelled with mortar or adhesive). The fastening of the window must be installed so that the external loads imposed on the window is transferred to the building structure via the fasteners (which may include anchors, plugs, bars, etc.). Proper fastening of the window retains its full performance, which means smooth opening and closing of the casement without rubbing against any parts. The fastening methods must not deform the window, bend the frame or the posts, etc.

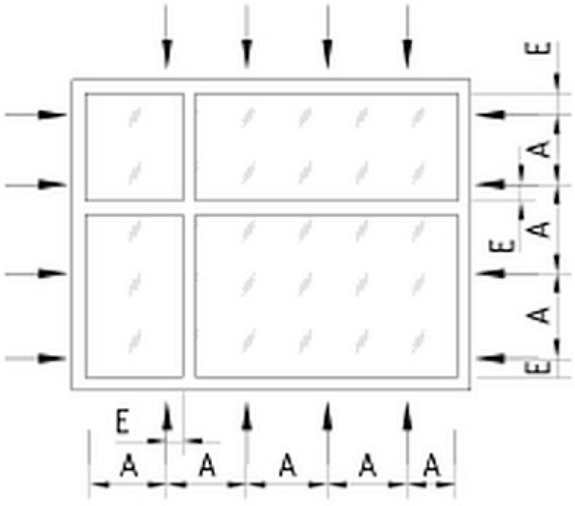

Fig. 3. Layout of fasteners

The fasteners of the window must be arranged along the frame sides with the maximum spacing which follows:

a. from the inner corner or post [E] 150-200 mm;
b. between each fastener [A] 500-700 mm.

The fastening of the window within the wall opening depends on the material(s) of the wall and the fasteners, which may include anchors, bars, bolts, or brackets:

1. Bars are used in concrete, solid bricks, silicate blocks, circular-hole blocks, ceramic or cement hollow units, aerated concrete, and natural rock.
2. Bolts are used in concrete, solid bricks, silicate blocks, circular-hole blocks, lightweight concrete, and wood.
3. Anchors are used whenever the gap between the frame and the reveal is too great to install bars. The anchors should be made of galvanized steel sheet at least 1.5 mm thick. Each anchor should be bolted to the frame with screws.
4. Profiled windows (arched, trapezoid, triangular, etc.) should be fastened only with bars or cutting thread bolts. No anchors should be used in this case.
5. Polyurethane caulking foam and thermal insulation materials are not proper fasteners; they only provide air seal and thermal insulation between the frame and the wall.

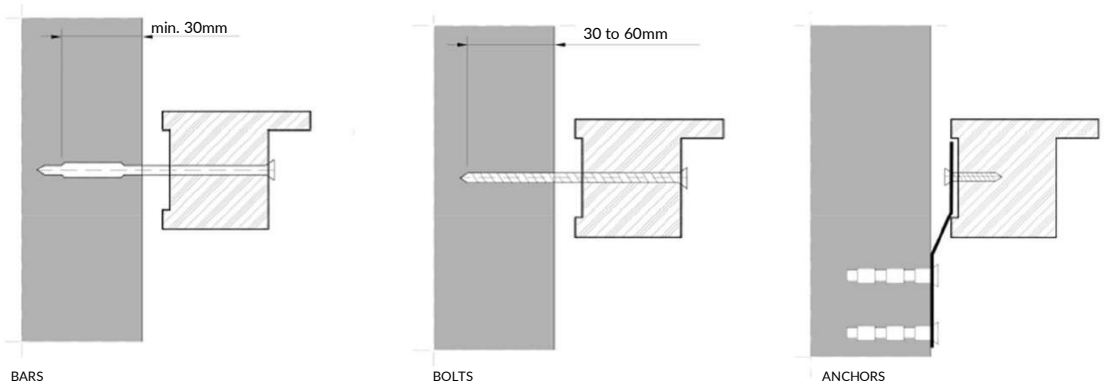

Fig. 4. Examples of window fastening

Once installed, the thermal insulation must be preserved against water and UV light by coating with render or fascias. Having installed the window, immediately remove all protective film and tape, clean the window of all dirt from the installation process, and install the handles and cover plates. The factory-applied protective film must be removed from the profiles in 3 months after installation.

INSTALLATION OF WINDOWS WITH BREATHING AND VAPOUR-PROOF MEMBRANES: SEALED INSTALLATION

The easiest and most popular installation method is to set them flush with the fall face, using PU caulking foam, breathing membrane tapes and vapour-proof membrane tapes. Sealing made with butyl tapes requires their attachment to the window frame profiles.

The step-by-step sealed installation process is as follows:

1. Secure the window within the wall opening with proper fasteners. Here, the fastening is not unlike in the traditional installation process.
2. Seal the gaps between the reveal and the window frame with caulking foam or another suitable thermal insulation material.
3. Apply the tape to the reveal to cover the caulking foam seam all around the window. The rule of thumb for this step is to “seal more on the inside than on the outside”. Cover the inner fasteners with vapour-proof membrane tape.

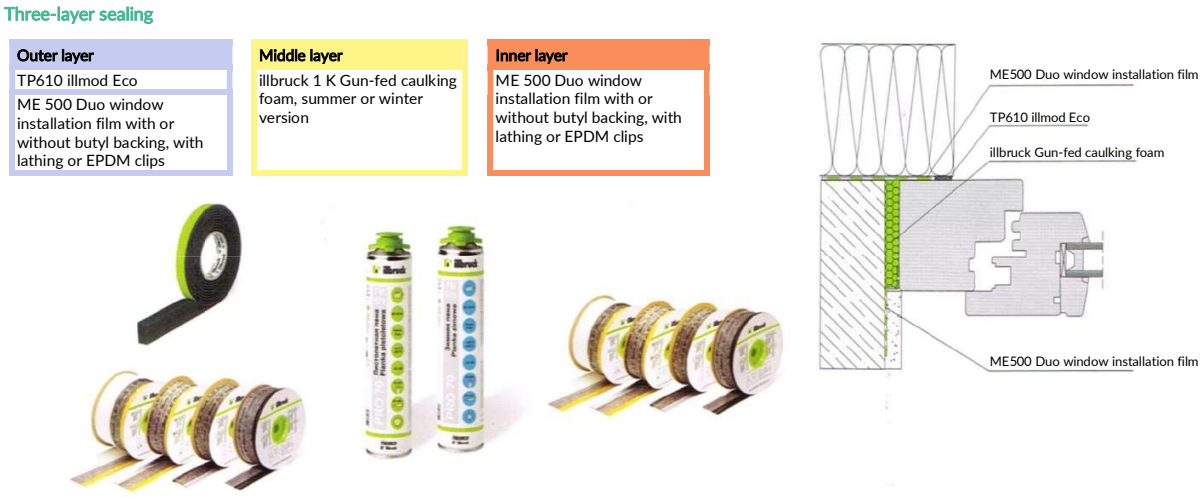

Fig. 5. Three-layer sealing of the window set in the window opening, flush with the reveal and complete with breathable and vapour-proof membrane tape

OPTIONAL INSTALLATION METHODS

Installation of the window within the thermal insulation layer

There are two stages of window installation within the thermal insulation layer, not unlike in other installation methods. The first stage is to properly align the window assembly, fasten it to the wall and support the window assembly to transfer the load to the building structure. The second stage is to install thermal insulation seal around the window frame, followed by preservation of the thermal insulation against weather or environmental factors which accelerate ageing (and degradation). Here, the window is fastened to the wall with brackets (example brand: KNELSEN). The consoles should be selected individually for each installation project.

MOWO installation of the window within the thermal insulation layer

A version of installation within the thermal insulation layer is the MOWO system by ILLBRUCK. This is the first tested and proven system to have the ift Rosenheim certification issued. This system includes fasteners and sealing of the window-to-wall interface within the thermal insulation layer of the wall. The MOWO system is an attempt at standardisation of the installation of windows within thermal insulation layers, providing a solution both for fastening and thermal insulation. This solution does not require any caulking foam, which must be immediately preserved against water and UV light once applied. The MOWO system does not require dedicated installation brackets, while the installation frame for bay windows is a natural extension of the reveal. The MOWO installation profiles are levelled during the installation process, so the fitter can always compensate for the irregularities caused by rough window opening surfaces.

The manufacturer of the windows shall not be liable for improper installation.
Always comply with the prevailing health and safety regulations when installing windows.
Improper installation of joinery may result in its detachment and fall, which can be a hazard of injury or death.