Technical Manual

University of Iowa
Architect: Steven Holl
Photo: Jerry Swanson Architectural Photography

Pilkington **Profilit**™
Profiled glass with system

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NSG Group Flat Glass Business

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Contents

Product CD for Architects and Construction Engineers

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Chapter 1

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1. Pilkington Schmelz/Saar, GERMANY

1.1. Location

1.1.1. Our factory in Schmelz/Saar, Germany

figure 1-1: Our factory in Schmelz/Saar, Germany

The manufacturer reserves the right to change or discontinue any specification or products without notification. All goods are subject to availability.

This publication provides only a general description of the product.
Further, more detailed information may be obtained from your local Pilkington Building Products supplier. It is the responsibility of the user to ensure that the use of this product is appropriate for any particular application and that such use complies with all relevant legislation, standards, code of practice and other requirements. To the fullest extent permitted by applicable laws, the companies of NSG Group disclaim all liability for any error in or omission from this publication and for all consequences of relying on it.

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1.2. References

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Chapter 2

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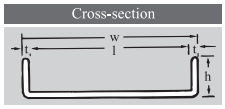
2. Product range, packing, storage, physical and chemical data, test certificates, fire rating

2.1. Pilkington Profilit™ profiled glass, normal and special profiles

2.1.1. Delivery program, dimensions, cross sections

Physical characteristics and dimensions

Cross-section



Tolerances: w ± 2.0 mm
t ± 0.2 mm
h ± 1.0 mm
Cutting tolerances of ± 3 mm are allowed.

The Pilkington **Profilit™** product range comprises 4 standard profiles (K 22(*), K 25, K 32, K 50) and 3 special profiles (K 22/60/7, K 25/60/7, K 32/60/7).
Both standard (NP) and special profiles (SP) are also available with longitudinal wires.
The range of profile options available in terms of width, flange height and glass thickness means that almost all glazing requirements are catered for.

- In addition to the maximum lengths indicated, all other lengths in multiples of 25 cm starting from 100 cm can be supplied. Fixed dimension lengths are possible on request.
- Research has shown that interiors fitted with ornamented glass rather than plain glass enjoy significantly enhanced light capture.

	Pilkington **Profilit™** types[1]	K 22(*)	K 25	K 32	K 50	K22/60/7	K25/60/7	K32/60/7
Dimensions	Designation as per DIN 1249 / EN 572 Part 7	A(*)	C	E	G	B	D	F
	Width w (mm)	232	262	331	498	232	262	331
	Flange height h (mm)	41	41	41	41	60	60	60
	Glass thickness t (mm)	6	6	6	6	7	7	7
	Weight (single-glazing) kg/m²	19,5	19,0	18,2	17,0	25,5	24,5	22,5
Pilkington **Profilit™** with wire	Max. length supplied mm (not max. installation length)	6000	6000	6000	5000	7000	7000	7000
	Number of longitudinal wires	7(*)	8	10	16(*)	7	8	10
	With 16 longitudinal wires (meshing function)	-	16	-	-	-	16	-
Pilkington **Profilit™** functional glass	For facades**	-	-	-	-	-	8+2*	-
	Heat insulating glass ‘plus 1.7’	-	S	S	S	S	S	S
	Heat insulating glass ‘plus 1.7 wired’	-	S	S	-	-	S	S
	Sun-protection glass ‘Antisol’	-	S	S	S	S	S	-
	Sun-protection glass ‘Antisol wired’	-	S	S	-	-	S	-
Pilkington **Profilit™** colours / ornamentation	Amethyst	-	S	S	-	-	S	-
	Amethyst wired	-	S	-	-	-	S	-
	Pilkington **Profilit™** clear (without ornamentation)	-	S(*)	-	S(*)	-	S(*)	-
	Pilkington **Profilit™** clear wired (without ornamentation)	-	S	-	-	-	-	-
	Light permeability in % (mean value)	SG: 86%				DG: 75%		
	Heat transmission coefficient U_G (W/m² x K)	SG: 5,6	DG: 2,8			SG: 5,52	DG: 2,7	as A-G
	Sound insulation value R_W from 100-3200 Hz	SG: 22 dB	DG: 38 dB***			SG: 25 dB	DG: 41 dB***	as A-G

*) One wire per flange **) For Pilkington **Profilit™** facades, consult our technical applications department prior to usage
***) Glass installation using Pilkington **Profilit™** gaskets nos. 165 and 166

Pilkington **Profilit™** thermally toughened	Pilkington **Profilit™** T and Pilkington **Profilit™** T Color thermally toughened profiled glass with or without heat soak-test upon request. The supply lengths and maximum installation lengths provided in this document do not apply for Pilkington **Profilit™** T and Pilkington **Profilit™** T Color.

For the application of Pilkington Profilit™ the relevant national and international requirements and standards have to be considered in the various countries.
We would be pleased to examine the possibility of supplying any product combination not mentioned above upon request.

Note: e.g. K 22 = 36 dB without padding, 38 dB with padding = R_W.
Heat transmission coefficient U_G: W/m² x K; amount of heat that passes through a unit area of 1 m² of a material of a unit thickness S within one hour for a unit temperature difference to adjacent room or outside air of 1 K (°C).
1 = Pilkington **Profilit™** profile-type glazing glass (standard production) / SG = single glazing / DG = double glazing
S = special production - for production-related reasons these products are only manufactured on a per-order basis and are not kept in stock.
(*) = sale from stock providing there are sufficient stocks available or from next production run

table 2-1: Delivery program, dimensions, cross section

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2.1.2. Packing / Storage / Handling

2.1.2.1. Packing

Standard profiles (e.g. K25/41/6) will be packaged in packs of 20 pieces and special profiles (e.g. K25/60/7) in packs of 14 pieces with plastic strips to form packs.

2.1.2.2. Storage / handling

When storing glass packs, please note the following:

- Padding (styrofoam) should be inserted between the individual layers of glass (preferably 40 or 80 mm thick polyurethane panels PG 20). This packing should cover 2/3 of the bearing surface between the individual glass packs. The packing should be staggered to provide a bond. Rigid expanded polyurethane panels will be used for transportation.

- For safety reasons, it is recommended that the number of layers stated below should not be exceeded:
  Pilkington **Profilit™** K22, K25, K22/60/7, K25/60/7 - 6 layers stacked
  Pilkington **Profilit™** K32/60/7 - 5 layers stacked
  Pilkington **Profilit™** K50 - 4 layers stacked

- Glass packs to be stored stacked in stepped form.

System sketch

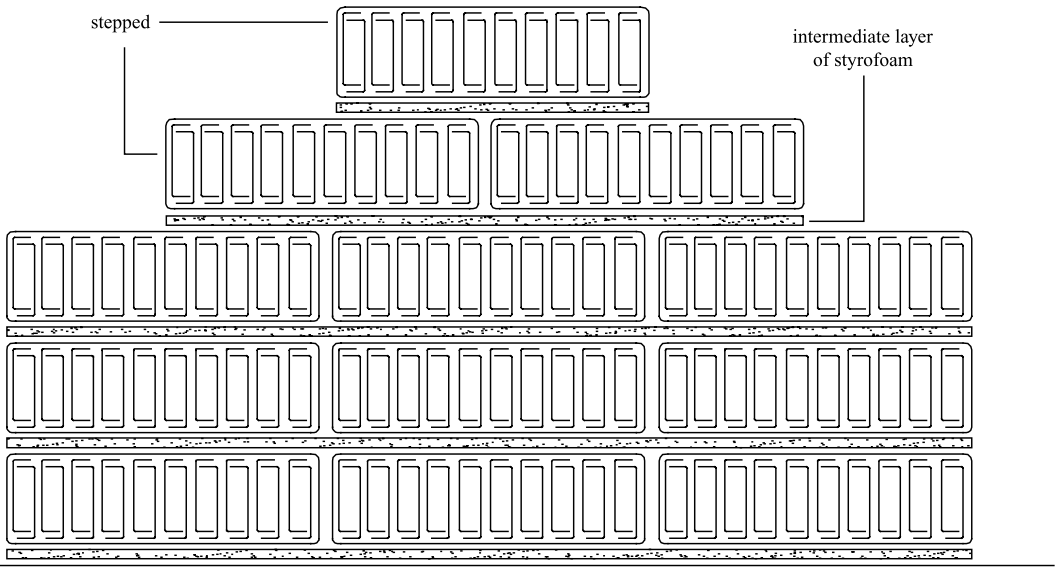

*figure 2-1: Storage of Pilkington **Profilit™** profiled glass for building – side view of stack*

- Check bearing capacity of floor first.
  The loading per linear metre of a layer of several packs next to each other per m² of floor area of glass packs is as follows:

Loading per linear metre of one layer of several packs per m² of floor area (glass storage area)	
Glass type Pilkington Profilit™	**Specific loading per m² in kg**
K22, K25	170
K32	205
K50	285
K22/60/7, K25/60/7	175
K32/60/7	210

table 2-2: Loading

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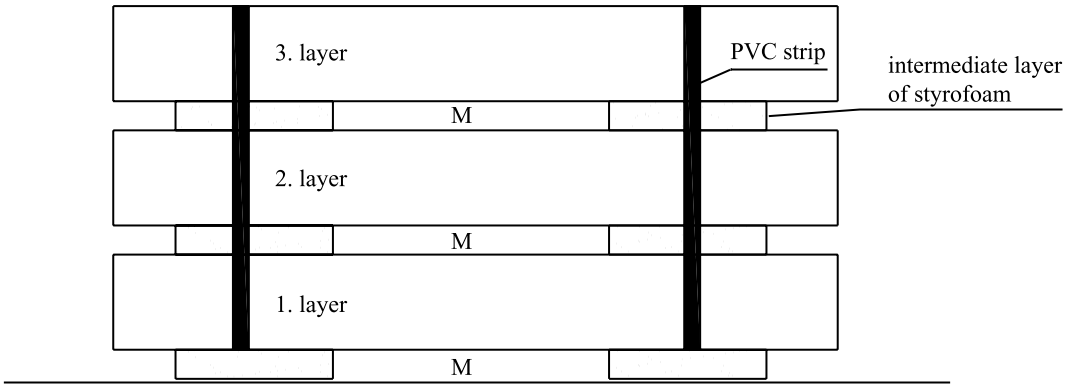
With these unit weights, in addition to the above lists, there is a further limit on stackable layers due to the bearing capacity of the storage area concerned.

The higher the stack, the wider the free-standing stack must be.

For handling the glass packs, a fork-lift should be used suspended from the loading hook of a hoist. (The fork-lift should bear a test symbol). The fork-lift should be positioned absolutely centrally.

Handling is also possible with stacker hoists.

As with a fork-lift, the bearing surface of the fork should be coated with a soft protective material (e.g. rubber or felt) to prevent damage to the glass.



Storage of Profilit™ profiled glass - side view of stack
2/3 of the storage surface is of styrofoam
Leave centre (M) free for lifting equipment

*figure 2-2: Storage of **Profilit™** profiled glass*

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2.1.3. Physical properties

Physical value		**standard profile**		**special profile**	
	Pilkington **Profilit™**	K22, K25, K32, K50		K22/60/7, K25/60/7, K32/60/7	
		single glazing	double glazing	single glazing	double glazing
Light transmission (average value)* as % - without coating	Pilkington **Profilit™**	84-88	74-76	84-88	74-76
Light transmission (average value)* as % - with coating as heat insulation glass Pilkington **Profilit™** 'Plus 1.7'	Pilkington **Profilit™** 'Plus 1.7'		67-73		67-73
Light transmission (average value)* as % - with coating as sun protection glass 'Antisol'	Pilkington **Profilit™** 'Antisol'		41-45		41-45
Light transmission (average value)* as % - with coatings as sun and heat protection glass	Pilkington **Profilit™** 'Antisol', 'Plus 1.7'		39-43		39-43
Sound insulation index $R_{w,P}$ of 100 to 3200 Hz - vertical installation	Pilkington **Profilit™**	22 dB to 29 dB***	38 dB** 36 dB without pad	25 dB	41 dB** 40 dB without pad
Heat transmission coefficient of Pilkington **Profilit™** glazing U_g = W/(m² * K) - no coating	Pilkington **Profilit™**	5,60	2,80	5,52	2,70
U_g =W/(m² x K) - with coating - as sun protection glass (as outer shell)	Pilkington **Profilit™** 'Antisol'	5,60	2,80	5,52	2,70
U_g =W/(m² * K) - with coating - as heat insulation glass (as outer shell)	Pilkington **Profilit™** 'Plus 1.7'		1,80		1,80
U_g =W/(m² * K) - with coating - as heat insulation glass (as inner shell) and sun protection glass (as outer shell)	Pilkington **Profilit™** 'Plus 1.7', 'Antisol'		1,80		1,80

table 2-3: Physical properties

* Examinations showed that glass with ornamentation provides a more homogenous spreading of the light in the room than a glass without ornamentation

** When using padding profiles N° 165 and 166

*** With additional sealing of alu-frame

Note: Pilkington **Profilit™** T and Pilkington **Profilit™** T Color thermally toughened profiled glass with or without Heat-Soak-Test: please refer to chapter 11.

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Possible combinations for standard and special profiles

	Standard glazing	Heat protection glazing	Sun protection glass	Sun and heat protection glazing
	Arrangement of glass types			
Total radiation transmission g (as %)	**Inner shell:** uncoated **Outer shell:** uncoated	**Inner shell:** 'Plus 1.7' **Outer shell:** uncoated	**Inner shell:** uncoated **Outer shell:** 'Antisol'	**Inner shell:** 'Plus 1.7' **Outer shell:** 'Antisol'
g-value	68	63	49	45

table 2-4: Possible combinations for standard and special profiles

Pilkington Profilit™ Sound insulation in accordance with DIN 4109 - 1989 Edition

Type of fitting	Sound insulation index R_w in dB in Laboratory test on Pilkington Profilit™	Sound insulation class	Sound insulation index R_w in dB of glass wall functionally installed in a structure	Required sound insulation index R_w according to DIN 52210 part 2 on test bench in dB
I. Pilkington Profilit™ standard profile K25, K32, K50 - double shell fitting				
without pad*	36	0	up to 24	≥ 32
with pad*	38	1	25 to 29	≥ 37
		2	30 to 34	
		3	35 to 39	
Pilkington Profilit™ standard profile K22 - double shell fitting				
without pad*	36	3	35 to 39	≥ 37
with pad*	38	3	35 to 39	≥ 37
II. Pilkington Profilit™ special profile K22/60/7, K25/60/7 - double shell fitting				
without pad*	40	3	35 to 39	≥ 37
with pad*	41	3	35 to 39	≥ 37
		4	40 to 44	
		5	45 to 49	
III. Pilkington Profilit™ standard profile K25 and special profile K25/60/7 - triple shell fitting (2 x K25 + K25/60/7)				
with pad	55	6	> 50	≥ 52

table 2-5: Sound protection in accordance with DIN 4109

* Pad N° 165 + 166

Sound velocity:

the sound velocity in the glass is 5,200 m/sec

Sound insulation:

Sound insulation is the resistance of a component to the transition of sound waves. The degree of sound insulation is expressed in dB (= decibels). An increase of 10 dB corresponds to the sound insulation being doubled.

Overview of dB values:

$R_{w,P}$ Sound insulation index on test bench
$R_{w,R}$ Sound insulation index, characteristics values with correction value

The following values apply:

$R_{w,R} = R_{w,P}$ - 5 dB for doors
$R_{w,R} = R_{w,P}$ - 2 dB for windows

also for rows of Pilkington **Profilit™** windows

$R_{w,B}$ Sound insulation index in buildings
$R_{w,Res}$ Resultant sound insulation with sound transition through adjacent components

Loudness scale

Noise level:

30 - 65 phon, mental reaction
65 - 90 phon, physiological reaction
90 - 120 phon, damage to hearing
Over 120 phon, damage to tissues

phon value	**Type of noise:**
0	Hearing threshold
10	Light rustling of paper
20	Whisper
30	Quiet residential street
40	Low radio noise
50	Street with very low traffic noise
60	Radio at room loudness level
70	Loud conversation, typewriter noise
80	Mechanical accounting
90	Road with loud traffic noise
100	Motorcycle without silencer 7 m away
110	Boilermaker works
120	Aircraft propeller 5 m away, engine test bench
130	Pain threshold

Pilkington **Profilit™** glazing affords, as the table shows, **exceptional sound insulation properties**, especially with double-shell glazing. These can if necessary be further improved by multiple layer glazing. The cost-effectiveness of Pilkington **Profilit™** glazing is thus also reflected in cuts in heating costs due to the **exceptional heat insulation**. These values are even good in comparison with conventional glass.

The **sound insulation properties** of Pilkington **Profilit™** glazing also meet present-day requirements to combat noise, especially when fitted in double-shell form.

Pilkington **Profilit™** thus makes an important contribution to modern construction in terms of **light permeability**, **sound and heat insulation**.

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Light transmission / Light diffusion

Profiled glass enables large-scale glazing combined with a cost-effectiveness unmatched by other types of glazing. In addition, the figured surface of Pilkington **Profilit™** diffuses any daylight so that interiors are lit uniformly, into every corner. Studies have shown that rooms glazed with cast glass have much better lighting into the depths of the room than if plain window glass is used.
The light transmission of single-shell Pilkington **Profilit™** is 86% and 75% with double-shell Pilkington **Profilit™**.

Property	Symbol	Value and Unity
relative density	ρ	2500 kg/m^3
Mohs' hardness scale		6 (feldspar 6, quartz 7)
Modulus of elasticity	E	7.0 * 10^4 N/mm^2
Linear expansion coefficient on temperature rise of 1°C	α	9 * 10^{-6} K^{-1}
Thermal conductivity coefficient	λ	1 W/(m * K)
Thermal resistance		1/λ = 0,007 m^2 * K/W

table 2-6

Condensation

At low outside temperatures, unfavourable heat insulation values of the glazing and corresponding air humidity in the room could result in the formation of condensation on position 2 of a double glazing. The condensation diagram for single and double shell Pilkington **Profilit™** glazing (fig. 2-3) takes into account the interdependence of condensation formation on outside temperature and relative air humidity at a room temperature of +20°C.
Air circulation in the room generated by the operation of fans, the provision of heaters under windows and similar measures are not taken into account in the diagram. These curves thus only show worst-case conditions resulting in condensate. Under normal conditions, there will be virtually no condensation formation on the inside surface of double shell Pilkington **Profilit™** glazing.
The condensation diagram (fig. 2-3) relates to the actual Pilkington **Profilit™** glazing, i.e. not the frame joints, as the U_g values always relate to the undisturbed pane centre.
With Pilkington **Profilit™** 'Plus 1.7' glazing (U_g value of 1.8), we recommend always using heat insulated frames.

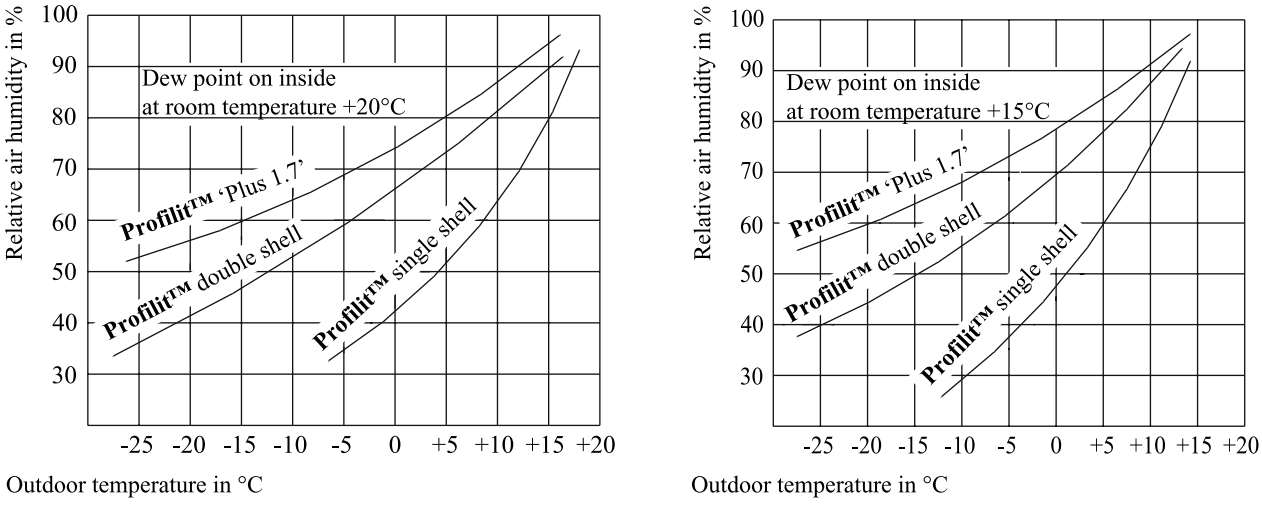

figure 2-3: Condensation diagrams

2.1.4. Chemical properties / Definition

Pilkington **Profilit™** profiled glass is an **alkali lime glass** produced as cast glass by a mechanical rolling process, but in U profiles. It is translucent, but not transparent, with a figured surface on the outside (in general figure 504) and has the quality features of cast glass. Due to the manufacturing process, bubbles, streaks, differences and deviations may be found in the surface at glass core, as may scratches, but these should not be considered faults, provided they do not impair loading capacity. (EN 572, part 7).

Pilkington **Profilit™** falls within **hydrolytic class III**. It is thus weather-resistant and non-susceptible to the aggressive atmospheres of industrial and coastal areas. Pilkington **Profilit™** is largely **resistant to the usual acid and alkali effects**. Under normal conditions, the glass should not become dull.

All materials found naturally have an intrinsic colour, and so does glass. As the thickness increases, this can become more apparent. **The characteristic colour of Pilkington Profilit™ is slight greenish**.

2.2. Sun protection glass Pilkington Profilit™ 'Antisol'

2.2.1. General features

Pilkington **Profilit™** 'Antisol' type, a **metal oxide coated sun protection profiled glass**, corresponds to uncoated construction glass in terms of size, packing, weight and product supply length. Pilkington **Profilit™** 'Antisol' is also supplied with wire inserts. The metal oxide coating is applied to one side on the non-figured side, i.e. the inside of the glass. This coating improves specific properties of the product.

Details of available types - including longitudinal wire inserts - acc. to the delivery programme (chapter 2.1.1).

By reflection in the ultraviolet and infra-red range or absorption:

- Sensitive products can be protected in the UV range
- Transmission of the heat radiation energy in the glazed room can be reduced.
  Pilkington **Profilit™** 'Antisol' type has a favourable effect with its amber colour, depending on light conditions, on the view from inside. From outside inwards the impression of colour is affected by the environment. Certain shades fall within the usual production tolerance range but this does not essentially impair the energy balance.
- The U_g values for double shell Pilkington **Profilit™** 'Antisol' glazing are the same as for Pilkington **Profilit™** standard glazing.

2.2.2. Table values / Energy balance

Transmission

double glazing	light	energy
outer shell coated	43%	49 %

table 2-7: Transmission

In comparison to uncoated Pilkington **Profilit™** construction glass, Pilkington **Profilit™** 'Antisol' has a relatively good light transmission. A large proportion of unrequired energy from the infra-red and ultraviolet range is, however, held back.

2.3. Heat insulation glass Pilkington Profilit™ 'Plus 1.7'

2.3.1. General features

Pilkington **Profilit™** 'Plus 1.7', **a heat protection glass coated with a semi-conductive metal oxide layer**, corresponds to uncoated Pilkington **Profilit™** profiled construction glass in terms of size, packaging, weight and product supply length. All the guidelines for installation of Pilkington **Profilit™** 'Plus 1.7' (and the admissible installation length) according to the Pilkington **Profilit™** standard profiles.

Details of available types - including longitudinal wire inserts - acc. to the delivery programme (chapter 2.1.1).

Design principle of Pilkington Profilit™ 'Plus 1.7'

The double shell construction of Pilkington **Profilit™** 'Plus 1.7' means that there is only a minor reduction in solar energy radiation, which is largely stored in the void due to the exceptional heat insulation value of this double shell glazing. Heat radiation (from inside outwards) is reflected to a large degree by the metal oxide layer (about 70%) thus appreciably stopping heat transition. Pilkington **Profilit™** 'Plus 1.7' thus ensures exceptional comfort on cold winter days and at the same time affords a reduction in expensive heating costs.

Pilkington **Profilit™** 'Plus 1.7' has a semi-conductive metal oxide coating obtained by diffusion. This selective metal oxide coating is on the inside of the pane.

In relation to the heat transition coefficient U_g, with a double shell installation, an improvement in the U_g value is obtained of about 30% in comparison to the standard Pilkington **Profilit™** construction.

In functional terms, this selective metal oxide coating reflects infra-red rays, so that compared to standard Pilkington **Profilit™** 'Plus 1.7' consequently achieves considerably improved heat insulation values. Due to this metal oxide coating, the intrinsic colour of the Pilkington **Profilit™** pane is virtually unchanged when you look through.

Bearing in mind the high quality of this product and the associated special production techniques, longer delivery times are inevitable. This high-grade functional glass may present differences in shade due to production methods. **In principle, the Pilkington Profilit™ glass of the inside shell of double shell glazing is coated. (Position 3!).**

2.3.2. Physical properties

Pilkington **Profilit™** 'Plus 1.7' has a U_g value of 1.8 W/(m^2 * K). The light transmission is around 68% (double shell). All other physical properties are as for Pilkington **Profilit™** standard profiles.

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2.4. Physical values for Pilkington Profilit™ product combinations

Pilkington **Profilit™**	**U_g-value [W/(m² * K)]**	**g-value**
Single shell without coating	5.7	0.79
Double shell without coating	2.8	0.68
Double shell with Pilkington **Profilit™** Standard and 'Plus 1.7'	1.8	0.63
Double shell with Pilkington **Profilit™** 'Antisol' and Standard	2.8	0.49
Double shell with Pilkington **Profilit™** 'Antisol' and 'Plus 1.7'	1.8	0.45
Double shell with Pilkington **Profilit™** 'Amethyst'	2.8	0.46
Double shell with Pilkington **Profilit™** 'Amethyst' and 'Plus 1.7'	1.8	0.49

*table 2-8: Physical values for Pilkington **Profilit™** product combinations*

Note: Pilkington **Profilit™** T and Pilkington **Profilit™** T Color thermally toughened profiled glass with or without Heat-Soak-Test: please refer to chapter 11.

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2.5. Pilkington Profilit™ installation components

The product range also includes Pilkington **Profilit™** installation components, comprising a complete accessory range for glazing with Pilkington **Profilit™** profiled glass without metal support bars.

Because:

- proper, cost-effective assembly of profiled construction glass
- optimum utilisation of its structural values
- safety of glazing without metal support bars

require proper installation methods.

Profiled construction glass and the installation method go hand in hand. We have therefore developed our own Pilkington Profilit™ installation system.

The Pilkington Profilit™ installation system, based on the building module principle, essentially consists of the following elements:

- High-grade aluminium sections, available in mill-finished anodised, RAL-coated and thermally broken designs;
- Plastic insert or holding sections, which are highly impact-resistant, light- and weatherproof as well as torsion-resistant; resistant against temperatures up to 60°C
- Ventilation shutters in standardised dimensions or special designs which can be adapted to any aluminium frame design used.

A basic element of the Pilkington Profilit™ installation system is to separate the glass and the metal frame with a plastic section. This fulfils the following important functions:

- Precise mounting of the glass panes
- Optimum deflection of wind forces
- Covering of inner frame to protect against soiling (for U profile)
- Visually pleasing design
- Fast, cost-reducing installation

The Pilkington **Profilit™** installation system guarantees - generally without requiring structures that cause high costs - a technically clean joint between the construction glass and bearing structures of any kind, whether steel, light alloy, concrete or other building materials. It provides a harmonious unit between the building and its glazing. Other technical features and use of the various installation system profiles are described individually in detail in chapter 5. A description of all the available installation profiles (and other accessories) can be found in chapter 9.

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2.5.1. Pilkington Profilit™ framing system (e.g. NP-series, full aluminium)

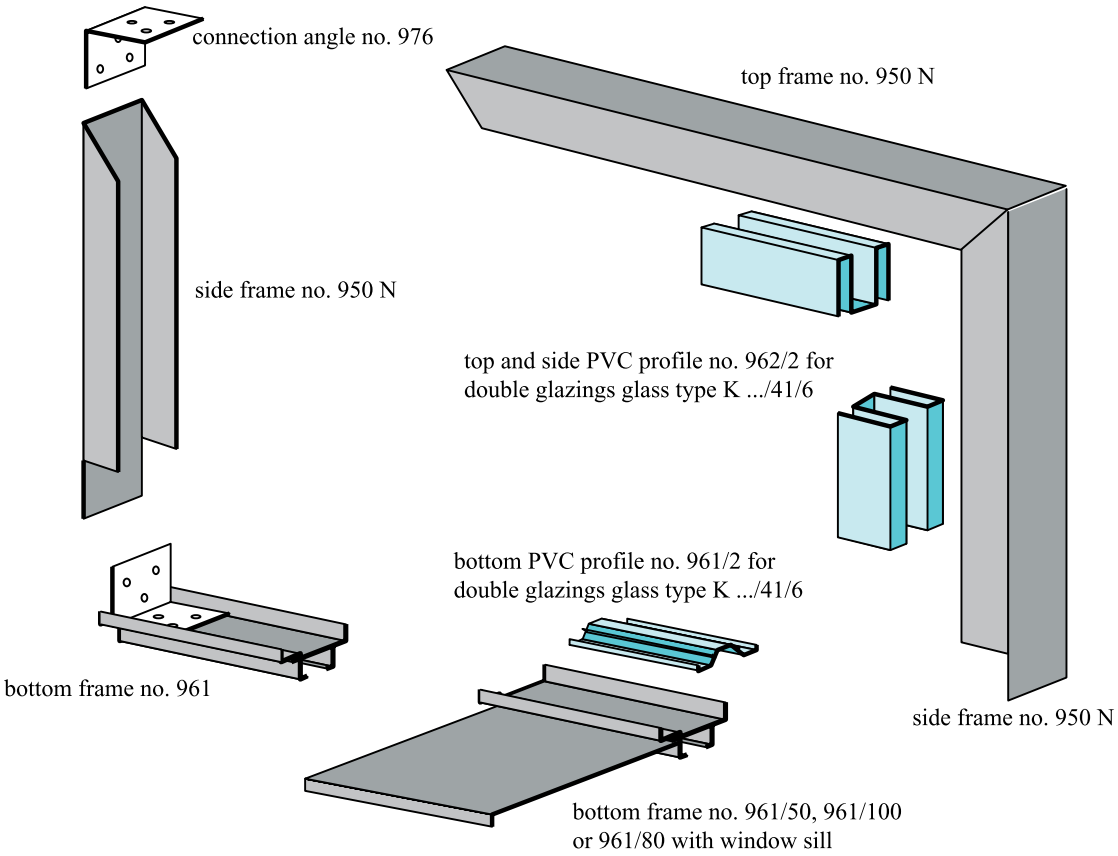
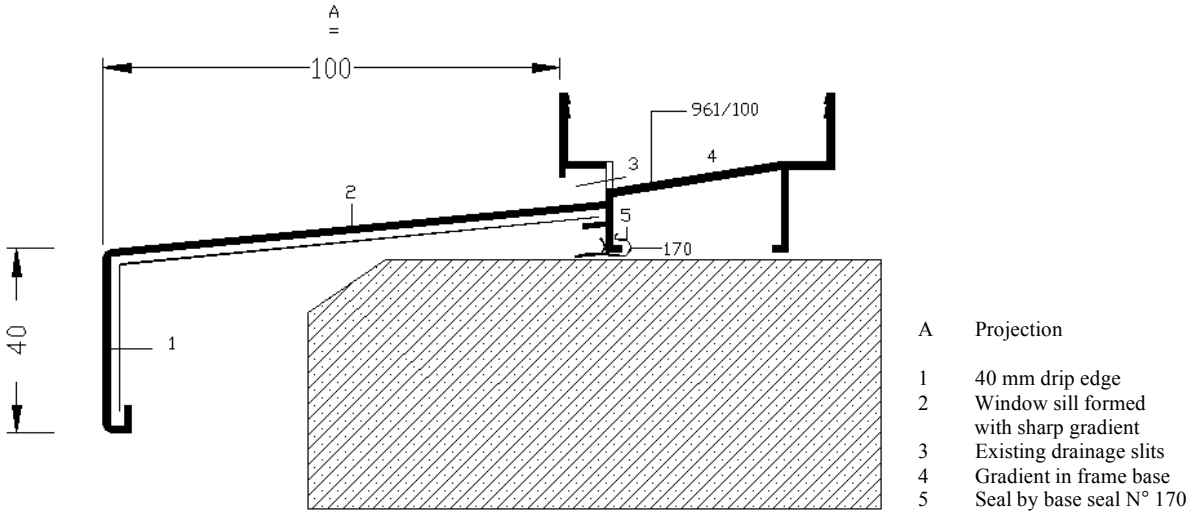


*figure 2-4: Pilkington **Profilit™** framing system (e.g. NP-series 60)*

2.5.2. Particular features and advantages of the Pilkington Profilit™ frame base section



A	Projection
1	40 mm drip edge
2	Window sill formed with sharp gradient
3	Existing drainage slits
4	Gradient in frame base
5	Seal by base seal N° 170

*figure 2-5: Pilkington **Profilit™** frame base section*

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2.6. Fire rating of Pilkington Profilit™ profiled construction glass

Pilkington Profilit™ profiled construction glass is a non-combustible material and belongs to building material class A.

2.7. Sound insulation of Pilkington Profilit™ shutters (other than pivoting shutter types)

2.7.1. Sound insulation of windows

Plain window with insulating glazing *)

Sound insulation class	Airborne sound insulation index R_w of functional installed window in accordance with DIN 52210 Part 5 in dB	Required airborne sound insulation index R_w of functional window on a test bench (P-F) in accordance with DIN 52210 Part 2 in dB	Required R_w value of glazing for plain window with insulating glass in dB
1	25 - 29	≥27	≥ 27
2	30 - 34	≥ 32	≥ 32
3	35 - 39	≥ 37	≥ 37
4	40 - 44	≥ 42	≥ 45
5	45 - 49	≥ 47	**)
6	≥ 50	≥ 52	***)

table 2-9: Sound insulation of windows

*) in accordance with VDI guidelines 2719 Table 2 - 3

**) Plain windows with insulating glass for class 5 must undergo a design test on the test bench in accordance with DIN 52210

***) Noise protection class 6 has long been achieved with tested counter-sash windows only

2.7.2. Sound insulation index of Pilkington Profilit™ shutter, pivot, pivot/tilt, tilt and flap shutter windows and fixed parts and elements of same

The characteristic value for the sound insulation index $R_{w,R}$ is 44 dB. With a required R_w value of windows glazed with insulating glass of ≥ 45 dB, a noise insulation class 4 = 40 - 44 dB has been achieved with a functional installed window.

Note:

For the scope of validity of DIN 4109 “Noise protection for high-rise buildings”, this standard and enclosure 1 to DIN 4109 are to be taken into account.

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2.8. Index of colour rendering

The general index of colour rendering Ra is a measure for the colour rendering of glazings, when daylight falls through the glass.

To determine the index of colour rendering, light of a standard source of light is led through a glass panel and the spectral range of the changed light is compared with the one of the original source.

The "Bundesanstalt für Materialprüfung" (BAM) in Berlin has determined the indexes of colour rendering for the following Pilkington Profilit™ combinations:

A) Pilkington Profilit™ standard profiles (NP) double glazed

Combination	**Index of colour rendering**
Standard / Standard	89
Standard / 'Plus 1.7'	94

B) Pilkington Profilit™ special profiles (SP) double glazed

Combination	**Index of colour rendering**
Standard / Standard	88
Standard / 'Plus 1.7'	94

General evaluation:

Is the general index of colour rendering **Ra between 91 and 100** it is considered to be a **"very good" colour rendering**, whereas **Ra between 81 and 90** means **"good" colour rendering**.

The index of colour rendering of e.g. standard inso-glass (float) is approx. 98.

Summery:

Pilkington Profilit™ - also in combination with Pilkington Profilit™ 'Plus 1.7' - consequently has good / very good colour rendering characteristics.

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3. Installation of Pilkington Profilit™ profiled glass

3.1. Installation options

Pilkington Profilit™ profiled glass can be installed in a number of ways depending on local requirements:

- Single shell, with the flanges to outside of glazing
  (= wind support bar glazing).
- Single shell, flanges to inside of glazing
  (= single shell standard glazing)
- Single shell, alternate inside flange, outside flange
  (= sheet pile glazing)
- Double shell glazing* as standard glazing, i.e.:
  - with paired flange joint arrangement
  - with offset flange joint arrangement
- Double shell as zigzag glazing, i.e.:
  - short zigzag (see chapter 10.15)
  - extended zigzag.
- Horizontal glazing (see chapter 10.3, 10.4):
  This glazing is recommended for double shell construction only
- Fitting with ventilation gap

* Triple shell and multiple shell construction is also possible. **Please contact our applications technology department for further information**.

The installation methods are illustrated below. Other forms of installation should not be selected without first obtaining information.

3.2. Single glazed installation - Basic principle

Single glazed installation is only applied where heat and noise insulation play a subordinate role, i.e. the glazing is **purely for wind and weather protection**.

There are three possible options for single shell glazing:

Option 1: The glass profile flange faces the outside of the glazed building
= wind support bar glazing

Option 2: The flange faces the inside of the glazing
= (single shell) standard glazing

Option 3: The flanges of the glazing runs face inwards and outwards alternately
= sheet pile glazing

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3.2.1. Wind support bar glazing

Installation of the glass runs with the flange of the profiled glass facing outwards enables higher installation heights than with the flange facing inwards. This type of glazing provides a reduced type ventilation produced by special metal and plastic holding sections, dispensing with a seal between the glass and the frame. If a seal is required against wind and moisture a sealing strip can be fitted between the glass and the frame.

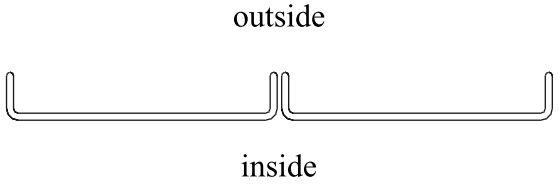

figure 3-1: Wind support bar glazing

3.2.2. Single shell standard glazing

This type of installation guarantees absolute leaktightness between glass and frame and also has the advantage that a second shell can be retro-fitted if the plastic section for double shell glazing and an additional section are used from the outset. The additional costs involved in this are low. This option can be used if, for example, for reasons of cost, the single shell is fitted first and the second shell is to be added at a later stage.

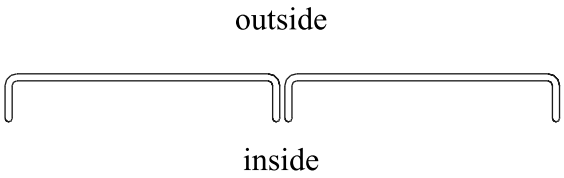

figure 3-2: Single shell standard glazing

3.3. Double shell fitting

Preliminary remark: Double shell glazing should always be used if **optimum noise and heat insulation values** are required.

For sports centres where ball impact is expected, glazing with Pilkington **Profilit™** K22/60/7, K25/60/7 and K32/60/7 shall be double shell only (see assembly guidelines in chapter 8.2.1 and 6.4).

With double shell glazing, the inner and outer shell are of Pilkington **Profilit™** standard profiles or special profiles of the same width. Combinations are possible and can achieve very attractive architectonic effects.

The following combinations can be fitted:

- **Profiled glass with or without wire inserts**
- **Coated and uncoated profiled glass**
  If Pilkington **Profilit™** 'Antisol' type is used, it is generally sufficient for one shell only (outer shell) to consist of this glass type. A variation in colour effect is possible with this solution.
- **Glass tolerances for individual combinations should be taken into account.**

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3.3.1. Double shell standard installation

With double shell standard installation, the flange pairs of adjacent runs fit together as shown in the illustration. This is the standard flange arrangement.

figure 3-3: Double shell standard installation

3.3.2. Double shell zigzag arrangement

This installation method is very decorative and increases the stability of the glass wall. An extended zigzag arrangement achieves a more attractive open appearance of large glazing runs. Finally, zigzag glazing is very suitable for circular buildings, provided the width of curvature of the breastwork is designed accordingly from the outset.

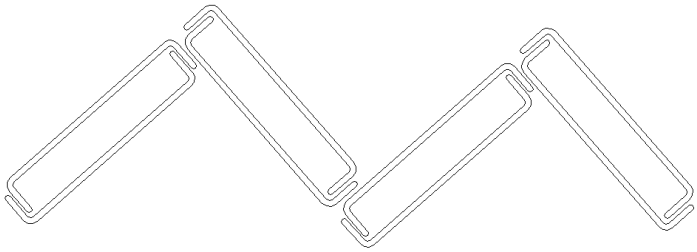

figure 3-4: Double shell zigzag arrangement

3.3.3. Glass corners

With double shell or single shell corner joints, it is also possible to construct glass corners (see chapter 8.2.7). Glass corners are decorative, inexpensive and present no sealing problems. However, it must be borne in mind that corner and edge zones are subject to higher wind loads. Appropriate design measures should therefore be taken accordingly for these zones, bearing in mind the supplementary provisions of DIN 1055, part 4, March 1969 edition.

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4. Selecting profiled glass types

4.1. Basic principles

For cost reasons (price of glass, consumption of Pilkington **Profilit™** SIL sealing material) the widest possible profile should be used in principle, provided that the maximum installation length (see chapter 6 - Maximum loads according to DIN 1055) is sufficient. In other words, the widest profile in the product range Pilkington **Profilit™** K50 should be used where the installation height so permits. From experiences, a lot of glass applications fall within the structurally viable range of this profile. Once the maximum admissible installation lengths of a given profile are exceeded, or the glazing is very exposed to the weather, the narrower normal profile or special profiles should be selected.
If the installation length of a given profile is exceeded with a single shell fitting, it should be checked in each case to see whether it would not be more economical to fit double shell glazing of wider profiles instead of single fitting with narrower profiles. As the problem of heat insulation in construction is becoming increasingly important, double shell glazing is preferred with heated buildings due to the lower U value.
If the maximum installation height is no longer sufficient, but higher glazing is required, the glazing must be divided. **In this case please contact our applications technology department for advice**.

4.2. Sports hall glazing subject to ball impact (see chapter 8.2.1)

For sports hall glazing that is subject to ball impact, a double shell special profile Pilkington **Profilit™** K22/60/7, K25/60/7 or K32/60/7 (standard annealed without wires or thermally toughened) construction should be selected, as permitted for impact glazing in accordance with DIN 18032 (ball impact safety).
Maximum tested glass length: L = 7.00 meters.
With this type of installation, our recommendations for installation of sports hall glazing must be followed.

4.3. Pilkington Profilit™ 'Antisol', sun protection glass

This metal oxide coated sun protection glass is obviously recommended for use where local conditions dictate a reduction in the unpleasant side effects of heavy solar radiation. Double shell glazing is generally recommended with the outer shell of coated glass.
If the glazing is very exposed, an enhanced effect is achieved if both shells consist of coated glass. Caused by the metal oxide coating, the installation situation and influences of the environment, irisation effects and changed colour impressions might occur, depending on the point of view. These effects are typical for this product and give no reason for complaint. The coating on the inside of the profile has high chemical resistance to industrial waste gases, etc. and is bonded with the glass to be scratch-resistant.

4.4. Pilkington Profilit™ with longitudinal wire inserts

Glass with wire inserts is recommended where there is a high risk of damage. The longitudinal wires consist of anti-rust material. The cut edges should be hand-ground.

4.5. Pilkington Profilit™ 'Plus 1.7', heat insulation glass

This metal oxide coated heat insulation glass with a U_g value of 1.8 (double glazed) is recommended wherever, in addition to the usual advantages of large-surface rational glazing, particularly high requirements must be met in terms of heat insulation.

Glazing must be double shell. Pilkington **Profilit™** 'Plus 1.7' must therefore always be on the inside, as otherwise the excellent reflection properties are lost due to condensation forming.

Combinations are possible with other types of glass such as with:

Pilkington **Profilit™** 'Antisol'
Pilkington **Profilit™** standard non coated profiles
Pilkington **Profilit™** 'Amethyst'

The coating on the inside of the profile has high chemical resistance to industrial waste gases, etc. and is bonded with the glass to be scratch-resistant. Examples of applications include facades, transparent heat insulation, industrial bays, workshops, sports halls, etc. **Pilkington Profilit™ 'Plus 1.7' keeps out the cold!**
For installation in pronounced south-facing buildings, a combination with Pilkington **Profilit™** 'Antisol' as an outer shell is recommended, as otherwise, due to longer solar radiation, rooms behind glass can become overheated during the summer months.
Caused by the metal oxide coating, the installation situation and influences of the environment, irisation effects and changed colour impressions might occur, depending on the point of view. These effects are typical for this product and give no reason for complaint.

4.6. Pilkington Profilit™ 'Amethyst'

A metal oxide coating that is applied to the inside of the glass profile provides an attractive amethyst-coloured appearance. The panels shall always be installed double glazed to emphasize the attractiveness of the Amethyst coating.
Combinations with other Pilkington **Profilit™** types like e.g. Pilkington **Profilit™** 'Plus 1.7' (heat insulation) are possible. In this case the 'Plus 1.7' coating shall be located on position 3, i.e. on the inner shell of the glazing.

The application as single glazing cannot be recommended, because irregular colour impressions might occur caused by reflections or deposits.

Caused by the metal oxide coating, the installation situation and influences of the environment, irisation effects and changed colour impressions might occur, depending on the point of view. These effects are typical for this product and give no reason for complaint. The coating on the inside of the profile has high chemical resistance to industrial waste gases, etc. and is bonded with the glass to be scratch-resistant.

4.7. Pilkington Profilit™ Clear (without ornamentation N° 504)

Pilkington **Profilit™** Clear is a profiled glass without the characteristic ornamentation (corresponding to type 504) on the outside surface. This type of glass is more transparent than a profiled glass with ornamentation and is characterised by the typical properties of a rolled, cast profiled glass. Consequently its transparency cannot be compared with a float glass.
The specific features of Pilkington **Profilit™** Clear are the partly clearly visible bubbles, inclusions and scratches and traces of the rolling process which are characteristic for the product in its "natural state" without the uniform ornamentation.

Regarding its visual appearance the standard EN 572-7 consequently does not apply for this glass type.

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The installation of this glass type has to be executed with special care, especially when the glazing shall be double shell (wearing of gloves is recommended).

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5. Application and selection of Pilkington Profilit™ installation system - aluminium and plastic profiles

5.1. Basic principles

The Pilkington Profilit™ installation system profiles are divided into four target groups, in terms of:

- Economy
- Function
- Type of glazing (e.g. standard or shed glazing)
- Glazing with standard profiles (41 mm flange height)
- Glazing with special profiles (60 mm flange height)

The details below refer to the current status and are subject to variation.

The groups are as follows:

Group 1 Profiles for wind support bar glazing (single shell outside flange only)

Group 2 Profiles for standard glazing (single and double shell)

Group 3 Profiles for special glazing (single and double shell)

Group 4 Profiles for shed glazing (single and double shell)

The construction principle for the Pilkington **Profilit™** installation system is the same in each case, as below.

5.2. Pilkington Profilit™ installation system groups

5.2.1. Mounting section for wind support bar glazing

Aluminium metal frames enclosing glazing	**Top and side frames**
	950 S 950 N
PVC insert profiles	962/1

table 5-1: Mounting section for wind support bar glazing

If ventilation shutters are incorporated in the glass surface, these should be braced at the sides with structurally designed reinforcement sections.

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5.2.2. Mounting sections for single and double shell standard glazing

Aluminium frame enclosing glazing		Top and side frames	Bottom frames							
			951	961	961/50	961/80	961/100	961/120	961/150	961/180
PVC insert profiles	Single shell installation	962/1	961/1	961/1	961/1	961/1	961/1	961/1	961/1	961/1
	Double shell installation	962/2 N	961/2	961/2	961/2	961/2	961/2	961/2	961/2	961/2
Expansion joint profile		950 N/D = 950 S/D	961 D	961/50 D	961/80 D	961/100 D	961/120 D	961/150 D	961/180 D	
H-bars			977	977	977	977	977	977	977	977

table 5-2: Mounting sections for single and double shell standard glazing

Similar sections also available in WG (heat-insulated) design

5.2.3. Mounting sections for special glazing, single and double shell

Aluminium frame enclosing glazing		Top and side frames	Bottom frames		
		980	981	981/50	981/100
PVC insert profiles	Single shell installation	981/1	981/1	981/1	981/1
	Double shell installation	980/2	981/2	981/2	981/2
Expansion joint profile			981 D	981/50 D	981/100 D
H-bars		978	978	978	978

table 5-3: Mounting sections for special glazing, single and double shell

Similar sections also available in WG (heat-insulated) design

5.2.4. Thermal broken aluminium framing system for double shell glazing

5.2.4.1. Standard profiles (NP) - double shell glazing

Aluminium frame enclosing glazing with thermal broken aluminium profiles		Top and side frames	Bottom frames						
		820	821	821/50	821/80	821/100	821/120	821/150	821/180
PVC insert profiles	Double shell installation	962/2 N	961/2	961/2	961/2	961/2	961/2	961/2	961/2
Expansion joint profile				961/50 D	961/80 D	961/100 D	961/120 D	961/150 D	961/180 D
H-bars		822	822	822	822	822	822	822	822

table 5-4: Thermal broken aluminium framing system for double shell glazing (NP)

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5.2.4.2. Special profiles (SP) - double shell glazing

Aluminium frame enclosing glazing with thermal broken aluminium profiles		**Top and side frames**	**Bottom frames**						
		810	811	811/50	811/80	811/100	811/120	811/150	811/180
PVC insert profiles	**Double shell installation**	980/2	981/2	981/2	981/2	981/2	981/2	981/2	981/2
Expansion joint profile				961/50 D	961/80 D	961/100 D	961/120 D	961/150 D	961/180 D
H-bars		812	812	812	812	812	812	812	812

table 5-5: Thermal broken aluminium framing system for double shell glazing (SP)

Remark:

Window sills and including expansion joint profiles are available in the widths: 130 - 240 mm (see chapter 9).

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6. Admissible loads according to DIN 1055, part 4 (March 2005)

6.1. Vertical glazing

6.1.1. Range of validity for installation tables

Glass is capable of absorbing exceptionally high compressive stresses but substantially lower tensile stresses. In the case of excessive bending stresses, destruction of the glass always initiates in the tensile zone. Thus when selecting the maximum glass length with single shell Pilkington **Profilit™** glazing in enclosed buildings, it is important to determine on which side the flange will be loaded.

The following wind load assumptions refer to the German standard DIN 1055, part 4:2005.

For the application in other countries the relevant and applicable local standards and building regulations have to be applied when determining the loads.

Standard Pilkington Profilit™ is not a safety glass!
In case of interior walls and / or areas with risk of fall please contact our technical applications department.

When determining the applicable wind load for a single glazed or double glazed **Profilit™** glazing according to DIN 1055, part 4:2005 project related parameters like e.g. wind load zone, building height, building geometry, topography and interior and exterior wind loads need to be considered.

The wind load is resulting from the internal and external wind pressure.

The wind pressure on an outer surface of a building according to DIN 1055, part 4:2005 is:

$$\mathbf{w_e = c_{pe} * q(z_e)\ [kN/m^2]}$$

with: c_{pe} aerodynamic factor for the external pressure

z_e related height

q wind speed pressure in kN/m^2

The wind pressure on an inner surface of a building according to DIN 1055, part 4:2005 is:

$$\mathbf{w_i = c_{pi} * q(z_i)\ [kN/m^2]}$$

with: c_{pi} aerodynamic factor for the internal pressure

z_i related height

q wind speed pressure in kN/m^2

The wind speed pressure q according to DIN 1055, part 4:2005, related to a certain wind speed v is:

$$\mathbf{q = v^2 / 1600\ [kN/m^2]}$$

(v = wind speed in [m/sec])

- No additional loads should be transferred to the glass surface by, for example, doors, gates or ventilation apertures or similar installations (For this reason H-bars or reinforcing bars are necessary for, for example, ventilation shutters; see also chapter 8.4).
- The individual glass runs of a glazing surface must be joined together with a permanently flexible single-component silicon rubber seal (e.g. Pilkington **Profilit™** SIL).
- For glazing with ventilation gaps, i.e. unsealed glass runs (such as in multi-storey car parks) the maximum installation lengths are reduced. Our applications technology department should be contacted in this case.
- For glazing, including assembly, the permanent deformation of a bar and the bearing structure of a frame should not be more than 1/300 of the bearing span or a maximum of 8 mm (vertical direction). Perpendicular to the window wall level, deformation of the frame should not exceed 1/300 of the bearing span (bearing span = glazing width).
- Admissible stress σ_{adm} = 20 N/mm^2 and 13 N/mm^2 for Pilkington **Profilit™** standard and special profiles (NP/SP) in sealed glazings.

Note: Pilkington **Profilit™** T and Pilkington **Profilit™** T Color thermally toughened profiled glass with or without Heat-Soak-Test: please refer to chapter 11.

6.1.2. Structural design of glass

6.1.2.1. Glass dimensions and section modulus

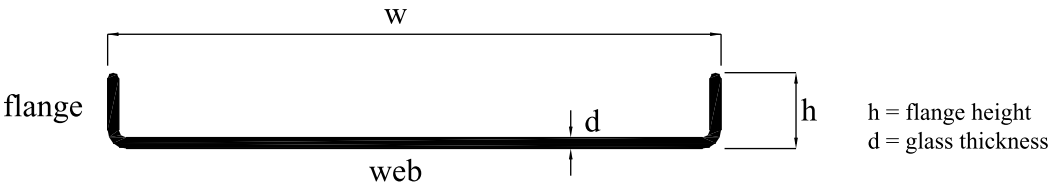

figure 6-1: Glass dimensions and section modulus

Profiled construction glass as per EN 572-7	Designation	Glass size and section modulus				
	Pilkington Profilit™	w (m)	h (mm)	d (mm)	W_{FL} (cm^3)	W_{St} (cm^3)
A	K22	0.234	41	6	5.21	22.67
C	K25	0.264	41	6	5.26	24.57
E	K32	0.333	41	6	5.37	28.49
G	K50	0.500	41	6	5.54	36.03
B	K22/60/7	0.234	60	7	13.00	47.91
D	K25/60/7	0.264	60	7	13.15	52.42
E	K32/60/7	0.333	60	7	13.43	62.07

table 6-1: Glass dimensions and section modulus

w: widths • W_{Fl}: Section modulus of "flange" • W_{St}: Section modulus of "web"

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6.1.2.2. Application of section modulus

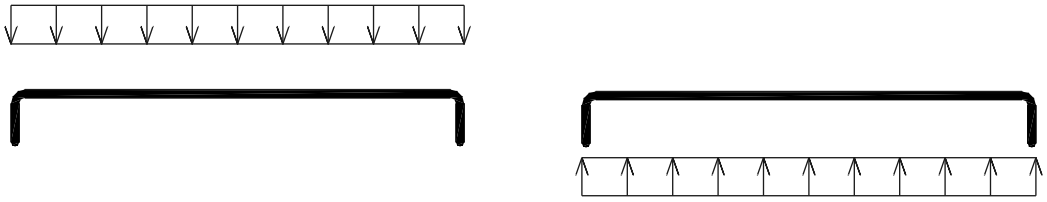

figure 6-2: Application of section modulus

Wind loading for double shell glazing:
Wind pressure: the outer shell bears half the load
Wind suction: the outer shell bears half the load

For built-in elements in glazing (windows, etc.), additional loads need to be taken into account.

6.1.2.3. Proof of stability

Admissible bending stress:

σ_{adm} = 20 N/mm² (wind pressure)
σ_{adm} = 13 N/mm² (wind suction)

Structural system: generally beam on 2 supports:

$$M = \frac{q * l^2}{8} \qquad \sigma = M/W$$

Example for outer shell of a double glazing:

Design wind load: w = 1.0 kN/m² (assumed for wind pressure and wind suction)

Application: K 25/60/7 vertically double glazed and sealed

Planned glass length: L = 3.75 m

a) Wind pressure: outer shell bears half the load

$$\sigma_{exist} = (½ * w * B * L^2) / (8 * W_{Fl}) = (½ * 1.0 * 0.262 * 3.75^2 * 10^3) / (8 * 13.15)$$

$$\sigma_{exist} = 17.5 \text{ N/mm}^2 \leq 20 \text{ N/mm}^2 = \sigma_{adm}$$

b) Wind suction: outer shell bears full load

$$\sigma_{exist} = (w * B * L^2) / (8 * W_{St}) = (1.0 * 0.262 * 3.75^2 * 10^3) / (8 * 52.42)$$

$$\sigma_{exist} = 8.8 \text{ N/mm}^2 \leq 13 \text{ N/mm}^2 = \sigma_{adm}$$

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6.2. Maximal installation lengths for a vertical glazing system

(see Annexe „Installation Lengths“)

6.3. Horizontal installation of glass (Application and installation length)

Application:

High, narrow lights, e.g. stairwells, but double shell only

Installation method:

See general assembly guidelines and construction drawings. (The incorporation of ventilation elements is possible to a limited extent). **Each glass run should be supported at the sides by appropriately dimensioned angles**.

Recommended maximum installation length for horizontally glazed outside walls. For transverse fitting, the maximum run length is 4.50 m.

Designation according to EN 572-7	Type Pilkington Profilit™	Design wind loading kN/m²	Double shell wall glazing building
			closed
A	K22	0.5 0.8 1.1	3.48 2.82 2.44
B	K22/60/7	0.5 0.8 1.1	4.50 4.22 3.70
C	K25	0.5 0.8 1.1	3.34 2.70 2.32
D	K25/60/7	0.5 0.8 1.1	4.50 4.07 3.55
E	K32	0.5 0.8 1.1	3.00 2.46 2.11
F	K32/60/7	0.5 0.8 1.1	4.00 3.77 3.26
G	K50	0.5 0.8 1.1	2.50 2.07 1.77

table 6-2: Recommended maximum installation length for horizontally glazed outside walls

6.4. Sports halls glazing subject to ball impact

Where optimum stability of profiled glazings is required, i.e. in sports hall glazing, the Pilkington **Profilit™** special profile K22/60/7, K25/60/7, K32/60/7 has proved highly successful.

Pilkington **Profilit™** glazing for sports centres with K22/60/7, K25/60/7, K32/60/7 meets the requirements of DIN 18032. It is basically double shell - standard annealed without wires or thermally toughened - and should be installed in accordance with our relevant recommendations.

If there is no risk of ball impact, special sports centre glazing need not be used.

6.4.1. Admissible installation heights

In the case of sports hall glazing where there is a risk of ball impact, the tabular values referred to in point 6.2 for Pilkington **Profilit™** construction, special glass types apply. The most favourable glass length is in the span of 2.50 m to 4.00 m above a breastwork of at least 2.00 m above the top edge of the hall floor. **For any projects falling outside this range, our applications technology department should be contacted right from the planning stage**.

Maximum tested glass length: 7.00 meters

For thermally toughened Pilkington Profilit™ different installation lengths apply.
Please contact our applications technology department.

6.4.2. Test certificate for Pilkington Profilit™ sports halls glazing (according to DIN 18032)

The test certificate for Pilkington Profilit™ sports hall glazing according to DIN 18 032 can be supplied upon request.

6.4.3. Special assembly regulations

For sports hall glazing with K22/60/7; K25/60/7or K32/60/7, special assembly regulations must be followed. Instructions for fitting SP-glass types for exposure to extremely severe loads are given in detail in chapter 8.2.1 of our general assembly guidelines (special cases).

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6.5. Maximal design loading for stay bars

Maximal length of stay bar N° 930

Pane width	Loading width	Support distance L and deflection f for f = L/300 ≤ 0.80 cm					
		0.5 kN/m²		0.8 kN/m²		1.1 kN/m²	
(m)	b (m)	L (m)	f (cm)	L (m)	f (cm)	L (m)	f (cm)
1.00	0.50	2.70	0.80	2.40	0.80	2.17	0.72
1.20	0.60	2.58	0.80	2.27	0.76	2.04	0.68
1.40	0.70	2.49	0.80	2.16	0.72	1.94	0.65
1.60	0.80	2.40	0.80	2.06	0.69	1.86	0.62
1.80	0.90	2.32	0.77	1.98	0.66	1.78	0.59
2.00	1.00	2.25	0.75	1.91	0.64	1.72	0.57
2.20	1.10	2.17	0.72	1.86	0.62	1.67	0.56
2.40	1.20	2.11	0.70	1.80	0.60	1.62	0.54
2.60	1.30	2.05	0.68	1.75	0.58	1.58	0.53
2.80	1.40	2.00	0.67	1.71	0.57	1.54	0.51
3.00	1.50	1.96	0.65	1.67	0.56	1.50	0.50
3.20	1.60	1.91	0.64	1.64	0.55	1.47	0.49
3.40	1.70	1.88	0.63	1.60	0.53	1.44	0.48
3.60	1.80	1.84	0.61	1.57	0.52	1.42	0.47
3.80	1.90	1.81	0.60	1.55	0.52	1.39	0.46
4.00	2.00	1.78	0.59	1.52	0.51	1.37	0.46
4.20	2.10	1.75	0.58	1.50	0.50	1.34	0.45
4.40	2.20	1.72	0.57	1.47	0.49	1.32	0.44
4.60	2.30	1.70	0.57	1.45	0.48	1.30	0.43
4.80	2.40	1.67	0.56	1.43	0.48	1.29	0.43
5.00	2.50	1.65	0.55	1.41	0.47	1.27	0.42
5.20	2.60	1.63	0.54	1.39	0.46	1.25	0.42
5.40	2.70	1.61	0.54	1.38	0.46	1.24	0.41
5.60	2.80	1.59	0.53	1.36	0.45	1.22	0.41
5.80	2.90	1.57	0.52	1.34	0.45	1.21	0.40
6.00	3.00	1.55	0.52	1.33	0.44	1.19	0.40
6.20	3.10	1.54	0.51	1.31	0.44	1.18	0.39
6.40	3.20	1.52	0.51	1.30	0.43	1.17	0.39
Closed building Profile N° 930							

table 6-3: Maximal design loading for stay bars. N° 930

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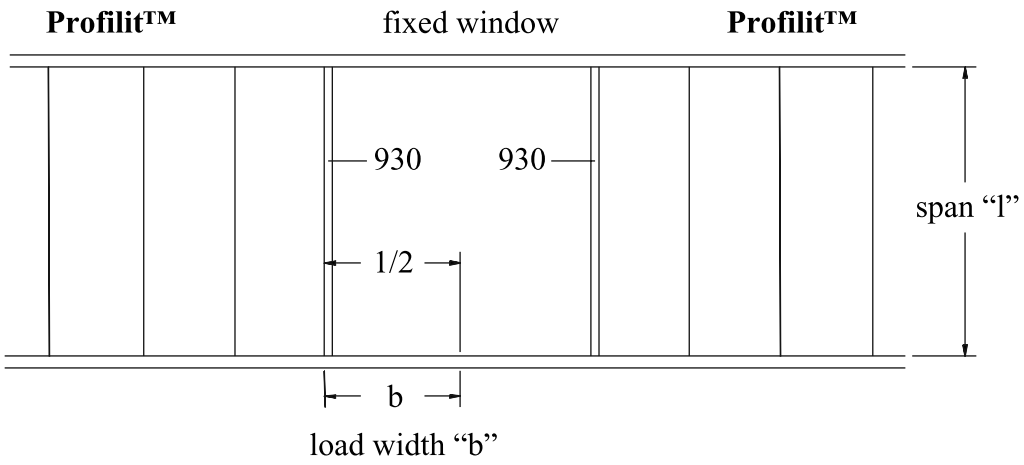

figure 6-3: Stay bar N° 930. sketch

Attention:

In case of using 930w. the maximum installation height must be multiplied with 0.9.

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Stay bar N° 936

Pane width	Loading width	Support distance L and deflection f for f = L/300 ≤ 0.80 cm					
		0.5 kN/m²		0.8 kN/m²		1.1 kN/m²	
(m)	b (m)	L (m)	f (cm)	L (m)	f (cm)	L (m)	f (cm)
1.00	1.00	1.91	0.64	1.63	0.54	1.47	0.49
1.10	1.10	1.85	0.62	1.58	0.53	1.42	0.47
1.20	1.20	1.80	0.60	1.54	0.51	1.38	0.46
1.30	1.30	1.75	0.58	1.50	0.50	1.35	0.45
1.40	1.40	1.71	0.57	1.46	0.49	1.31	0.44
1.50	1.50	1.67	0.56	1.43	0.48	1.28	0.43
1.60	1.60	1.63	0.54	1.40	0.47	1.26	0.42
1.70	1.70	1.60	0.53	1.37	0.46	1.23	0.39
1.80	1.80	1.57	0.52	1.34	0.45	1.21	0.40
1.90	1.90	1.54	0.51	1.32	0.44	1.19	0.40
2.00	2.00	1.52	0.50	1.30	0.43	1.17	0.39
2.10	2.10	1.49	0.50	1.28	0.43	1.15	0.38
2.20	2.20	1.47	0.49	1.26	0.42	1.13	0.38
2.30	2.30	1.45	0.48	1.24	0.41	1.11	0.37
2.40	2.40	1.43	0.48	1.22	0.41	1.10	0.37
2.50	2.50	1.41	0.47	1.20	0.40	1.08	0.36
2.60	2.60	1.39	0.46	1.19	0.40	1.07	0.36
2.70	2.70	1.37	0.46	1.17	0.39	1.06	0.35
2.80	2.80	1.36	0.45	1.16	0.39	1.04	0.35
2.90	2.90	1.34	0.45	1.15	0.38	1.03	0.34
3.00	3.00	1.33	0.44	1.13	0.38	1.02	0.34
3.10	3.10	1.31	0.44	1.12	0.37	1.01	0.34
3.20	3.20	1.30	0.43	1.11	0.37	1.00	0.33
Closed building Profile N° 936							

table 6-4: Maximal design loading for stay bars. N° 936

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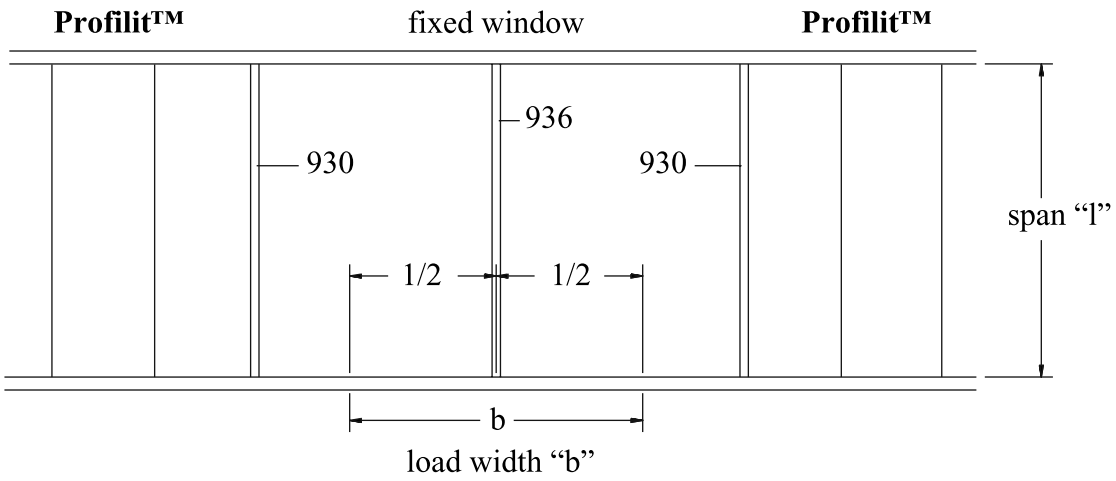

figure 6-4: Stay bar N° 936. sketch

Attention:

In case of using 936w. the maximum installation height must be multiplied with 0.9.

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6.6. Admissible installation length of H-bars

The admissible bearing span of the ventilation shutter reinforcing bars (H-bars) N° 977 (reinforcement for standard profiled glass walls) and N° 978 (reinforcement for special profiled glass walls) for closed and open buildings and for the wind loadings 0.5 kN/m^2. 0.8 kN/m^2 and 1.1 kN/m^2 are summarised in table below.

This covers all types of ventilation shutters. used solely for ventilation purposes. i.e. no ventilation shutters with fixed parts for visual contact. etc.. which have to be reinforced because of window row height.

Note: **The maximum allowable installation lengths for Pilkington Profilit™ glass profiles need to be considered.**

See also Pilkington **Profilit™** catalogue. Chapter 8.4 "Installation of ventilation shutters".

The tabular data apply to the following two examples of installation:

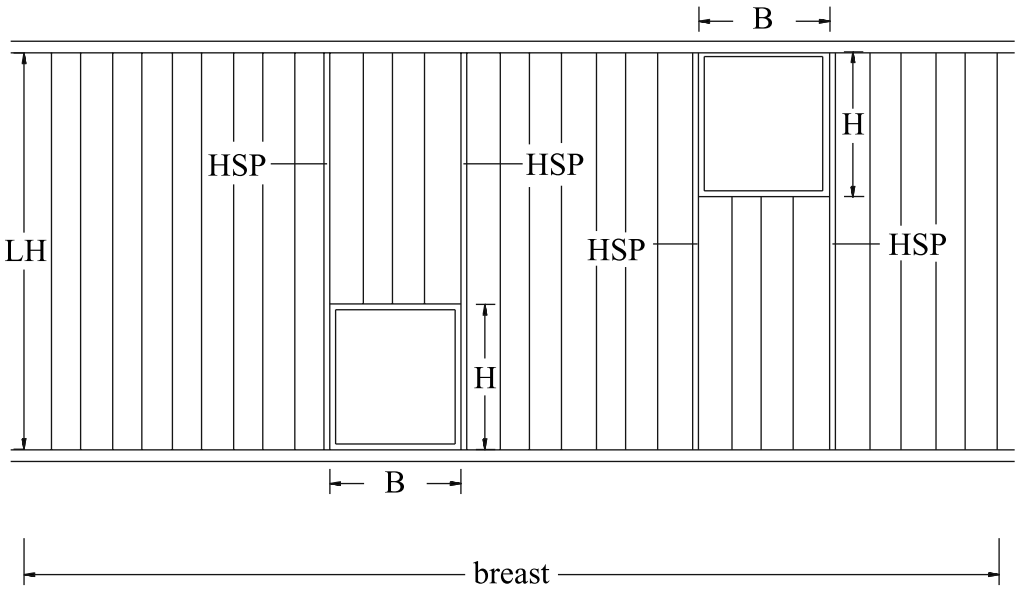

*figure 6-5: Schematic view of a Pilkington **Profilit™** facade*

LH = Window row height **B = Ventilation shutter width**
H = Ventilation shutter height **HSP = H-bars (977/978)**

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Table 6-5: Maximum admissible installation height for H-bars

Ventilation casement: B+H (cm)	105		
Design wind loading (kN/m²)	0.5	0.8	1.1
Window row height (cm)	LH =	LH =	LH =
H-bar N° 977	390	275	240
H-bar N° 977 + aluminium tube 40/40/2.5	410	310	265
H-bar N° 977 + aluminium tube 50/40/2.5	435	325	280
H-bar N° 977 + aluminium tube 60/40/2.5	460	355	300
H-bar N° 977 + aluminium tube 60/40/4	-	365	310
H-bar N° 978	590	435	360
H-bar N° 978 + aluminium tube 40/40/2.5	635	460	380
H-bar N° 978 + aluminium tube 50/40/2.5	664	480	395
H-bar N° 978 + aluminium tube 60/40/2.5	700	510	415
H-bar N° 978 + aluminium tube 60/40/4	-	545	440
H-bar N° 978 + aluminium tube 60/40/4	-	575	470
H-bar N° 978 + aluminium tube 80/40/4	-	-	490

table 6-5: Maximum admissible installation height for H-bars

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6.7. Admissible installation height of ventilation shutter elements vertical and horizontal (in Pilkington Profilit™ walls) and ventilation shutters and ventilation shutter elements in shed glazing

Table 6-6:
Maximal admissible installation height (H) for Pilkington Profilit™ window elements, lateral joint with Pilkington Profilit™ profiled construction glass, top and bottom joint with Pilkington Profilit™ frame (NP frame)

Glazing: Isoglass

Element width (B) (cm)	75			105			125		150			
Design wind load (kN/m²)	0.5	0.8	1.1	0.5	0.8	1.1	0.5	0.8	1.1	0.5	0.8	1.1
Element height (H) (cm)	H	H	H	H	H	H	H	H	H	H	H	H
Elements without vertical reinforcement (cm)	255	220	200	230	195	175	215	185	165	205	175	155
Side element reinforcement with Pilkington Profilit™ H-bars N° 977 (cm)	375	320	285	335	265	255	315	270	240	295	250	225
Side element reinforcement with galvanized steel tube 80/40/3 mm	545	460	415	485	415	370	455	390	350	430	365	280

*table 6-6: Maximal admissible installation height (H) for Pilkington **Profilit™** window elements*

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Table 6-7:
Maximal admissible installation width (B) for Pilkington Profilit™ window elements with horizontal Pilkington Profilit™ profiled glazing, top and bottom joints with Pilkington Profilit™ profiled construction glass, lateral joint with Pilkington Profilit™ frame (NP + SP frames)

Glazing: Isoglass

Design wind load (kN/m²) and deformation f (m)	0.5	f	0.8	f	1.1	f
Element width (B) (cm)	B		B		B	
Elements without horizontal reinforcement (cm)	225	0.68	200	0.52	180	0.35
Horizontal element reinforcement with Pilkington Profilit™ H-sash bars N° 977 (cm)	275	0.75	275	0.75	250	0.60
Horizontal element reinforcement with Pilkington Profilit™ H-sash bars N° 978 (cm)	300	0.81	300	0.81	300	0.81
Horizontal element reinforcement with aluminium square tubes Ø 60/60/4 mm	325	0.84	300	0.60	260	0.35
Ø 100/100/4 mm	400	0.25	400	0.50	400	0.50
Horizontal element reinforcement with galvanized steel tube Ø 50/50/3 mm	325	0.84	300	0.60	260	0.35
Ø 80/80/3 mm	400	0.25	400	0.50	400	0.50

*table 6-7: Maximal admissible installation width (B) for Pilkington **Profilit™** window elements*

Note:

If ventilation shutters shall be installed on inclined Pilkington Profilit™ glazing. please contact our technical application department.

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6.8. Admissible bearing spans of Pilkington Profilit™ bar section N° 983

This section acts as a structurally designed "bar section" for subdividing very large Pilkington **Profilit™** profiled glass walls in stair-wells or halls or for halls with panoramic structures and is suitable for a supporting bar for roof glazing. With a width of 83 mm. this section is designed for the SP glass 83 frame series in particular. Use of this supplementary section N° 983 "K" means that Pilkington **Profilit™** NP glass can also be used (figure 6-6, drawing 2).

For larger bearing spans or larger load absorption. section 983 can be reinforced with a galvanized square tube: Dimensions: 70/70/7 mm (figure 6-6, drawing 2). The fixing materials and tube bracing section 70/70/7 mm should be provided by the customer. The tables below provide an easy method of determining the admissible bearing span of the bar section 983 for a given glass load and wind load. For assembly recommendations see chapter 6.

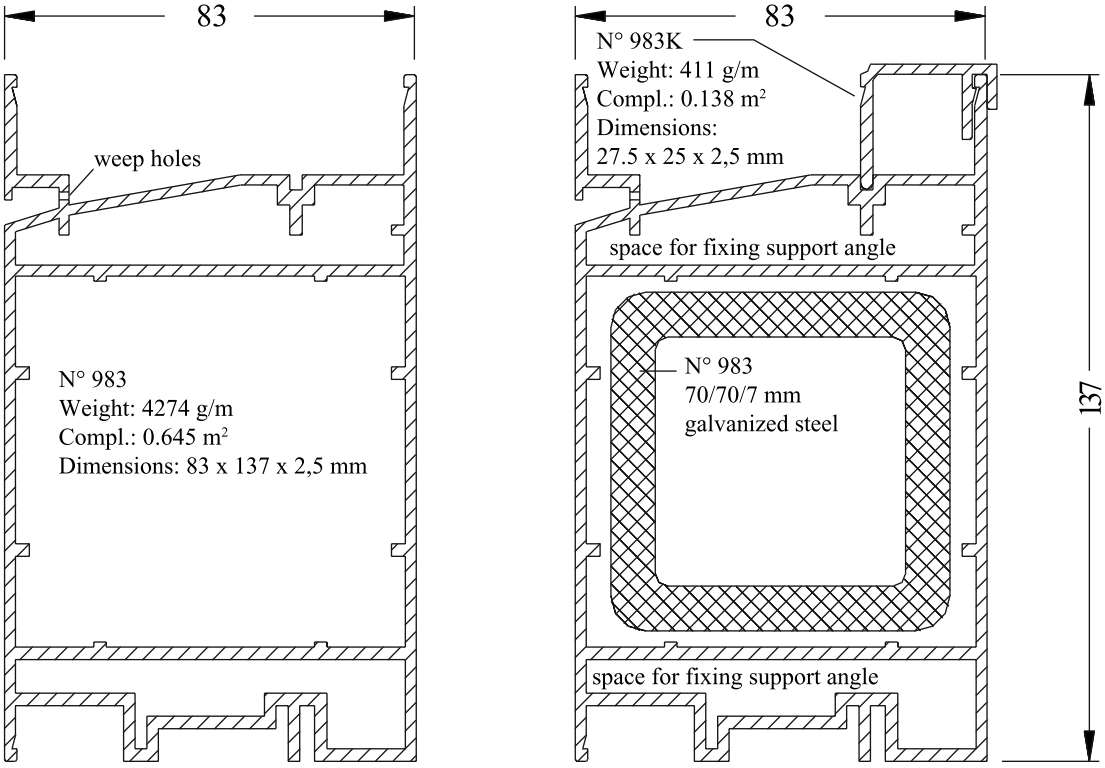

*figure 6-6: Bearing spans of Pilkington **Profilit™** bar section N° 983. drawing 1 + 2*

Note on Table 6-10:

Bar N° 983 projects in front of the building supports (support spacing 5.00 or 6.00 m).
In this instance. the vertical loads are transferred from the Pilkington **Profilit™** profiled glazing via the window structure to the breastwork. The transparent structure should be reinforced accordingly (e.g. aluminium or steel 40/40 mm base section).

The applicable vertical loads per linear metre are given in table 6-12. Deformation of the bar N° 983 should be taken into account in this instance. Fit the visual contact or ventilation shutter elements first. The Pilkington **Profilit™** glass can then be fitted. The joint between the Pilkington **Profilit™** bar N° 983 and the steel tube behind is in the form of an aluminium edge-piece (aluminium plate) 3.0 mm thick.

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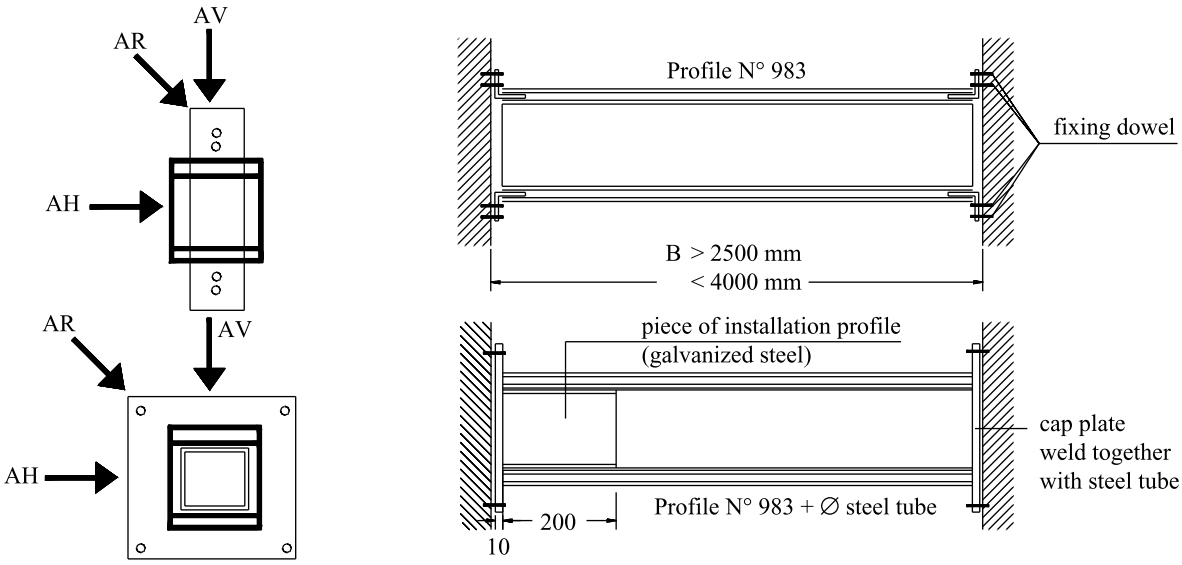
Table 6-8:
Superimposed Pilkington Profilit™ profiled construction glass window runs, horizontal bar section N° 983 and associated reinforcement of square steel tube (galvanized) in stair-well with divided glass panes as per sketch opposite

Explanations: fv = Vertical deformation cm fh = Horizontal deformation cm
AV = Vertical support load kN AH = Horizontal support load kN
Force/side to be anchored - AR = Resultant support load

Design wind load kN/m²	**0.5**			**0.8**			**1.1**		
Installation width (m)	**Section**	**AV AR fv (cm)**	**AH (kN) fh (cm)**	**Section**	**AV AR fv (cm)**	**AH (kN) fh (cm)**	**Section**	**AV AR fv (cm)**	**AH (kN) fh (cm)**
2.50 m	Section N° 983	1.40 2.26 0.36	1.76 0.78	Section N° 983 + Ø 70/70/3	1.40 3.14 0.26	2.80 0.56	Section N° 983 + Ø 70/70/3	1.40 4.10 0.20	3.86 0.76
3.00 m	Section N° 983 + Ø 70/70/3	1.68 2.70 0.43	2.10 0.72	Section N° 983 + Ø 70/70/3	1.68 3.76 0.43	3.36 1.16	Section N° 983 + Ø 70/70/5	1.68 4.92 0.37	4.62 1.24
3.50 m	Section N° 983 + Ø 70/70/4	1.96 3.54 0.71	2.46 1.13	Section N° 983 + Ø 70/70/6	2.96 4.38 0.64	3.92 1.56	2x Section N° 983 + 2 x Ø 70/70/4	1.96 5.74 0.36	5.40 1.25
4.00 m	Section N° 983 + Ø 70/70/7.1	2.24 3.60 0.95	2.80 1.41	2x Section N° 983 + 2 x Ø 70/70/4	2.24 5.00 0.61	4.48 1.54			

*table 6-8: Superimposed Pilkington **Profilit™** profiled glass window runs*



The number, type, size and spacing of the fixing dowels should be determined on the basis of local conditions.

*figure 6-7: Superimposed Pilkington **Profilit™** profiled construction glass window runs*

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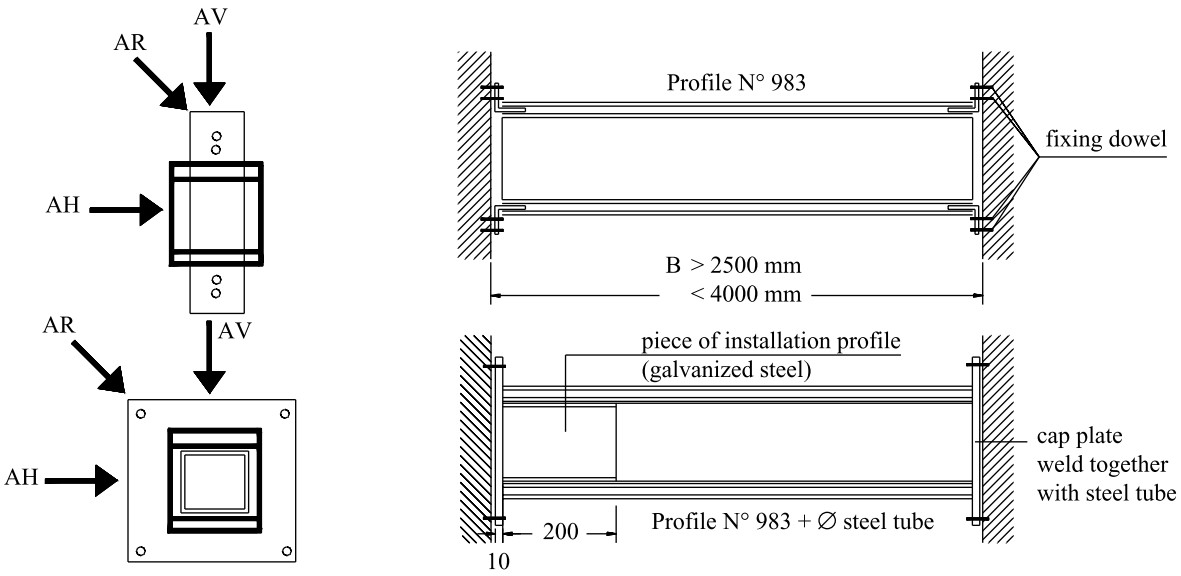
Table 6-9:
Pilkington Profilit™ profiled construction glass window runs above / below visual contact and ventilation shutter elements, horizontal bar section N° 983 and associated reinforcement of square steel tube (galvanized) in stair-well with divided glass panes as per sketch opposite

Explanations: fv = Vertical deformation cm fh = Horizontal deformation cm
AV = Vertical support load kN AH = Horizontal support load kN
Force/side to be anchored - AR = Resultant support load kN

Design wind load kN/m²	**0.5**			**0.8**			**1.1**		
Installation width (m)	**Section**	**AV AR fv (cm)**	**AH (kN) fh (cm)**	**Section**	**AV AR fv (cm)**	**AH (kN) fh (cm)**	**Section**	**AV AR fv (cm)**	**AH (kN) fh (cm)**
2.50 m	Section N° 983	0.70	0.88	Section N° 983	0.70	1.40	Section N° 983	0.70	1.93
		1.13			1.57			2.05	
		0.18	0.39		0.18	0.62		0.18	0.84
3.00 m	Section N° 983	0.84	1.05	Section N° 983	0.84	1.68	Section N° 983	0.84	2.31
		1.35			1.88			2.46	
		0.38	0.80		0.38	1.28		0.22	0.80
3.50 m	Section N° 983	0.98	1.23	Section N° 983 + Ø 70/70/3	0.98	1.96	Section N° 983 + Ø 70/70/4	1.96	5.40
		1.57			2.19			5.74	
		0.70	1.48		0.40	1.08		0.36	1.25
4.00 m	Section N° 983 + Ø 70/70/3	1.12	1.40	Section N° 983 + Ø 70/70/4	1.12	2.24	Section N° 983 + Ø 70/70/7.1	1.12	3.08
		1.79			2.50			3.28	
		0.68	1.14		0.61	1.54		0.48	1.56

*table 6-9: Pilkington **Profilit™** profiled glass window runs above / below visual contact and ventilation shutter elements*



The number, type, size and spacing of the fixing dowels should be determined on the basis of local conditions.

*figure 6-8: Pilkington **Profilit™** profiled glass window runs above / below visual contact and ventilation shutter elements*

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Table 6-10:
Hall construction - Pilkington Profilit™ profiled construction glass window runs over visual fixed window elements, horizontal bar section N° 983 and associated reinforcement of square steel tube (galvanized) in hall window runs with viewing panes installation heights q = 0.5 kN/m²

Explanations: qv = Window loading kN/m AH = Horizontal support load kN
fh = Horizontal deformation cm

The load is transmitted from the Pilkington Profilit™ field via the visual contact elements to the breastwork. Visual contact pane assembly with reinforcement bars before assembly of Pilkington Profilit™ (due to deformation of bar 983).

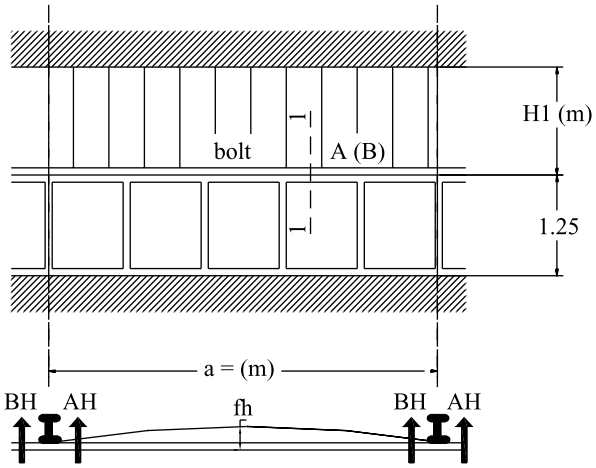
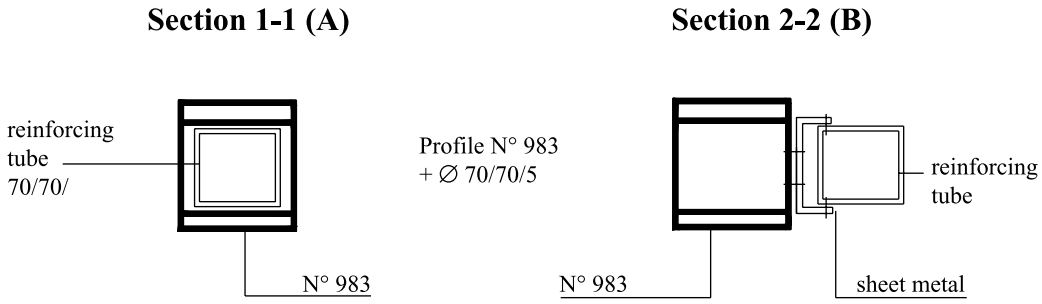


*figure 6-9: Pilkington **Profilit™** profiled glass window runs over visual fixed window elements*

	Profiled glass height H in (m)	Section N° 983 + square steel tube	qv (kN/m)	AH = BH (kN)	fh (cm)	Position of reinforcing tube
a = 5.00 m	H = 1.25 m	N° 983 Ø 70/70/5	0.63	1.56	1.95	inserted
	H = 1.88 m	N° 983 Ø 70/70/7.1	0.75	1.95	1.93	"
	H = 2.50 m	N° 983 Ø 100/70/4	1.00	2.34	1.71	behind N° 983
	H = 3.13 m	N° 983 Ø 100/70/5	1.25	2.75	1.80	"
	H = 3.75 m	N° 983 Ø 120/80/3	1.50	2.75	1.80	"
	H = 4.40 m	N° 983 Ø 120/80/4	1.76	3.53	1.63	"
a = 6.00 m	H = 1.25 m	N° 983 Ø 100/70/5	0.50	1.89	2.12	"
	H = 1.88 m	N° 983 Ø 120/80/5	0.75	2.34	1.87	"
	H = 2.50 m	N° 983 Ø 120/80/4	1.00	2.82	1.96	"
	H = 3.13 m	N° 983 Ø 140/80/4	1.25	3.30	1.88	"
	H = 3.75 m	N° 983 Ø 160/80/4	1.50	3.75	1.60	"
	H = 4.40 m	N° 983 Ø 160/80/4	1.76	4.23	1.80	"

*table 6-10: Pilkington **Profilit™** profiled glass window runs over visual fixed window elements*



Fixing of the bolts to the main structure should be determined to suit local conditions.

*figure 6-10: Pilkington **Profilit™** profiled glass window runs over visual contact elements*

6.9. Fixing system (screws / dowels) for assembly of Pilkington Profilit™ frames

Our recommendations in this respect should be of **help in selecting the fixing system** and for determining the spacing of this. We are assuming that the Pilkington **Profilit™** frame system is being used for this!

I. Sub-structure:

The following sub-structures will generally be found in line with current building practice for using Pilkington **Profilit™** profiled glass:

a) Steel structures

b) Gas concrete

c) Concrete (in-situ/reinforced concrete)

General:

Pilkington **Profilit™** aluminium frames (solid aluminium or heat-insulated) should be fixed non-positively directly to the existing structurally designed sub-structure. complying with the relevant standards.

II. Fixing system (screws / dowels)

All fixing elements on the outside or on facades must be approved by site inspection by the **Institut für Bautechnik Berlin - DIBT**. Fixing elements for frame assemblies for indoor applications of Pilkington **Profilit™** glazing can be selected on the basis of other criteria where necessary.

All fixing elements / screws must. however. be anti-rust and stainless steel.

Selection of fixing elements / Screws / Dowels for:

Steel structures ≥ 6.0 mm thick (ST 37) - possible from thickness of 3 mm
To fix the Pilkington **Profilit™** frames. we recommend screws with the following quality properties / features:

Example:
Joint elements: E-X ENDIINOX Type BZ o 6.25
Minimum thickness ≥ 6.0 mm

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Materials:	Stainless steel screws Material N° 14301. DIN 17440 Washer: stainless steel Material N° 14301 DIN 17440 with moulded-on EPDM seal.	For thin plate sub-structures up to 3 mm thick. which fulfil a structural bearing function. possibly with additional reinforcement. END stainless steel type A screws are recommended. as shown in the Figure.

Gas concrete walls
To fix Pilkington **Profilit™** frames. we recommend using screws and dowels with the following quality properties / features:

Example:
Designation for dowel/ screw combination: S10H - 100RSS made by Fischer GmbH. 72178 Tumlingen. GERMANY

Minimum thickness of screws: ≥ 7.0 mm

Note: Holes drilled in gas concrete should be made with the appropriate type of ram.

Concrete (pre-casr concrete / in-situ cast concrete)
For this we recommend the following fixing system quality, likewise made by Fischer, for example:

S10R-80 + screw 7 * 85 hexagon head

III. Spacing of fixings

Recommendations for **top and bottom Pilkington Profilit™ frames, solid aluminium or heat insulated** (for side frames, fixings can be spaced further apart).

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Table 6-11: Steel and concrete substructure (a + c)

Frame loads / Wind	**Window run height (m)**												
Design wind load (kN/m^2)	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00
0.5	**Frame load per m due to wind (kN)**												
	0.250	0.375	0.500	0.625	0.750	0.875	1.000	1.125	1.250	1.375	1.500	1.625	1.750
	Spacing of fixings (m)												
	0.75	0.70	0.65	0.60	0.50	0.45	0.40	0.35	0.30	0.30	0.25	0.20	0.20
0.8	**Frame load per m due to wind (kN)**												
	0.400	0.600	0.800	1.000	1.200	1.400	1.600	1.800	2.000	2.200	2.400	2.600	2.800
	Spacing of fixings (m)												
	0.60	0.50	0.45	0.40	0.40	0.35	0.30	0.30	0.25	0.20	0.20		
1.1	**Frame load per m due to wind (kN)**												
	0.550	0.825	1.100	1.375	1.650	1.925	2.200	2.475	2.750	3.025	3.300	3.575	3.850
	Spacing of the fixings (m)												
	0.60	0.40	0.35	0.30	0.25	0.25	0.20	0.20					

table 6-11: Frame loads / Wind and spacing of the fixings (steel and concrete substructure)

Table 6-12: Gas concrete substructure (b)

Frame loads / Wind	**Window run height (m)**												
Design wind load (kN/m^2)	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00
0.5	**Frame load per m due to wind (kN)**												
	0.250	0.375	0.500	0.625	0.750	0.875	1.000	1.125	1.250	1.375	1.500	1.625	1.750
	Spacing of fixings (m)												
	0.60	0.55	0.50	0.45	0.40	0.35	0.30	0.25	0.20	0.20	0.20	0.15	0.15
0.8	**Frame load per m due to wind (kN)**												
	0.400	0.600	0.800	1.000	1.200	1.400	1.600	1.800	2.000	2.200	2.400	2.600	2.800
	Spacing of fixings (m)												
	0.50	0.45	0.35	0.30	0.25	0.20	0.15	0.15	0.15	0.10			
1.1	**Frame load per m due to wind (kN)**												
	0.550	0.825	1.100	1.375	1.650	1.925	2.200	2.530	2.750	3.025	3.300	3.575	3.850
	Spacing of the fixings (m)												
	0.40	0.35	0.25	0.20	0.15	0.15	0.10	0.10					

table 6-12: Frame loads / Wind and spacing of the fixings (gas concrete substructure)

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6.10. Technical conversion values

Power units	
W (Watt)	= J/s = kg * m^2/s^2
1 kp * m/s	= 9.807 W
1 PS	= 735.5 W = 0.7355 kW
1 kcal/h	= 1.163 W
1 cal/s	= 4.187 W

Dynamic units	
J (Joule)	= N * m = W * s = kg * m^2/s^2
1 kp * m	= 9.80665 J
1 kcal	= 4.187 kJ
1 cal	= 4.187 J
1 erg	= 10^7 J
1 kW/h	= 3.6 * 10^6 J = 3.6 MJ

Pressure units	
Pa (Pascal)	= N/m^2
bar (Bar)	= 10^5 Pa
1 at	= 735.6 Torr = 98.066 5 kPa
1 atm	= 101.325 kPa
1 bar	= 100 kPa
1 Torr	= 133.322 4 Pa
1 m WS	= 0.1 at = 9.806 65 * 10^3 Pa

Force units	
N (Newton)	= kg * m/s^2
1 kp	= 9.806 65 N
1 Mp	= 9.806 65 kN
1 p	= 9.806 65 mN
1 dyn	= 10^5 N = 10^2 mN

Mass	
1 t	= 10^3 kg
1 ton	= 1.016 047 * 10^3 kg
	= 1.016 047 t
1 long ton	= 1.016047 * 10^3 kg
	= 1.016047 t
1 short ton	= 0.907185 * 10^3 kg
	= 0.907185 t
1 pound. Ib	= 0.45359237 kg
1 ounze. oz	= 0.02834952 kg

Thermal energy	
J (Joule)	= W * s

Length	
1 m (Meter)	= 10^2 cm = 10^3 mm = 10^6 µm
1 sm (Seemeile)	= 1852 m
	= 1.852 km
1 mi (mile)	= 1609.344 m
	= 1.609344 km
1 yd. yard	= 3 ft
	= 0.9144 m
1 ft. Foot	= 12 in
	= 0.3048 m
	= 30.48 cm
1 in. inch	= (") Zoll
	= 0.0254 m
	= 25.4 mm

Surface area	
m^2	
1 a (Ar)	= 10^2 m^2
1 ha (Hektar)	= 100 a = 10^4 m^2
1 Barn	= 10^{28} m^2 = 100 fm^2
square mile	= 2.589 988 * 10^6 m^2
	= 2.589 988 km^2
square yard	= 0.836 127 m^2
square foot	= 9.29 * 10^{-2} m^2
	= 9.29 dm^2
square inch	= 6.4516 * 10^{-4} m^2
	= 6.4516 cm^2

Volume	
1 m^3	= 10^3 dm^3 = 10^3 cm^6 = 10^9 mm^3
1 reg. Ton	
(register tonne)	= 100 ft^3 = 2.832 m^3
yd^3 (cubic yard)	= 0.764 555 m^3
ft^3 (cubic foot)	= 2.831685 * 10^{-2} m^3
in^3 (cubic inch)	= 1.638707 * 10^{-5} m^3
	= 16.38706 cm^3
1 gal (gallon brit)	= 4.546 dm^3
1 gal (gallon USA)	= 3.785 dm^3

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Chapter 7

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7. Determination of glass length and number of profiled glass panes

7.1. Determination of glass length

To determine the exact **glass length L**, the vertical frame joint dimensions X should be deduced from the outside dimensions of the frame structure, height H. (If no seal is specified between the frame and the structure, the dimension H is identical to the clear height of the opening in the structure). The frame joint dimensions X consist of data X_1 and X_2 given by the top or bottom frame, ($X = X_1 + X_2$).

Note:

To determine the dimension H by measurement on the structure, a large number of measurements need to be made to establish the minimum clear height of the window opening. The lowest measured vertical clearance is based on determination of the frame height H, from which the glass length is calculated.

7.1.1. Calculation of glass length

The formula for calculating the glass length is as follows:

L = H - X (mm)

The structural safety of the glazing requires the length of the glass run to be cut exactly to the calculated dimensions.

The value X is, as stated, dependent on the top and bottom frames. As several frame compositions as shown in the table below are possible, this value is variable.

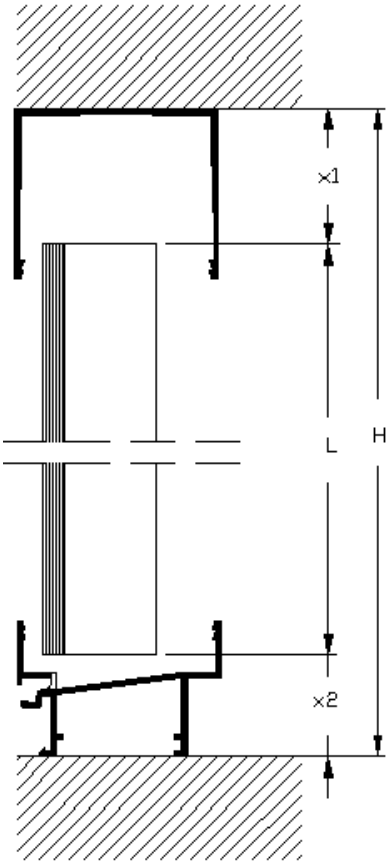

figure 7-1: Calculation of glass length

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Table of frame joint dimensions for Pilkington Profilit™ profiled glass and for shutter installation over the entire window row at a given height:

Bottom frame number	Top frame number	Frame joint dimensions	
		X (mm) for glass	X (mm) for shutter
811	810	80	85
811/50	810	80	85
811/80	810	80	85
811/100	810 WG	80	85
811/120	810 (SP)	80	85
811/150	810	80	85
811/180	810	80	85
821	820	80	85
821/50	820	80	85
821/80	820	80	85
821/100	820 WG	80	85
821/120	820 (NP)	80	85
821/150	820	80	85
821/180	820	80	85
951	950 S + 950 N	35	35
961	950 S + 950 N	60	65
961/50	950 S + 950 N	55	60
961/80	950 S + 950 N	55	60
961/100	950 S + 950 N (NP)	55	60
961/120	950 S + 950 N	55	60
961/150	950 S + 950 N	55	60
961/180	950 S + 950 N	55	60
981	980	60	65
981/50	980	60	65
981/100	980 (SP)	60	65
982	980	65	85

table 7-1: Frame joint dimensions

WG (SP) heat insulated special profile
WG (NP) heat insulated normal profile
NP non heat-insulated normal profile
SP non heat-insulated special profile

$X = X_1 + X_2$ depends on the choice of the frames

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7.2. Determination of number of profiled glass panes

7.2.1. Preliminary remark

Now that we have seen in sections 7.1. and 7.1.1. how to determine the glass length, the **number of glass panes** needed to glaze the window opening concerned now has to be calculated.

Case 1

If the designer cannot use the modular dimension of the Pilkington **Profilit™** glazing, the window opening can be free-designed. In other words, in practice the window opening generally does not match the profiled glass element modular dimensions. This means that edge panes have to be adapted by longitudinal cutting.

Case 2

If the designer intends to use Pilkington **Profilit™** construction glass, it is advisable to design the width of the window opening to take a whole number of profiled glass elements, provided other conditions so permit. In other words, the width in this case is first set as an approximation and then determined exactly to suit the profiled glass panes used.

7.2.2. Glazing of openings with optional width

To determine the number of glass runs required, the following values have to be determined:

- **External width "B"** of frame structure
  (determined from measurement of building structure)
- If no seal is specified between the frame and the structure,
  dimension "B" is identical to the **horizontal clearance** of the opening to be glazed
- **Centreline dimension "e"** of the profiled glass pane to be used
- **Lateral frame joint dimension "Y"**

The centreline dimension "e" is as follows:

Width of profiled glass pane + 2 mm, thus

K 22 = 234 mm	K 22/60/7 = 234 mm
K 25 = 264 mm	K 22/60/7 = 264 mm
K 32 = 333 mm	K 32/60/7 = 333 mm
K 50 = 500 mm	

7.2.3. Calculation of number of entire glass panes

The following formula is used to calculate the number "N" of entire glass panes:

$$N = \frac{B - Y}{e}$$

The calculation method is based on the assumption that the joint width between the individual glass panes is 2 mm. There may be some deviation from the calculated result due to deviations in construction glass element tolerances. This deviation is offset by measuring the width of the remaining pane after inserting the entire pane, cutting as necessary.

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7.2.4. Width of remaining glass pane

With small window openings, glazing is generally started from the centre outwards. In this case, the first and last pane should be cut to the exact width after measuring on the structure. Glazing will then be symmetrical if the first and last remaining panes are largely the same width.

If symmetry is not a critical factor, glazing can be started from one side.

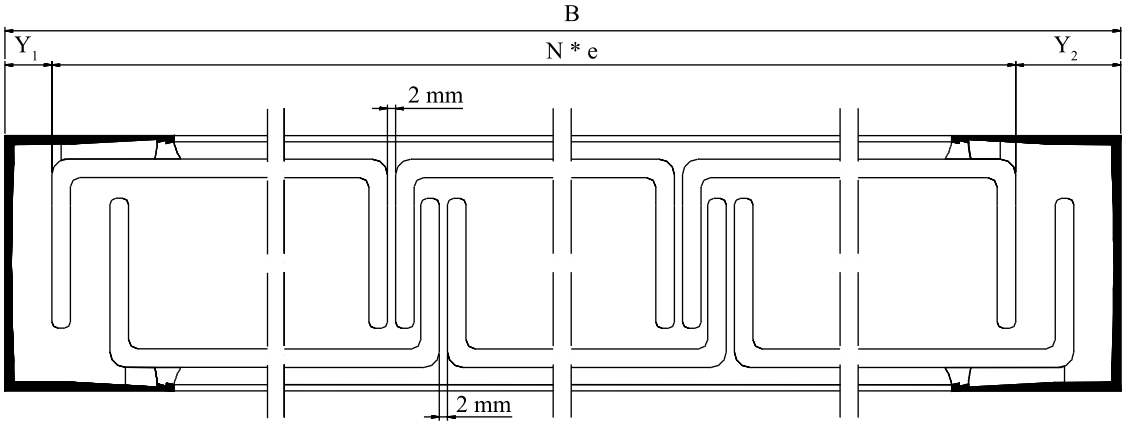
The side frame joint dimension "Y" is determined from the values of the side frame, Y_1, Y_2 and can be taken from the table below.

	Frame joint dimension Y (mm)
Side frame N° (for both sides)	**single shell + double shell**
810	80
820	80
950 S + 950 N	55
980	65

table 7-2: Frame joint dimension "Y"

The side frame joint dimension "Y" is made up of the values Y_1 and Y_2.

System: for standard profiles



Horizontal section - double shell glazing (N = number of glass panes, e = centreline dimension acc. to 7.2.5.)

figure 7-2: System for standard profiles, sketch

7.2.5. Width of openings according to modular dimensions

This is a matter of determining the exact width of a window opening so that only entire glass panes are used, in other words, profiled glass panes that have to be divided by cutting do not have to be used. The approximate dimension of the window opening is first determined. This approximate dimension then has to be corrected to the exact measurement of the window opening.

The procedure is then as described for the following example:

- Required opening width, 10 m approx.
- Appropriate profiled glass pane K 50, single or double shell

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- Appropriate frame N° 950 S
- 20 glass panes or pairs of glass panes are required
  (centreline dimension e of K 50 (glass + joint) = 500 mm)
- 20 panes thus gives a width of 20 x 500 = 10,000 mm, including joints
- For this, the side frame joint dimension "Y" is also calculated,
  e.g. for frame N° 950 = 55 mm - for single shell glazing

Result:

For this opening, an external width of the surrounding frame of B = 10,055 mm is required (B = N * e + Y). (B = 10,000 mm + 55 mm = 10,055 mm). If this dimension is too large, a figure of 19 glass panes or pairs of glass panes should be taken.

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7.2.6. Width measure table

This table applies to **single- and double-shell window walls** with 2,0 mm joint width **without framework connection dimension "Y"**, i.e. number of glasses * centreline dimension (N * e) and **without padded flanges**.

	Centreline dimension "e" (mm)			
	234	**264**	**333**	**500**
Number N	**Pilkington Profilit™ K22 K22/60/7**	**Pilkington Profilit™ K25 K25/60/7**	**Pilkington Profilit™ K32 K32/60/7**	**Pilkington Profilit™ K50**
3	702	792	999	1500
4	936	1056	1332	2000
5	1170	1320	1665	2500
6	1404	1584	1998	3000
7	1638	1848	2331	3500
8	1872	2112	2664	4000
9	2106	2376	2997	4500
10	2340	2640	3330	5000
11	2574	2904	3663	5500
12	2808	3168	3996	6000
13	3042	3432	4329	6500
14	3276	3696	4662	7000
15	3510	3960	4995	7500
16	3744	4224	5328	8000
17	3978	4488	5661	8500
18	4212	4752	5994	9000
19	4446	5016	6237	9500
20	4680	5280	6660	10000
21	4914	5544	6993	10500
22	5148	5808	7326	11000
23	5382	5072	7659	11500
24	5616	6336	7992	12000
25	5850	6600	8325	12500

table 7-3: Width measure table

7.2.7. Determination of glass length below and above ventilation shutter elements (mm)

Explanations:

H clear height
L glass length

$L = H - X$

X frame joint dimension
$X = X_1 + X_2$ (depends on the choice of the frames)

Y outer height of wing unit
Z glass length under or over the ventilation element
$Z = L - Y + 15$

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Example:

Glass length L = H - X
X = 55 mm (frames e.g. N° 961/50 and 950 N)
L = 3000 - 55 = 2945 mm

Outer height of wing unit Y = 1000 mm

Glass length over or under the ventilation element:

Z = L - Y + 15
Z = 2945 - 1000 + 15
Glass length Z = 1960 mm

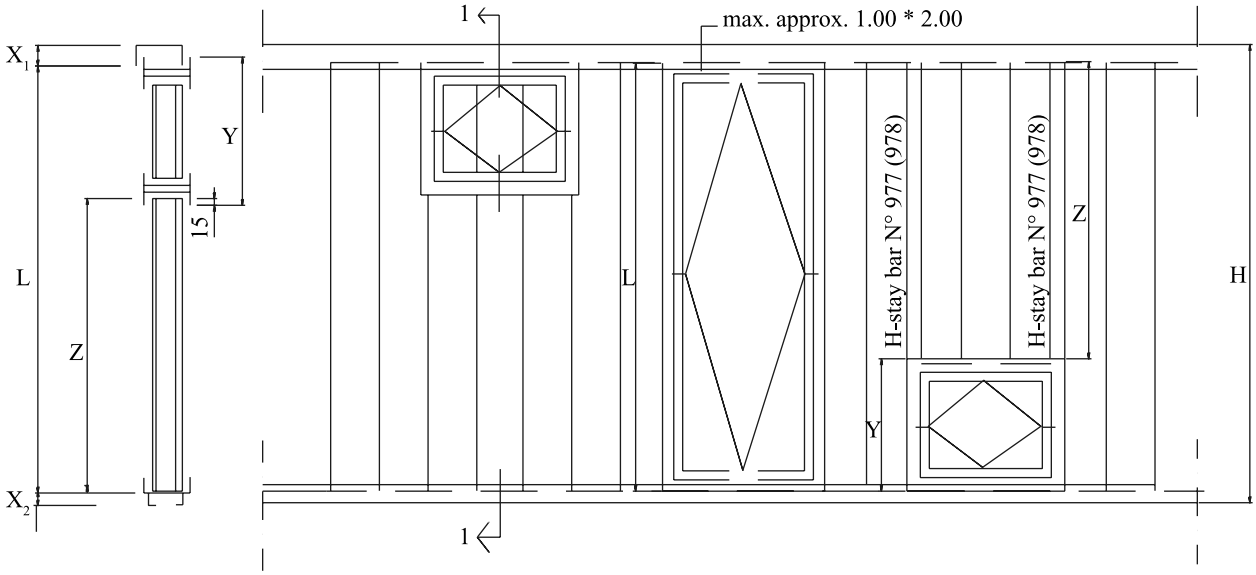

figure 7-3: Glass length over or under the ventilation element, sketch

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8. Guidelines for assembly

8.1. General guidelines for assembly

The glass fitter should take careful note of the guidelines for assembly given below. Safe assembly of profiled construction glass can be achieved for most glass construction problems by following these recommendations. The manufacturer nonetheless cannot provide any guarantees in this respect. The responsibility for safe and proper installation of Pilkington **Profilit™** glazing rests with the fitter. **In case of any doubt, you should obtain advice from our applications technology department**.

For example in a special case higher wind speeds have to be considered, or if construction problems have to be resolved that are not covered in our publications, it is essential to **contact our applications technology department**.

Basic principle: If in doubt, ask.

Additionally we would in particular stress the fact that for installation queries, we are assuming that Pilkington **Profilit™** installation system will be used.

When using Pilkington Profilit™ in Germany, we recommend in particular compliance with the following DIN specifications, guidelines and regulations, etc. or application of these as appropriate, where relevant. In all other countries all the relevant national standards and regulations that are relevant have to be followed.

Technical Guidelines N° 17:
"Glazing with multi-layer insulating glass"

Technical guidelines N° 19:
"Overhead glazing"

EN 572-7:
Flat glass used in construction, profiled construction glass - Concept - Dimensions

Bundesverband der Unfallversicherungsträger
der öffentlichen Hand - GUV

DIN 17611:
Anodized extrusion moulded profiles

DIN 18232:
Smoke and heat extraction systems

DIN 18357:
Coating

DIN 18364:
Surface protection on steel and light metal alloy regulations

DIN 18361:
Glazing work

DIN 18360:
Metal structures

DIN 18056:
Window walls

DIN 18032:
Gymnasia and sports halls

DIN 18540:
Sealing outside joints and formation of these

DIN 18545:
Part 1: sealing glazing with seals, Part 2 Group E

DIN 52460:
Testing materials for joints and glazing seals

DIN 1055 and supplementary provisions
Load data for superstructures

DIN 1748:
Extrusion moulded profiles of aluminium

DIN 4102
Fire rating of building materials and building elements

DIN 4108 and enclosure
Heat protection in building construction and
economy energy regulation heat protection regulations of 24.2.1982
Hamburg heat protection regulations for buildings of 6 October 1992

Heat protection regulations of 1.1.1995

DIN 4109:
Noise protection; concepts

VDE Guidelines 2719 - Sound insulation of windows and ancillary devices

DIN 4113
Aluminium in building construction

DIN 4766:
Surface roughness processing methods

DIN 52460:
Joints and glazing seals - Concepts

DIN 58125:
"School construction" - technical building requirements for the prevention of accidents -

…and other standards, where appropriate. Recommendations of the Institut für Fenstertechnik e.V. Rosenheim and of the Aluminium Centre in Düsseldorf should be taken into account. For example:

Code of practice A5 "Cleaning aluminium in building constructions"
Guidelines for planning and construction of roofs with seals - Flat roof design guidelines - produced and issued by the Zentralverband des Deutschen Dachdeckerhandwerks - Fachverband Dach-, Wand- und Abdichtungstechnik - e.V. and the Bundesfachabteilung Bauwerksabdichtung im Hauptverband der Deutschen Bauindustrie e.V. 1982 edition, as well as the specialist regulations for roofing, issued by the Zentralverband des Deutschen Dachdeckerhandwerks e.V. and the requirements of the general accident prevention association.

With regard to the **mandatory nature of DIN standards**, it is pointed out that they do not - as is frequently incorrectly assumed - have any "statutory" nature.

For clarification, we would quote from the code of practice for crafts, standards and the law issued in May 1978, which was published by DIN:

DIN standards are freely available to anyone for use. Anyone using them should ensure that they are correctly applied in each concrete case.

DIN standards are just one, not the only, source of information for proper technical procedure as a rule. It should also be borne in mind that DIN standards only take into account the relevant state of technology at the time of issue.

Application of DIN standards does not discharge the individual from responsibility for his own action. In this respect, anyone using them does so at his own risk. DIN Deutsches Institut für Normung e.V. or anyone involved in producing the standards, cannot be held liable.

Anyone finding an inaccuracy or the possibility of incorrect installation when applying a DIN standard is asked to advise DIN immediately, so that any faults can be remedied.

The fitter should check all recommended materials for suitability for the application in question.

8.1.1. Preparation for assembly

To reduce assembly time on site, it is recommended to cut the frame profiles to size at the workshop and prepare the corner joints. At smaller sites it is advisable to prepare the frames on site.

With exact frame assembly, profiled glass panes can be pre-cut to the exact length or ordered to fixed sizes from the glassworks.

8.1.2. Assembly equipment

The installer should be provided with full details on the following loads e.g. **wind loads**, **suction forces**, **internal building pressure (due to air-conditioning systems, for example)**, **etc.**

The following tools and equipment are required for processing and fitting Pilkington **Profilit™** frame systems and Pilkington **Profilit™** construction glass:

- Movable, demountable scaffold for assembly
- Aluminium saw for cutting metal sections and plastic sections
- Hammer drill for drilling holes in aluminium frames and main structure
- Pneumatic guns with thrust piston for joining metal sections (where suitable)
- Welding apparatus for fixing steel frames to the steel bearing structure
- Riveting tongs for riveting the frame corner joint
- Sundry tools such as a spirit level, drill for drilling holes for riveted corner joints
- Glass cutters: "Silberschnitt" model with splayed cutter head
- Cutting templates for glass cutting and cutting line for longitudinal cutting

- Hand lifter with two suction heads and connector
- Hand spray-gun for Pilkington **Profilit™** SIL or
- Compression spray (1 - 2 atu)
- Suitable cutting table with felt covering
- Standard measuring instrumentation

8.1.3. Frame assembly

The contractor should check whether the main structure can take the expected loads. The sub-structure must be structurally designed and made such that the Pilkington **Profilit™** frames can be assembled level and flush (see also DIN 18360 Metal structures - Locksmith works).

- The top and bottom frames must be assembled absolutely horizontally.
- Side frames must be fitted absolutely vertically.
- Any unevenness in the bearing sub-structure must be compensated (by customer).
- The joint in the area of the top and bottom frames should be in the form of a 45° mitre joint or joined flush.
- The joint in the area at the bottom and side frames should be flush.
- Frame joints should be sealed to prevent penetration of rainwater and condensation after riveting or bonding. We recommend e.g. a sealing strip such as EGO - Tape 2000 made by E. Goldmann, Munich. The same applies to seals on other frame joints.
- We recommend a crimped seal between aluminium frames and the adjoining structure, such as self-adhesive sealing cord or strip.
- In general fixing to the frames will be with screws and dowels. Fixing with shot type systems is only suitable in special cases. Plate screws for steel structures.
- As wind forces can be transmitted from the glass through the frames into the main structure, the main structure must be capable of withstanding these wind forces, i.e. the stability of the sub-structure should be checked before installing the frames. For example, porous concrete must have extra reinforcement or be fitted with an additional structurally designed bar structure on the lintel and breastwork.
- In addition to straddling dowels, non-rusting screws at least diameter 7 mm are necessary for fixing the frames.
- Washers should be provided between the screw head and the frame. The screw fixing area should be sealed so that it is airtight and watertight.
- In the case of gas concrete, interior window sills are recommended due to the formation of condensation on the frame.
- Window sills should be chamfered on the side (edge profile N° 974). An appropriate joint should be constructed between the edge profile and the main structure.
- Window sills should be sealed at the front of the breastwork especially in the case of gas concrete - in particular in the case of unprotected top edges on the breastwork.
- Depending on the local conditions and application, e.g. insect screens could be used to cover the drainage slits. The functionality of the drainage slits however, shall not be affected.

- It is advisable to have an "anti-drone" coating on window sills, which can be achieved by application of:
  - bonded film
  - filler
  - paint

  on the underside of the window sills. These materials can be obtained from the specialist trade sector or from the manufacturer.

- In the case of extreme temperature effects (especially on the south side of buildings), we recommend joining the frames every 3.00 m maintaining a joint about 4 mm wide. If 6.00 m long frames are installed, the joint should be about 8 mm wide. For assembly during lower temperatures, this should be slightly more.

- Frame expansion joints should be sealed with the corresponding expansion joint profiles and Pilkington **Profilit™** SIL.

- Window sill joints should match the frame joints.

- In general, the Basic frames with a separate window sill starting from an overhang of 130 mm have to be supported to ensure that the gradient of the window sill is sufficient.

- Separate window sills should be sealed with silicon before applying the PVC elastic core N° 961 K in the area of the joint and at the ends.

- Frame assembly on gas concrete blocks such as YTONG or similar:
  For this we recommend, for example, FISCHER frame dowels S 10 H - SS 100 R (hexagon head cap screw 7/105) for the top and side Pilkington **Profilit™** frames and FISCHER frame dowels S 10 H - 100 R with hexagon head cap screws 7/140 for the bottom Pilkington **Profilit™** frames.

  The recommended working load per fixing element for the top Pilkington **Profilit™** frame is 386 N max. and 525 N max. for the bottom Pilkington **Profilit™** frame.

  The values apply to GB 3.3.

  The spacing of the fixings should then be determined.

  Attention:
  Check whether the gas concrete blocks need reinforcing by structurally designed bars (see chapter 6).

  In the case of "wet" rooms or if condensation is expected, make sure that an impermeable coating is applied to the gas concrete parts before assembling the frame.

  Another critical factor in safety of the glazing is the spacing of the fixings (screws). Screw spacings are determined from the relevant wind load and the window row height for the corresponding screw quality (**please check with our applications technology department**).

  The applicable German standard for frame fixing is DIN 18056.

  For safety, in our view the fixing spacing should not exceed 50 cm, increasing the fixing point density still further if extreme loads are possible.

  The frames for horizontal glazing (964, 984, 864, 884) must be fixed alternately to the bearing, structurally designed, sub-structure; screw diameter $d \geq 7$ mm, screw spacing dependent on expected load. Main steel structures should deflect up to 1/300 in accordance with DIN 1050. This should be taken into account in determining the glass length. (If necessary cut glass longer or form double shells).

- Thermally broken frames should be assembled in offset arrangement with the fixings in the metal frame.

- The thermally broken frames shall be fixed through the aluminium. They can be coated and anodised in compound.

- To prevent corrosion damage to light metal alloy frames, this should receive appropriate paintwork facing the bearing sub-structure (e.g. steel, concrete, masonry, etc.) (Bitumen epoxy resin based paint system).
- If hot galvanized steel parts are incorporated, the cut edges and drilled holes should be coated with inorganic zinc. Before fitting, these parts should then be painted with one or more coats or appropriate dividing film applied.
- Temperatures for frame assembly should be between +5°C and +40°C.
- In the case of glazing fitted at an angle in roofs and walls, in which the base frame is at a gradient, the geometry of the bottom of the frame should be specially designed to ensure controlled run-off of condensation.
- Check that the bearing sub-structure can take the expected frame loads (due to the dead weight of the glass, wind, snow, etc.).
- Admissible deformation of Pilkington **Profilit™** window elements and Pilkington **Profilit™** structures, unless otherwise specified: L/300. See also DIN 18056 and Technical Guidelines N° 17 for glazing.
- In addition to an external seal, an internal seal is also recommended between Pilkington **Profilit™** frames and adjoining structures.

8.1.4. Glass cutting and glass assembly - use of PVC holding and pad sections

- To cut the glass, an even cutting table is necessary, ideally covered with felt. A glass cutter specially designed for profiled construction glass (pointed end with steel wheel) is required.

  The cut must be made right through the material, i.e. without stops (e.g. use of PVC- or wooden templates).

  The cut surface of the glass must be dust free and dry.

  The glass cutter wheel should be immersed in a stripping agent.

  Cut surfaces created during assembly must be even. Any roughness must be ground with a fine whetstone.

  Glass panes should be installed absolutely vertically using Pilkington **Profilit™** holding and inlay sections of rigid PVC.

  During assembly, the glass runs should be inserted into the top frame until they slide above the bottom frames and can then be inserted into them, with the entire glass web surrounded by the Pilkington **Profilit™** PVC holding section.

  To achieve an effective seal, guarantee adhesion (load transmission) and enable horizontal expansion of the Pilkington **Profilit™** profiled glass pane, these should be fitted with a joint at least 2 mm for single or double shell installation.

  Note: Pilkington **Profilit™** T and Pilkington **Profilit™** T Color thermally toughened profiled glass with or without Heat-Soak-Test: please refer to chapter 11.

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Assembly sequence for Pilkington Profilit™ glass with double shell gazing:

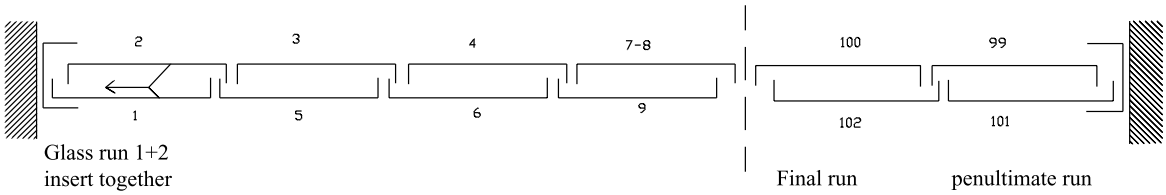

*figure 8-1: Assembly sequence for Pilkington **Profilit™** glass with double shell gazing*

Glass gap on bottom frame: 12 mm minimum
Glass gap on top frame: 20 mm minimum
For horizontal installation of Pilkington Profilit™ profiled construction glass, the glass gap on the side frame should be at least 20 mm.

- Use of Pilkington **Profilit™** holding and inlay sections

  For single shell installation, the Pilkington **Profilit™** inlay sections for the bottom Pilkington **Profilit™** frame and top Pilkington **Profilit™** frame should be cut (short sections) so that they can be inserted centrally with the appropriate distance between the flanges of a profiled glass run.

  Consequently, for single shell glazing, for top and bottom frames:

K22	= 21.0 cm
K25	= 24.0 cm
K 32 and K 32/60/7	= 31.3 cm
K 50	= 48.0 cm
K 22/60/7	= 20.8 cm
K 25/60/7	= 24.0 cm

  For double shell installation, the Pilkington Profilit™ inlay sections - same for top and bottom Pilkington Profilit™ frames - should be cut as follows:

K22	= 19.5 cm
K25	= 22.7 cm
K 32 and K 32/60/7	= 29.7 cm
K 50	= 46.0 cm
K 22/60/7	= 18.8 cm
K 25/60/7	= 22.0 cm

- For extreme temperature gradients and low window runs with a high proportion of aluminium or for “wet” rooms, condensation can occur from time to time, as Pilkington **Profilit™** double glazing is not an insulating glass and the seal is not impermeable to diffusion. The same applies if damp air is locked in (low vapour pressure with low solar radiation). The bottom Pilkington **Profilit™** frames should generally have holes drilled for aeration or ventilation.

- According to DIN 4108 Part 3, the formation of condensation in building elements is harmless if the thermal protection and structural stability of the building elements are not impaired by the increase in moisture content of the building and insulating materials. It must be ensured that the water volume generated by condensation W_T can be discharged back into the environment during the evaporation period ($W_T < W_V$). Building materials that come into contact with condensation should not be damaged. No claims may be made in such circumstances.

- The profiled construction glass should be incorporated in the frame structure such that forces from the building itself do not affect the glazing. To avoid damage to the glazing and the building structure, discharge of any condensation that occurs must be ensured (as per German standard DIN 18361).

- Surface sandblasting substantially reduces the strength of glass by damaging the fire-polished surface. If this is to be used, please **contact our applications technology department**.

- When assembling thermally broken frames, especially sandwich constructions, sound and heat protection requirements should be taken into account.

  Where applicable, the guidelines for assembly for quality-assured windows of the Gütegemeinschaft Aluminiumfenster und Fassaden e.V. of Frankfurt and the recommendations of the Institut für Fenstertechnik e.V. of Rosenheim, respectively the national standards and regulations should be applied as appropriate (e.g. expansion capacity of frames, choice of joint size, choice of sealant, filer between bottom frame and substructure with heat insulation material to improve heat insulation and prevent formation of condensation).

- The cut edges of wire reinforced glass should be processed with a manual whetstone (carborundum) - not by machine. Remove wire ends. If aggressive effects are expected, the wire ends should be protected, where atmospheres aggressive to special steel prevail.

- Heating units, etc., should be about 25 to 30 cm away from the profiled glass wall (otherwise radiation protection is required).

- **Warning:** If different types of glass are combined in double shell glazing, such as glass without wire inserts and glass with wire inserts or coated glass, particular attention must be paid to the width tolerances of the individual glass types.

  This also applies if pad sections N° 165 + 166 are also used, and for window runs one on top of the other.

- Before installation, the colour, dimensions and wire inserts, etc. should be checked. Complaints in this respect after installing the glass cannot be considered.

- It should be ensured that Pilkington **Profilit™** profiled construction glass in ventilation shutters should be positioned exactly over the glass that is above or below the shutters. The same applies if several window runs are positioned one on top of the other.

- To prevent rattling due to high winds on high glass panes (more than 2.70 m height), incorporation of pad section N° 166 is recommended.

- The rupture strength of glass can be substantially reduced if the surface and/or edges are damaged mechanically (micro-fractures, cracks, shelling). These faults are unavoidable when cutting and breaking glass with ornamentation and wire reinforced glass. These types of glass thus represent an increased risk of breakage in principle. Bubbles and differences in the surface and glass core, scoring and minor manufacturing deviations in the wire insert are acceptable, provided they do not exceed the values specified for the particular type of cast glass and the loading capability is not impaired (EN 572, Part 7).

- **Note:** To ensure adequate expansion of the glass panes with each other, these should only be sealed at the beginning and end of the flange.

- Pilkington **Profilit™** profiled construction glass is not designed to take human weight for access.

Arrangement of pad section N° 166 for roof glazing, with a gentle gradient of 0° to 45° (measured from the horizontal)

Note: The application of profiled glass in inclined glazings has to be clarified with local building authorities and compliance with national standards and regulations has to be checked.

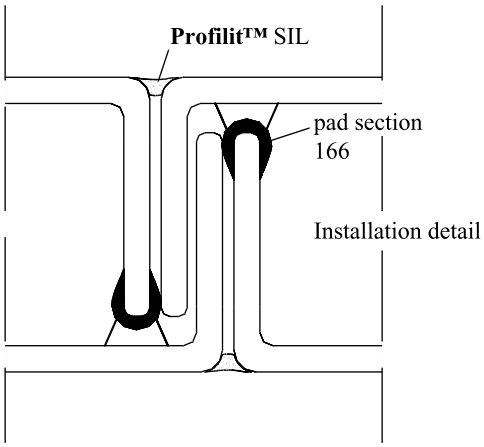

figure 8-2: Arrangement of pad section N° 166 for roof glazing

Note: Particular care should be taken to ensure that the selective coating applied is not contaminated when installing surface-treated, i.e. coated Pilkington **Profilit™** profiled construction glass (e.g. finger prints).

8.1.5. Sealing and bonding of glass profiles

The linseed oil cement and plastic materials used previously have been superseded by silicon rubber materials. Pilkington **Profilit™ SIL silicon rubber** has been developed as a seal for the Pilkington **Profilit™** installation system for bonding the glass runs together and to the adjacent frame structure (oxime/neutral system). Pilkington **Profilit™** SIL is supplied trade in plastic tubes up to 310 ml and should be applied by hand-spray or compression spray (1 to 2 atü). The hollow cone on the tube should be cut off at a slight angle.

Due to horizontal expansion of the glass, and to ensure an absolute seal, the joints between the individual glass panes should not be less than 2 mm wide and 8 mm deep (but not substantially more - see illustration 8-3 (1) below. Practical experience has shown that taking into account a seal between the glass and the frame and joint configuration between the glass runs, one tube is needed for about 15 running metres of joint. Before sealing the glass panes, make sure that these are dry and free from dust and grease.

If the glass is heavily soiled, a colourless cleaning agent should be used in accordance with the instructions for use. The contact surfaces with aluminium should likewise be treated with an adequate cleaning agent. The joint width between the Pilkington **Profilit™** glass and the aluminium frames should be more than 3 mm. The sealant adhesion surface between the glass and frame should be at least 5 mm. The shelf life is at least 12 months from the date of manufacture.

To ensure fast setting and thus prompt achievement of the loading capacity of the joint, and to guarantee an ice-free substrate for adhesion, we recommend that Pilkington **Profilit™** SIL should only be applied in temperatures over +5°C. When applying the seal, particular care should be taken to ensure that work is completed cleanly. Sealant residues can be removed from the glass surface by mechanical means or using silicon solvent. When undertaking repairs, the old silicon compound should be removed with a blade.

In general, the provisions of DIN 18361, respectively relevant national standards and regulations apply: "…joints must be watertight…".

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Note: Plastic-coated aluminium sections should be treated before sealing with Pilkington **Profilit™** SIL with Pilkington **Profilit™** primer, as otherwise optimum adhesion cannot be guaranteed. If other sealants are used, compatibility of the primer with the sealant used should be checked.

Description of Pilkington Profilit™ SIL sealant:

Reaction system:	Oxime/Neutral reacts to air humidity
Colour:	transparent
Specific density	1.01 approx.
Consistency:	paste
Processing temperature:	+5°C to +40°C
Exposure time/ambient conditions:	20 min. approx.
Reaction process/	1 day = 2 mm approx.
Ambient conditions	1 week = 6 mm approx.
Presentation:	Plastic tubes, ∅ 47 mm = 310 ml approx.
Shelf life:	12 months
Storage:	dry, at temperatures between +5°C and +25°C
Additional properties:	resistant to fungicide
Content:	310 ml

Physical properties:

Shore A hardness to DIN 53505:	20 % elongation at rupture approx.
DIN 53 504:	at least 500 %
Admissible total deformation:	25 % approx.
Tensile strength to DIN 53504:	12 kp/cm^2 approx.

Pilkington Profilit™ SIL corresponds to stress group "E" according to DIN 18545.

Note: Avoid contact with skin and eyes. Keep up-set product out of children's reach. Dispose of set sealant compound with household waste. Leave plastic sealant mass to set before disposal. When making joints between Pilkington **Profilit™** glass and aluminium frames, press the glass panes against the PVC inlay section.

Sealing profiled glass runs with Pilkington Profilit™ SIL

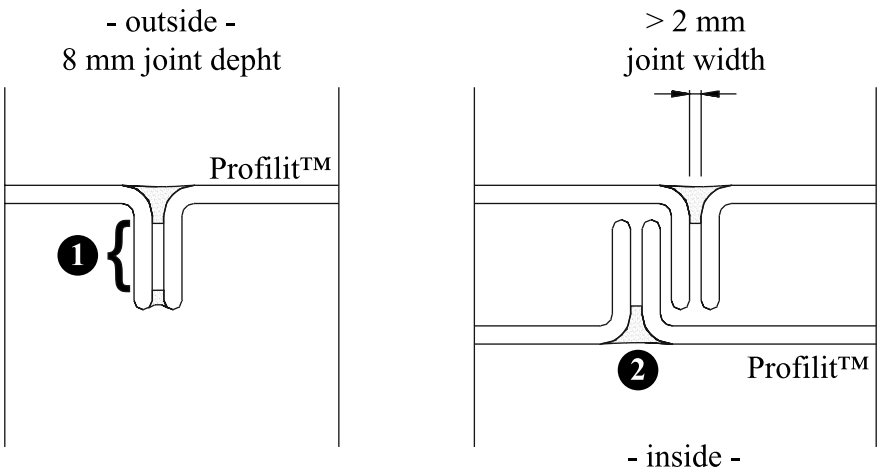

*figure 8-3: Sealing profiled glass runs with Pilkington **Profilit™** SIL, sketch (not to scale)*

Flanges should not be sealed in area ❶ as otherwise there is no room for expansion of the glass.

With double shell glazing, the inner shell should in principle be sealed as shown in ❷.

Joint should be sealed for increased safety and freedom from dust. Inadequate joints should likewise be sealed (e.g. behind columns) to prevent penetration of insects and humidity (apply silicon to glass flanges first).

8.2. Special applications

8.2.1. Sports hall glazing at risk of ball impact

The official research and materials testing institute of Baden-Württemberg, the "Otto-Graf-Institut" of the University of Stuttgart has tested and approved the ball safety properties of Pilkington **Profilit™** K 22/60/7, K25/60/7, K32/60/7 in accordance with the provisions of DIN 18032.

Construction specifications:

- Pilkington **Profilit™** glazing at risk of impact in sports centres should be double shell in each case - without wire inserts.
- For impact safety, a breastwork height of at least 2.00 m above the hall floor is required in this type of hall.
- In the case of gymnasia glazing at risk of ball impact, the tabular values for Pilkington **Profilit™** special profile types (chapter 6) do not apply, as these only take account of wind load. A breastwork height of at least 2.0 m for impact protection with regard to persons is required (above the top edge of the hall floor). Maximum tested glass length: L = 7.00 meters. For any projects deviating from this, **our applications technology department should be contacted right at the design stage**.
- Our pad sections N° 165 and N° 166 should be used over the entire length for padding the glass flange against the glass web.
- Limited ball impact safety (hand ball): tested with standard annealed Pilkington **Profilit™** (without wires).
- Ball impact safety (hand ball + hockey ball): tested with thermally toughened Pilkington **Profilit™**.
- To be absolutely leakproof against the weather and safe from breakage, the joints between glass panes should be at lest 2 mm wide and the remaining joints between the glass and the frame should be sealed with Pilkington **Profilit™** SIL.
- Ventilation shutters should be reinforced with H-frames.

Definitions (according to DIN 18032)

Ball impact safety

Ball impact safety building elements are those which can permanently withstand mechanical stresses due to the impact of a ball without any change in the element or the sub-structure.

Limited ball impact safety

Limited ball impact safety elements are those incorporated in walls which can only sustain damage from hockey balls.

8.2.2. Horizontal installation of profiled glass panes

Application:

To construct narrow, very high glazing without divisions, horizontal glazing with Pilkington **Profilit™** construction glass can be used. This type of glazing is primarily used in stairwells.

Type of glazing:

Horizontal glazing is generally recommended with double shell construction.

Installation method (see chapter 10.3 and 10.4):

Each glass pane should be fitted left and right to glass holding brackets of appropriate dimensions, using pads. The glass should not be forced due to too wide bearing angle.

At the bearing angle point, a flexible pad should also be provided (e.g. cellular rubber).

Glass panes should be sealed between each other and to the frame with a permanently elastic single-component silicon rubber (e.g. Pilkington **Profilit™** SIL).

A very important constituent is the Pilkington **Profilit™** frame system specially designed for glazing with Pilkington **Profilit™** construction glass. For admissible glass bearing spans, see chapter 6.

Warning:

Glazing should be carried out in dry weather, as inclusions of moist air between the panes can be difficult to dry out.

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8.2.3. Inclined glazing and glazing at shallow gradient up to 45° (Roof glazing)

Note: The application of profiled glass in inclined glazings has to be clarified with local building authorities and compliance with national standards and regulations has to be checked.

Glazing that is horizontal or inclined at an angle of up to 45° can be either single shell or double shell construction.

Roof glazing must in principle have safety properties.

In addition to the standard longitudinal wire inserts, with a wire spacing of about 25 mm, Pilkington **Profilit™** profiled construction glass types K 25, and K 25/60/7, with 16 non-rusting longitudinal wires correspond, according to the officially confirmed tests conducted, to the same glass type with the original spot-welded wire mesh inlay now no longer produced. With double shell glazing, it is sufficient for the bottom layer of glass only of Pilkington **Profilit™** to have a wire insert. The cut edges of wire reinforced glass should be treated before fitting (by folding the ends, for example) to round off any micro-inclusions. The glass flanges with the double shell construction should be padded with transparent pad section N° 166. Similarly, the glass support should be padded against the bearing structure (with neoprene strip, for example).

The glazing should be secured to the substructure by means of a suction anchor with an intermediate support, to prevent lifting in the wind (see also chapter 10).

For roof glazing and anywhere, where for specific reasons, such as barrack construction, profiled construction glass with wire mesh inserts has long been required, Bauglasindustrie GmbH now offers Pilkington **Profilit™** profiled construction glass K 25, and K 25/60/7, with 16 wire inserts in each case.

The structural values match the long published values for Pilkington **Profilit™** profiled construction glass with longitudinal wire inserts for “roof” applications in chapter 6 of the Pilkington **Profilit™** manual.

For technical installation reasons, glass panes should not exceed 3.50 m for normal profiles and 4.50 m for special profiles.

The roof pitch should be the minimum ensuring easy run-off of rainwater. A self-cleaning effect will only be achieved as the roof pitch increases. The maximum glass length should be determined on the basis of snow and wind loads and dead weight. See Pilkington **Profilit™** catalogue chapter 6.
Based on structural conditions, we recommend, for example, narrow Pilkington **Profilit™** profiled construction glass for roof glazing, and in particular types K 25, and K 25/60/7, in this case. Glazing with sun protection glass type “Antisol” or with Pilkington **Profilit™** heat protection glass ‘plus 1.7’ (for inner shell only) is also possible.

Maximum bearing span of glass panes (extract from chapter 6 of the Pilkington **Profilit™** catalogue).
More than one intermediate support is recommended, with reservation, to offset any difference in deformation of the substructure. Snow and wind load assumptions should be met in accordance with local official data or DIN 1055.

- Pilkington **Profilit™** glass should be affixed in the surrounding frame on fitting strips, of at least 50 SHORE hardness 4 x 10 mm, and sealed with silicon rubber.
- Plastic support sections should be used for the bottom frame. For gradient > 60°, Pilkington **Profilit™** inlay sections N° 961/2 N (981/2) and N° 962/2 N (980/2) can also be used.
- Joint spacing between glass panes approximately 3.0 mm.
- For double shell glazing and gradients up to 45° from the horizontal, transparent pads N° 166 fitted continuously along the glass flange are recommended.
- Projection of the Pilkington **Profilit™** glass panes on the support is dependent on stresses, but to a maximum of 8 cm.
- Padding of the Pilkington **Profilit™** glass on the centre support should consist of a light padding material such as Neoprene of the appropriate width, depending on load.

- The glass panes should be secured against slippage or lifting (wind/suction) (see sketches). The glass should not be forced.
- Support areas should be designed to prevent heat accumulation.
- The bottom frames should be designed and fitted in such a way that any moisture can always run off "outwards" over the roof edge (through drainage holes, for example).
- Heat protection regulations should be taken into account, where applicable in individual cases (thermally separate frames).
- "Bonding" of the Pilkington **Profilit™** glass panes to the supports and glass joints with the sub-structure are not permitted.
- The sub-structure should be designed for structural stability.
- Maximum deformation of sub-structure: 1/300. If centre supports are used, make sure that the edge supports do not deflect more than the centre support.
- All joints should be sealed so that they are watertight (sealing strip such as EGO-Ferm or EGO-Tape 2000). Expansion joint width 8 mm minimum.
- Joints on frames should be continued over the glass surface (for expected high expansion values or large window row lengths for example).
- Frame length 2.00 m to 6.00 m dependent on sub-structure and building situation.
- Building expansion joints should be observed and developed in line with the glass surface and frames.
- Roof surfaces are not accessible (for assembly and repair purposes only with special precautions).
- Roof surfaces should be secured against avalanche.
- Condensation may form in the gap between double shell glazing under certain conditions.
- The following guidelines should be observed where relevant:
  Guidelines for planning and construction of roofs with seals - Flat roof design guidelines - produced and issued by the Zentralverband des Deutschen Dachdeckerhandwerks - Fachverband Dach-, Wand- und Abdichtungstechnik - e,V. and the Bundesfachabteilung Bauwerksabdichtung im Hauptverband der Deutschen Bauindustrie e.V. 1982 edition, as well as the specialist regulations for roofing, issued by the Zentralverband des Deutschen Dachdeckerhandwerks e.V.
- For definitions of roof glazing / overhead glazing, see chapter 6.
- If movement is expected in the window rows (roof and wall) due to type of hall, substructure, temperature effects, etc., the necessary expansion joints should be provided in the glass surface and frames.

8.2.4. Shed glazing

Shed glazing is a special type of roof glazing and can be constructed as either single or double shell. The most usual gradient of the glass surface from the vertical is 30°.

For both types of glazing, appropriate bottom shed frames are available (940 + 940w and 982, 982w).

Frames for double shell construction are mounted with hammerhead screws and can be drained (see chapter 10).

Inclination of glazing to the horizontal is generally large enough not to need to cater for snow loads, but the possibility of snow accumulating must be taken into account.

- Vertical shed glazing counts as window walls according to DIN 18052 - not overhead glazing - and wire inserts are not required.

- Drainage holes as required in the bottom frame should be made by the fitter to suit the roof pitch.

8.2.5. Zigzag glazing

When determining the bearing span, the relevant wind loads or snow loads should be taken into account with this type of application. Sealing with Pilkington **Profilit™** SIL should be carried out with care. The top should be covered with a plate and the glass elements secured against lifting due to suction, by means of a steel section fitted over the glazing, for example.

Formation of Pilkington Profilit™ all-glass corners, single and double shell

With double shell construction, zigzag glazing is used as a glass wall. In this case, the aluminium frames should be cut to the corresponding angle, corresponding to the width of the profiled glass pane used for short zigzags, and correspondingly longer for long zigzags (for example, 3x the length of the profiled glass pane and 1x length of the profiled glass pane).

8.2.6. Sheet pile glazing

Sheeting wall glazing as a variant of single shell wall glazing consists of Pilkington **Profilit™** glass panes nested or aligned alternately, in which the PVC sections in the top and bottom frame have to be cut between the glass flanges. The system is sealed inside and outside.

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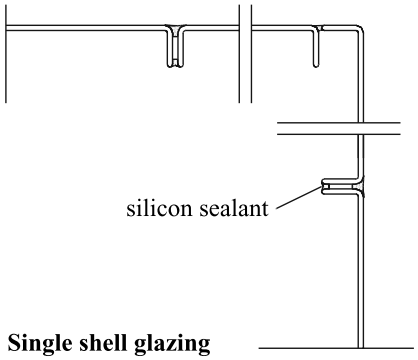
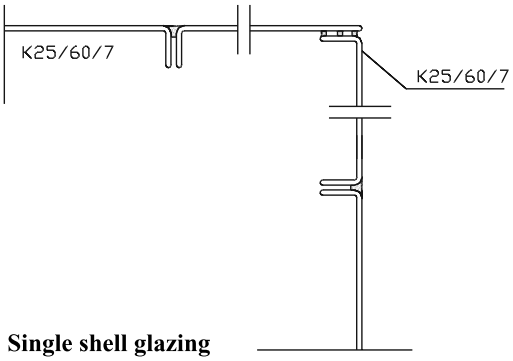
8.2.7. Glass corners

All-glass corners can be constructed for either single shell or double shell glazing, insofar as DIN 1055 - Sheet 4 and supplements, respectively national standards and regulations so permit (higher wind load assumptions).



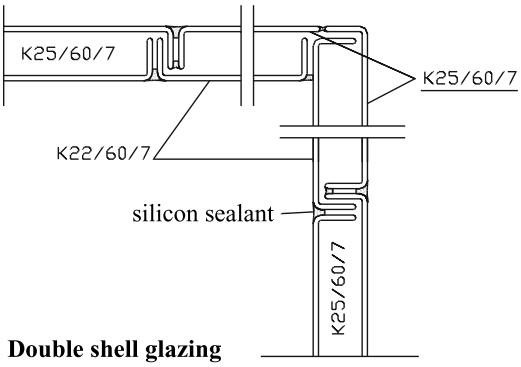
Single shell glazing

installation suggestion in case of an
application of whole glass runs



Single shell glazing

installation suggestion in case of an
application of length cutted glass run



Double shell glazing

at least one glass run must be cut
lengthwise and pad by profile N° 166

figure 8-4: Glass corners

With the single shell all-glass corner, and double shell, the fitting options are as shown above. The feasibility of these options for specific projects should be checked for individual applications.

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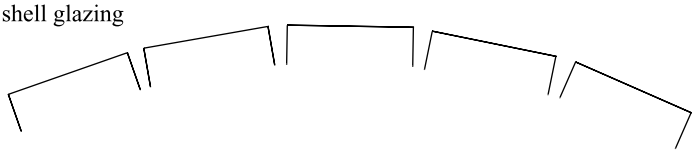
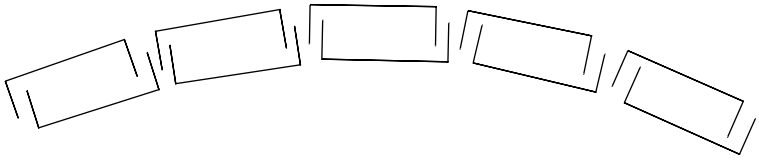
8.2.8. Curved glazing

The following fitting options are possible:

Single shell glazing



Double shell glazing
a) for radius of 1.50 m and up



b) for radius of 2.00 m and up

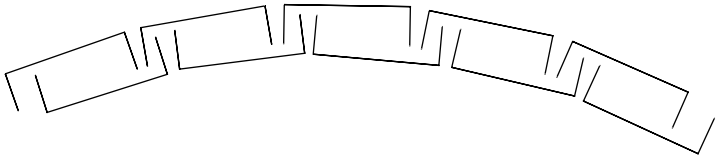


figure 8-5: Curved glazing

Curved glazing, for example for stairwell enclosures, can be single or double shell.
Narrow glass types are the most suitable.

Frame geometry:

Frames may be

a) cut into the inside in the glass centreline area and curved. A cover-plate must be fitted in this case.

b) machine-bent.

The minimum bending radius for Pilkington **Profilit™** glazing is 1.50 m approx. (regarding the glass).

8.3. Arrangement of wind stay bars

If installation heights are required which are higher than the admissible installation height, a wind stay bar can be fitted mid-way up the window row. Arrangement of the stay bar not only entails special structural calculation of admissibility of the glass load, the design dimensions of the stay bar are also of exceptional importance. **If necessary, please contact our applications technology department**. Calculation of the wind stay bar should be carried out by a qualified structural engineer.

Fitting specifications

The wind stay bar is fitted behind the glazing to absorb horizontal wind forces. A pad made of Neoprene (or equivalent) should be fitted over the entire window row width between the Pilkington **Profilit™** glazing and the wind stay bar. A specially designed suction anchor for Pilkington **Profilit™** profiled glass is used to anchor the Pilkington **Profilit™** glass panes to the wind stay bar. The suction anchors should be fixed under the stay bar, providing additional retention for the pad section.

Every Pilkington **Profilit™** glass run should be anchored.

8.4. Installation of ventilation shutters

Heat insulated ventilation shutters - apart from pivoting type - correspond with DIN 18055 and fall into RMG (frame material group) 2.1.

The installation of ventilation shutters in Pilkington **Profilit™** glass walls requires perfect skilled assembly. The shutter must be fixed so that it cannot twist. If possible, standard shutters should be used, of a width enabling full runs to be fitted. The modular section should also be taken into account with special sizes. Pivoting type are best as with this system, the centre of gravity remains in the glass wall area when the shutter is opened. An additional inner interlock can be provided on the centre-hung sash if required.

- If the casement is assembled over the entire window row height, it is recommended that the top and bottom frames run continuously and the shutter is fitted in between (see chapter 10 and chapter 6).

- If the ventilation shutter is built into a window row, the U glass runs which would otherwise run continuously from the bottom to the top frames, will be interrupted over the width of the shutter light. These glass runs thus transmit only part of the wind load directly onto the window row frame, whilst the remaining wind load is transmitted to the two directly adjacent continuous glass runs. In this case, a vertical stay bar (H-bar) or similar should be fitted on both sides of the shutter light (provided the light is not already fixed on one side to the side window row frame), running from the bottom to the top window row frame. The stay bars should be fitted so that they meet flush. This ensures that the two adjacent glass runs (depending on arrangement of the shutter light, only one adjacent glass run) are only exposed to their own wind load and hence no additional loads which could result in a substantial reduction in the admissible installation height.

  In general, it is necessary to specially reinforce the shutter lights in profiled glass walls (irrespective of whether the profiled glass walls are single or double shell; an exception to this are low window runs, following structural confirmation).

  The types of installation shown, 1 to 10, guarantee the requisite vertical or horizontal reinforcement of shutters and doors. For maximum deformation of metal sections, see DIN 18056, point 5.3.3.

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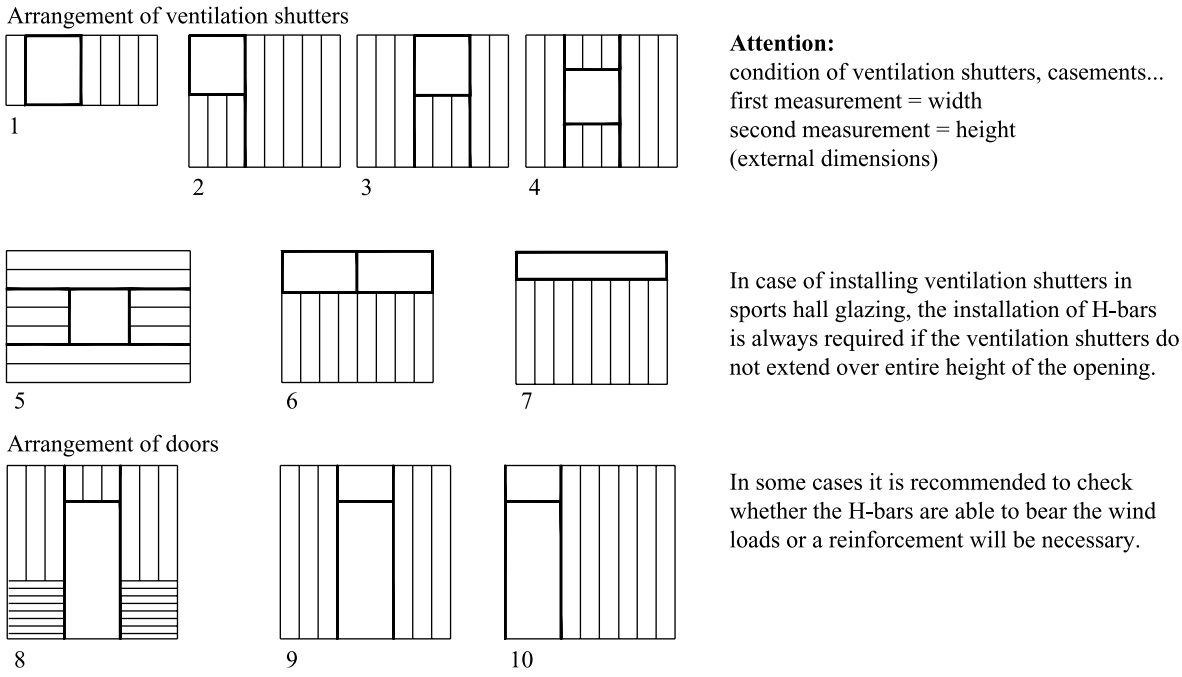

Attention:
condition of ventilation shutters, casements...
first measurement = width
second measurement = height
(external dimensions)

In case of installing ventilation shutters in sports hall glazing, the installation of H-bars is always required if the ventilation shutters do not extend over entire height of the opening.

In some cases it is recommended to check whether the H-bars are able to bear the wind loads or a reinforcement will be necessary.

figure 8-6: Installation of ventilation shutters

Arrangement of ventilation shutters

"L" = max. glass length from the tables in chapter 6
* Light dimensions ≤ 1.0 * 1.0 m

- If ventilation shutters are to be fitted at the top of an element with the fixed part of the skylight opener hand lever below, particular details should be given.
- If the hand lever of the linkage of a skylight is to be fitted to the side frame or H stay bar with a centre-hung, hinged or tilting light, the cross-shaft must be fitted on the right or left and the hand lever must be bent at right angles if there is a soffit. Any bends in the linkage are the responsibility of the customer. This should be stated when the customer places an order.
- Ventilation shutter elements and element combinations with fixed parts for vertical and horizontal installation must also be specially reinforced. This should be taken into account in the calculations and order. If the element is not reinforced by the manufacturer, the customer must do this (e.g. with square tubing). This also applies to thermally insulated structures.
- From rod lengths of 5.0 m and over, a manually operated or electric motor geared drive will be required for skylight openers.
- Unless the order states otherwise, ventilation shutters will be supplied mill finished or with anodised or galvanised coatings.
- The maximum cord length for pivoting lights with spring-load catches is 6.0 m
- ISO glass is also suitable for glazing with sealed profiles for all ventilation shutter groups and elements (please state specially in order).
- When ordering and using rubber glazing seals, state pane thickness (e.g. total thickness of ISO panes).
- For pivoting casement operation with cord control and pulleys, 2 side rollers and 1 fixed roller are required.

- ISO glass used in Pilkington **Profilit™** ventilation shutter elements is generally glazed with intermediate strips and silicon sealant. EPDM sealing profiles can also be supplied on request.

- Isoglass used in Pilkington **Profilit™** ventilation shutter elements is generally glazed with intermediate strips and silicon sealant. EPDM sealing profiles can also be supplied on request. The intermediate strip size should be selected to suit the type of light, glass holding strips and glass thickness.

  In this case, the maximum glass thickness for visual contact elements and ventilation shutters is as follows:
  Flat glass: up to 8 mm
  Isoglass: up to 24 mm

  Note: For maximum surface load N° 930 and N° 936, see chapter 6.

  These frames for installing visual contact elements are also available in heat-insulated quality: 930w, 931w, 934w and 936w.

  Please make special note of the importance of the hole arrangement in sections N° 931, 931w, etc. to offset vapour pressure (where required).

  If several ventilation shutters or shutter elements and fixed parts are arranged alongside each other, they should be joined with section 934.

  If profiled construction glass is installed over ventilation shutters/elements, the window frame should have forced ventilation (holes).

- For tilting, rotating tilting and rotating casements, the actuation handles are generally positioned mid-way up the light (figure 8-7, pos. 1). If the handle height is offset from this, details should be obtained from the customer, taking into account the light size and arrangement in the window row (figure 8-7, pos. 2).

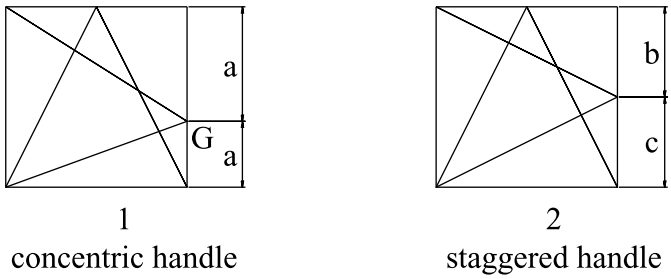

figure 8-7: Handles for tilting, rotating tilting and rotating casements

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8.5. Installing visual contact elements in accordance with workplace regulations

To install visual contact elements, a side frame N° 930 and a top or bottom frame N° 931 will be required. The side frames are fixed with aluminium angle brackets - 2.5 mm thick - to the top and bottom Pilkington **Profilit™** frames. Frame N° 931 is clamped in the top and bottom Pilkington **Profilit™** frames. Additional fixing is not necessary.

The double stay bar N° 936 has an external dimension of 55 mm, so that it fits in the 60 mm wide Pilkington **Profilit™** frame and is thus easy to install.

Ventilation shutters slide over the double stay bars. Visual element frames can only be installed in conjunction with the 60 series Pilkington **Profilit™** frame.

8.6. Safety regulations for handling profiled glass

Personal protection equipment recommendations (taken from ZA1/163)

When working and handling profiled construction glass, the following personal protection equipment should be used:

1) To avoid injury by cuts to the hand and lower arm, use suitable safety gauntlets with long cuffs or use special lower arm protection (protective sleeves).

2) To avoid injury by cuts to the body, wear safety aprons.

3) Foot protection in accordance with DIN 4843 “Safety boots, technical safety requirements”.

4) For work areas where there is a risk of head injury, safety helmets must be worn in accordance with DIN 4840.

5) For work areas where there is a noise level of 85 dB(A) or over, ear defenders must be worn.

All other relevant national safety measures, regulations and personal protection regulations shall be followed.

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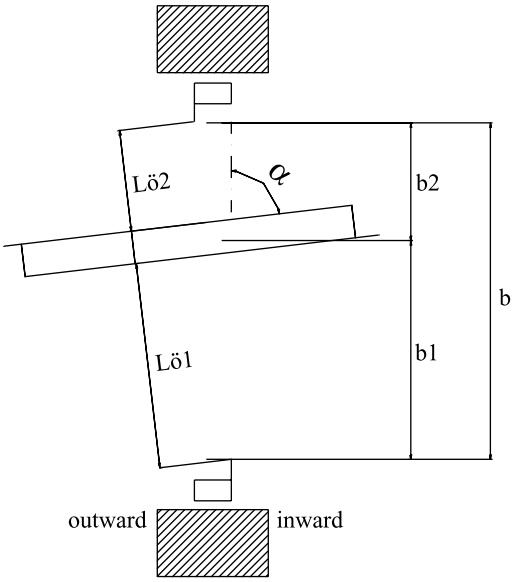
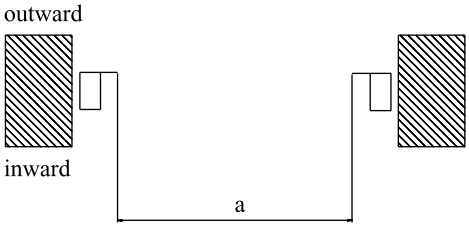
8.7. Calculation of geometric ventilation surface "Ag" according to window geometry - Provisions and specifications

Off-centre bearing of Pilkington Profilit™ pivoting window casements

Example: "PIVOTING WINDOW LIGHT" - top inwards



System section, vertical



System section, horizontal

figure 8-8: Calculation of geometric ventilation surface "Ag", example

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α for pivoting window lights with cord pull actuation = 83°

If an aerodynamic cross-section is required, the Cv value should be agreed with the relevant authority.

Cv value = efficiency of window construction < 1

Definitions:

Ag = free ventilation surface
Löw = inside opening
b1 = vertical light clearance
b2 = vertical light clearance
b = b1 + b2
a = horizontal light clearance

Formula for pivoting light:

Ag = a * (Löw1 + Löw2) **geometric**

Basic formula per light:

Ag = Löw (a + b)

but:

Ag max. = a * b

Note:

Aerodynamic ventilation surface (Aw) in relation to geometric ventilation surface:

Aw = Ag * Cv

Geometric ventilation cross sections of Pilkington Profilit™ pivoting lights (NP):

Dimensions External dimensions in mm	Ventilation cross-section in m^2
785 x 785	0.39
835 x 835	0.43
1000 x 1000	0.67
1050 x 1050	0.75
1050 x 1195	0.89

*table 8-1: Geometric ventilation cross sections of Pilkington **Profilit™** pivoting lights (NP)*

General note:
All national standards and regulations governing the design of free geometric ventilation surfaces for openings in vertical facades of smoke ventilation installations have to be followed.

Off-centre bearing of Pilkington Profilit™ pivoting lights

Light height "h" (mm)	Eccentricity "a"
up to 835	50 mm
1000	40 mm
2000	30 mm

*table 8-2: Off-centre bearing of Pilkington **Profilit™** pivoting lights*

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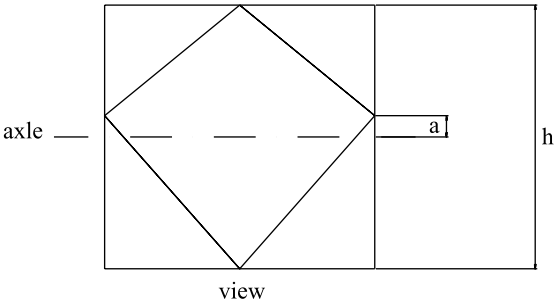

figure 8-9: Off-centre bearing of Pilkington Profilit™ pivoting lights

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Chapter 9

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9. Aluminium and plastic sections for Pilkington Profilit™ installation system

The Pilkington Profilit™ installation system consists of the elements described below:

a) Aluminium frames of anodized semi-machined quality, plus special coatings

b) Aluminium frames of thermally broken quality

c) Plastic inlay sections of high impact light grey rigid PVC

d) Plasticized PVC pad sections

e) Wind anchors
For the application of wind anchors please **contact the Applications Technology department**.

f) Sealing sections of neoprene and plasticized PVC

g) Semi-machined sections will be supplied in anodizing quality.

9.1. Pilkington Profilit™ aluminium frames

Aluminium frames have the following general quality features:

- Alloy = AlMgSi0.5 (DIN 1725)
- Hardening = F 22
- Anodizing = EV1/E6; 20 my (according to DIN 17611)

Aluminium frame tolerances correspond with DIN 1748.

- Anodizing hardness = 350 to 400 Wickers
- Strength (admissible): σ H = 93.5 N/mm^2
  σ HZ = 106 N/mm^2
- Modulus of elasticity: E = 70,000 N/mm^2
- Shear modulus: G = 27,000 N/mm^2
- Heat expansion coefficient: α_T = 2.3 - 10^{-5} mm (mm K)
- Heat expansion: α = 24 - 10^{-6} (1/°C)
- Weight: ρ = 27 kN/m^3

Aluminium is naturally covered with an oxide layer of about 0.01 my to 0.10 my thick and should not really therefore require additional protection. The natural oxide layer is, however, not generally sufficient to satisfy the requirements for

a decorative surface finish. It is also only effective in the chemically neutral range and does not offer sufficiently high wear strength. Sections and plates will therefore generally be anodized or coated.

The classification of Pilkington **Profilit™** frames in heat-insulated aluminium/plastic composite sections in the material groups in DIN 4108, Part 4 is given in chapter 9.

Aluminium frames and other aluminium parts should be properly protected as and where required during the construction period until final acceptance of work if there is a risk of attack due to alkaline water, cement splashes, etc., where reference is made to such protective measures in the tender documents. In this connection, we would draw attention to code of practice "A5" issued by Aluminium-Zentrale GmbH of Düsseldorf and to all relevant national standards and regulations.

Note:

When storing aluminium sections, make sure that there is no build-up of condensation (e.g. by using cardboard packaging).

RAL-coated frames should be degreased before sealing with silicon sealant or suchlike (e.g. R 1000 for Pilkington Profilit™ SIL.

RAL Reichsausschuss für Arbeitsnormung und Lieferbedingungen

WG Heat-insulated Pilkington **Profilit™** frames (aluminium/plastic composite frames)

9.1.1. Anodising quality

This means:

Surfaces

Irrespective of the anodizing method selected, the following **surface treatments** can be carried out before anodizing:

Abre-viation	Preliminary treatment process	Structure or appearance
E 0	no preliminary treatment	mould striations and scratches perceptible
E 1	ground	blunt ground structure corresponding to abrasive grain
E 2	brushed	matt gloss, scratches possibly visible
E 3	polished	gloss, scratches and mould striations still visible
E 4	ground and brushed	matt gloss
E 5	ground, polished	gloss
E 6	chemically pre-treated	satin matt, mould striations and scratches possibly still visible

table 9-1: Anodising quality / surface treatments

Colours

EV 1	Natural silver	
EV 2	New silver	Single-stage
EV 2	Light gold	anodizing
EV 4	Deep gold	process

Electrolytic colouring

C 0 Natural silver (EV 1)

C 31	Light bronze	Two-stage
C 32	Brilliant bronze	anodizing
C 33	Mid-bronze	process
C 34	Deep bronze	
C 35	Black	

Note:

EV	Anodizing association
C	English abbreviation for colour
ELOXAL	Electrolytic oxidation of aluminium
M	Microlytic
F	Hardening

- **Aluminium offers particular advantages:**
  - high strength, low weight
  - easily processable
  - resistant to aggressive atmospheres in anodized or coated quality
  - non-combustible, magnetically neutral
  - no loss of strength due to solar radiation
  - not brittle to frost or UV radiation
  - dimensional accuracy

- **Precautions for transportation, storage and assembly:**

  Anodized aluminium frames and anodized parts must be transported and stored properly to avoid damage. Additional precautions for protecting the frames or parts during transportation, storage and assembly should be agreed.

9.1.2. Powder coating

The parts to be coated must be pre-treated. Iron parts must be phosphatized and aluminium must be chromated. This ensures perfect adhesion. The powder coating is applied electrostatically to the prepared substrate. The subsequent heat process produces an impermeable, resistant plastic coating with a coating thickness over 100 my (microns).

Result:

- High coating thickness, therefore long service life
- Optimum elasticity with a high degree of hardness
- Colour fidelity
- Non-susceptible to lime mortar
- Processable and ductile (milling, punching, drilling, bending)

Coating:

Light metal alloy parts should have an electrolytic polyester-based powder coating to the colour selected by the customer. The coating thickness should be 50 - 80 microns. The powder coating should be hardened and heat-treated at temperatures of 160°C to 220°C. The gloss level should be at least 60 % according to DIN 67530 (angle of incidence 60°).

The coating should be applied in accordance with the guidelines issued by the Gütegemeinschaft für Stückbeschichtung von Bauteilen e.V. (GSB).

9.1.3. Wet coatings

The quality of a coating is determined by the quality of the lacquer system and adhesion to the metal. The adhesion is dependent on pre-treatment alone.

According to the latest state of technology in DIN 50939, the following pre-treatment is required**:**

1) The aluminium should be carefully degreased.

2) Surfaces should be pickled.

3) Surfaces should be chromated.

4) After chromating, the parts should be rinsed in salt-free water.

Only then should coatings be applied.

The coating should be applied electrostatically with fully automated spray guns; coating thickness: 50 my (variable from 20 to 60 my); processing temperature: 70 - 130°C.

By chromating by immersion (before coating), a certain level of corrosion protection is already achieved where the coating is incomplete.

When exposed to the elements, chromating of the aluminium is the prerequisite for good coating adhesion (DIN 50939). It likewise offers good corrosion protection. PUR 2 K coatings can be adapted to suit specific requirements by careful choice of type and quantity of initial components. Elasticity and surface hardness take into account different material thickness and mechanical stresses during construction.

Highly effective dispersal carried out in the liquid phase provides finer distribution of pigment and thus exact grading of colour and gloss. The smooth sealed surface is also obtained at the same time.

PUR 2 K coating offers the highest chemical resistance and are thus the ideal long-term option for protection even under the direct effect of aggressive atmospheres.

PUR 2 K coatings are non-susceptible to extreme temperature changes, even with humidity.

The exceptionally good fade resistance is ensured by aliphatic polyisocyanate, used as a curing component in 2 K coatings. Ultraviolet rays are reflected.

The hard smooth surface, lasting gloss and dirt-repellent properties ensure a fine appearance from afar. Coated surfaces are easy to clean as there is little stubborn dirt to remove and in extreme cases, aggressive cleaning agents can be used.

General notes on powder and wet coatings:

Unless otherwise requested, only the visible surfaces will be completely coated. If all surfaces of a frame need to be coated (all round) this should be specifically stated. The application (use) should also be stated. Preliminary treatment in accordance with DIN 50939.

As there may be slight differences in shade from one coating contractor to another despite the RAL colour definitions, its is recommended that coating should only be carried out at one works.

Wording of original RAL colour chart:

„Colour and gloss taken from this chart should not be taken as binding as there may be differences in colour from the original colour charts in the RAL 840-HR and RAL 841-GL indexes due to different production methods and pigmentation."

As neither RAL nor the powder coating manufacturers commit themselves to colours being binding in their colour charts, we would make the following recommendations:

a) Associated projects should in principle have a surface produced by one manufacturer only (no division).

b) If a) is not possible, colours should be matched beforehand with colour samples before application, if colour matching is required for materials from different manufacturing sources.

Calculation of the surface area for determining prices of RAL coatings should be based on the anodizing quality grade. Exception: large plate (ask for details).

9.2. PVC inlay sections

Pilkington **Profilit™** PVC inlay sections are designed to hold the glass in position and adjust the Pilkington **Profilit™** glass in the frame, to ensure a proper joint between the Pilkington **Profilit™** glass and the Pilkington **Profilit™** frame.

Pilkington **Profilit™** PVC inlay sections also act as a contact surface for the Pilkington **Profilit™** glass.

Pilkington **Profilit™** PVC inlay sections are made of an impact-resistant, fade-resistant rigid PVC Hostalit Z material.

Pilkington **Profilit™** PVC inlay sections can be used in applications up to 60°C.

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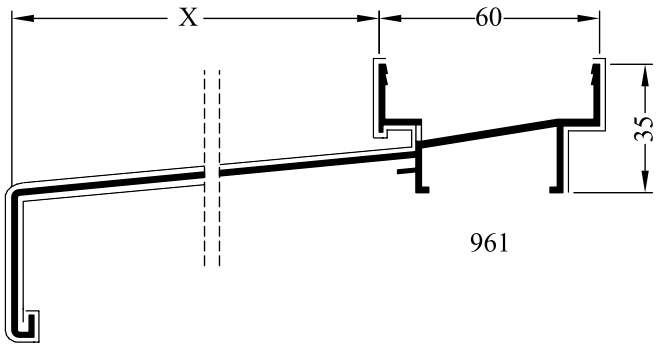
9.3. Aluminium and plastic profiles for Pilkington Profilit™ glazing (NP/SP) (Overview - Pilkington Profilit™ Installation Components - Annexe 3)

Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
Bottom frame N° 961/x window sill with condensation channel 50, 80, 100, 120, 150, 180 drip edge 40 mm - optimized -	

Article N°	Window sill overhanging (mm) /incline	Completion (m^2/running metre)	Weight (g/running metre)	Visible surf. (m^2/running metre)
961/50	50	0,500	990	0,280
961/80	80	0,560	1176	0,309
961/100	100	0,600	1355	0,329
961/120	120	0,685	1366	0,349
961/150	150	0,695	1734	0,379
961/180	180	0,755	1893	0,409

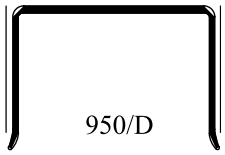
Expansion joint profile N° 961/D for bottom frame N° 961 + 961/50 ... Weight: 206	Compl.: 0,120 VS: 0,025  961/D
Expansion joint profile N° 950/D for top and side frame N° 950N, 950S and 920 Weight: 492	Compl.: 0,368 VS: 0,176  950/D

*figure 9-1: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (1)*

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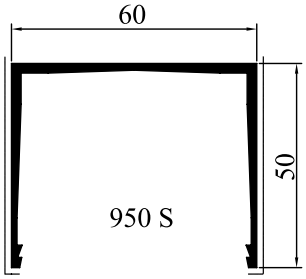
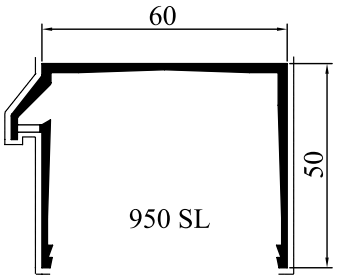
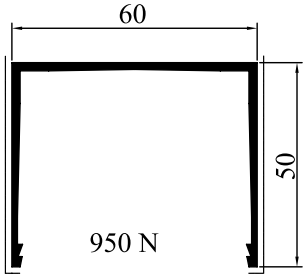
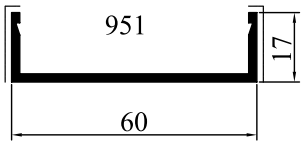
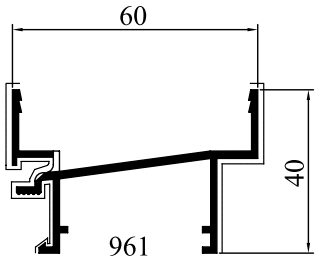
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
Top and side frame N° 950S Weight: 770 - optimized -	 Compl.: 0,320 VS: 0,104
Top frame N° 950SL Weight: 834 with integrated ventilation	 Compl.: 0,349 VS: 0,114 Top frame with integrated ventilation
Top and side frame N° 950N Weight: 662 - optimized -	 Compl.: 0,320 VS: 0,104
Bottom frame (Interior glazing) N° 951 Weight: 478	 Compl.: 0,189 VS: 0,038
Bottom frame with channel condensation N° 961 Weight: 685 - optimized -	 Compl.: 0,334 VS: 0,136

*figure 9-2: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (2)*

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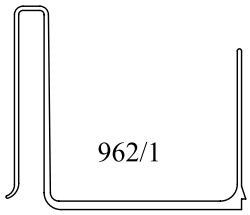
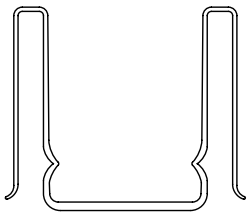
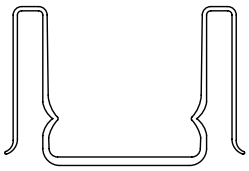
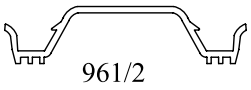
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
Top and side inlay profile N° 962/1 non punched for single glazing Weight: 300	
Top and side inlay profile N° 962/2N non punched for double glazing Weight: 380	
Top and side inlay profile N° 962/2A (old) for installation in ventilation casement non punched Weight: 330	
Bottom inlay profile N° 961/2 non punched Weight: 165 + N° 961/1 Weight: 150	

*figure 9-3: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (3)*

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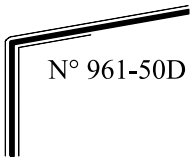
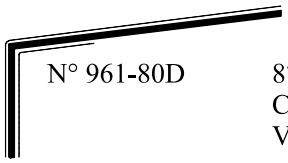
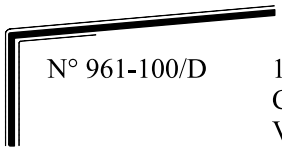
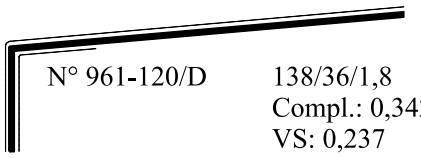
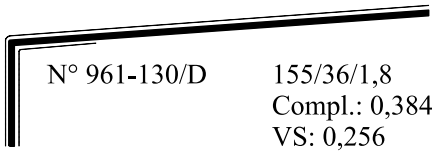
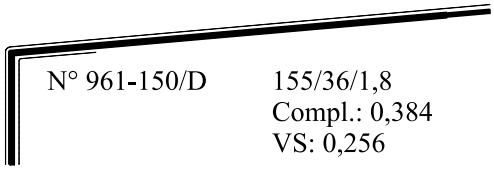
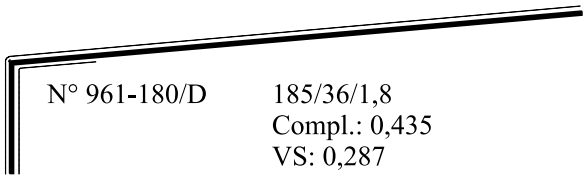
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
Expansion joint profile N° 961-50 for bottom frame N° 961/50, 981/50 Weight: 354	 N° 961-50D 57/36/4,1 Compl.: 0,190 VS: 0,161
Expansion joint profile N° 961-80D for bottom frame N° 961/80, 821/80, 811/80 Weight: 597	 N° 961-80D 87/36/1,8 Compl.: 0,249 VS: 0,211
Expansion joint profile N° 961-100D for bottom frame N° 961/100, 821/100, 811/100, 981/100 Weight: 692	 N° 961-100/D 107/36/1,8 Compl.: 0,326 VS: 0,299
Expansion joint profile N° 961-120D for bottom frame N° 961/120, 821/120, 811/120 Weight: 780	 N° 961-120/D 138/36/1,8 Compl.: 0,342 VS: 0,237
Expansion joint profile N° 971-130/D for window sill N° 971/130 Weight: 824	 N° 961-130/D 155/36/1,8 Compl.: 0,384 VS: 0,256
Expansion joint profile N° 961-150/D for bottom frame N° 961/150, 972/150, 821/150, 811/150 Weight: 891	 N° 961-150/D 155/36/1,8 Compl.: 0,384 VS: 0,256
Expansion joint profile N° 961-180/D for bottom frame N° 961/180, 973/180, 821/180, 811/180 Weight: 1048	 N° 961-180/D 185/36/1,8 Compl.: 0,435 VS: 0,287

*figure 9-4: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (4)*

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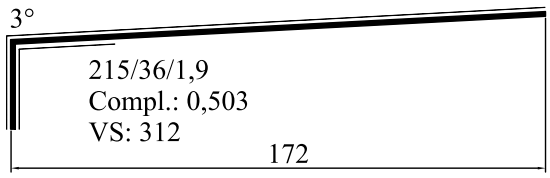
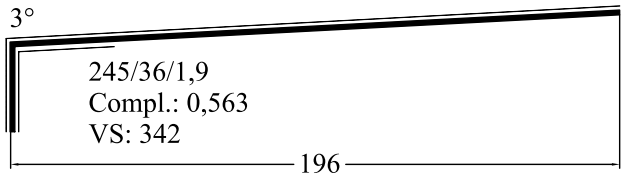
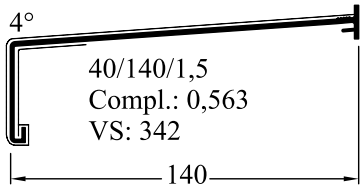
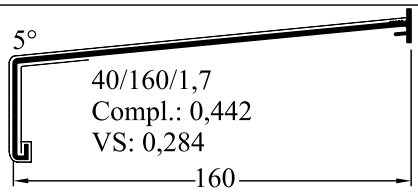
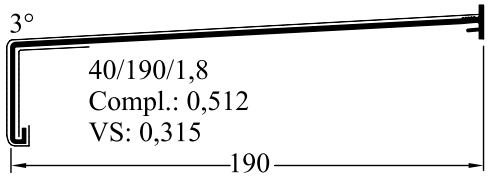
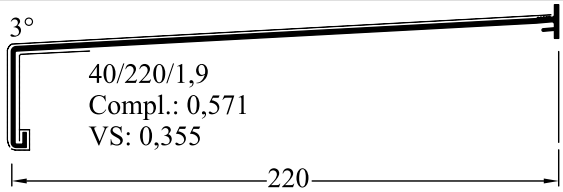
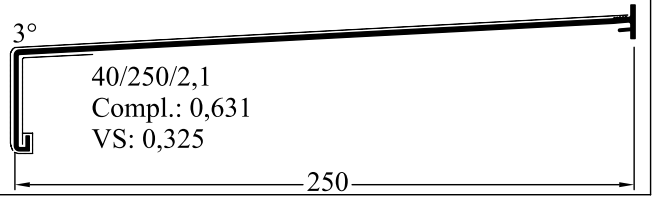
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
Expansion joint profile N° 973/210/D for N° 973/210 Weight: 1280	
Expansion joint profile N° 973/240/D for N° 973/240 Weight: 1634	
Window sill N° 971/130 for profiles 961, 981 811, 821 Weight: 826	
Window sill N° 972/150 for frames 961, 981 811, 821 Weight: 1328	
Window sill N° 973/180 for frames 961, 981 811, 821 Weight: 1151	
Window sill N° 973/210 for frames 961, 981 811, 821 Weight: 1328	
Window sill N° 973/240 for frames 961, 981 811, 821 Weight: 1693	

*figure 9-5: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (5)*

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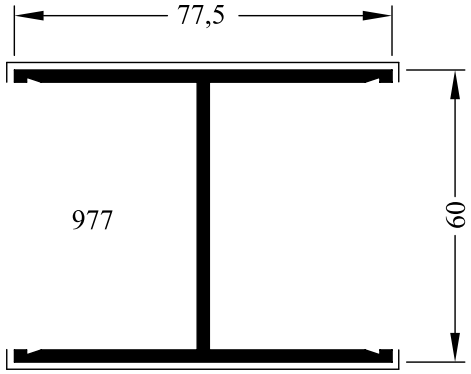
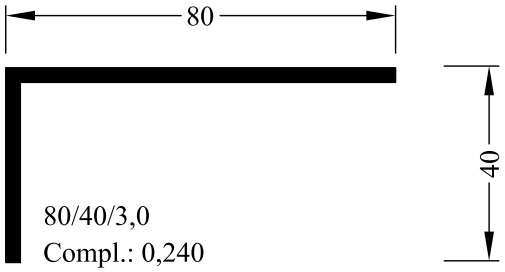
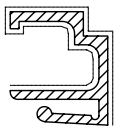
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
H-frame N° 977 for installation of ventilation shutters, for series 60 N° 961, 961/50, 961/80, 961/100, 961/120, 961/150, 961/180, 940, 963, N° 950S - 950N	
Corner connection N° 976 cut to a width of 55 mm Weight: 949	
PVC clamp profile N° 961K (grey + black) for connection of window sill with bottom frame N° 971/130, 972/150, 973/180, 973/210, 973/240	  N° 974 20/25/2 Compl.: 0,162 VS: 0,099 window sill end profile Weight: 384

*figure 9-6: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (6)*

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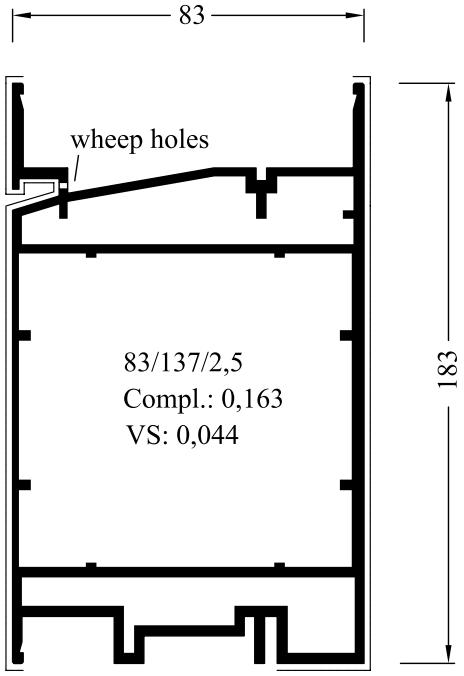
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
Latch-bolt profile N° 983 for subdivision of **Profilit™** glass walls NP/SP and Iso glass Weight: 4274	

*figure 9-7: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (7)*

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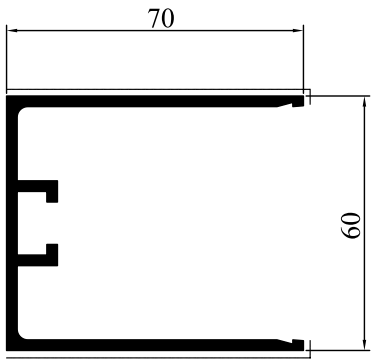
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
Side frame for horizontal NP-glazing N° 964 Weight: 1453	 N° 964 70/60/2,5 VS: 0,145 **Note:** Fitting Halfen-screw: HS20/12, M8x20 nut, washer and support angle min. 60/60/3 mm (for K22, K25, K32) or 60/60/4 mm (for K50) made of aluminium width: 30 mm

*figure 9-8: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (8)*

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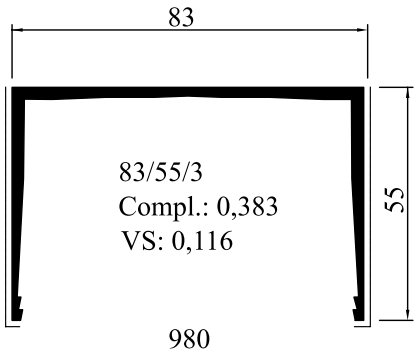
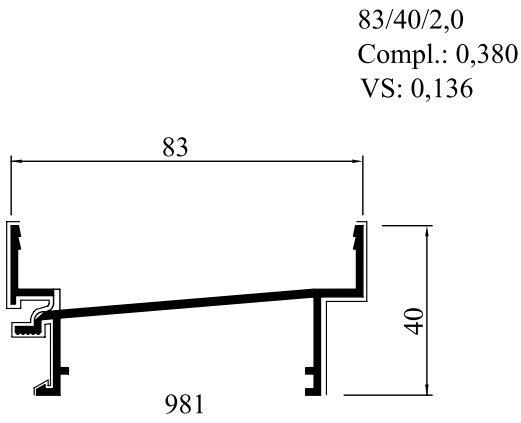
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
Top and side frame N° 980 Weight: 1226 - optimized -	
Bottom frame with condensation channel N° 981 Weight: 826 - optimized -	

*figure 9-9: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (9)*

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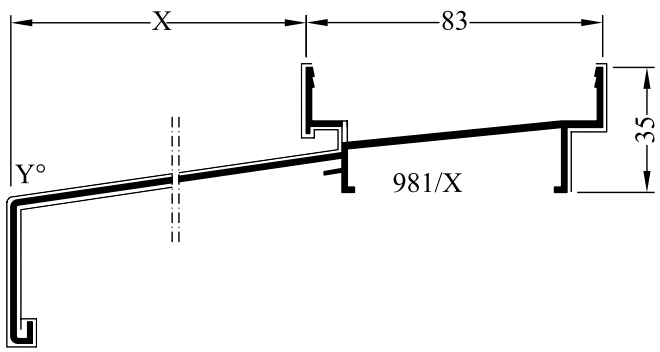
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
Bottom frame N° 981/x with adapted window sill: 50, 100 mm Drip edge 40 mm - optimized -	

Article N°	Window sill overhanging (mm) /gradient	Completion (m^2/running metre)	Weight (g/running metre)	Visible surf. (m^2/running metre)
981/50 981/100	x=50 / Y=10 x=100 / Y=5,5	0,547 0,644	1096 1350	0,280 0,329

Joint expansion profile N° 981/D for bottom frame N° 981 + 981/50 + 981/100 Weight: 206	Compl.: 0,165 VS: 0,025 
Joint expansion profile N° 980/D for top and side frame N° 980, 910 Weight: 626	Compl.: 0,314 VS: 0,086 

*figure 9-10: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (10)*

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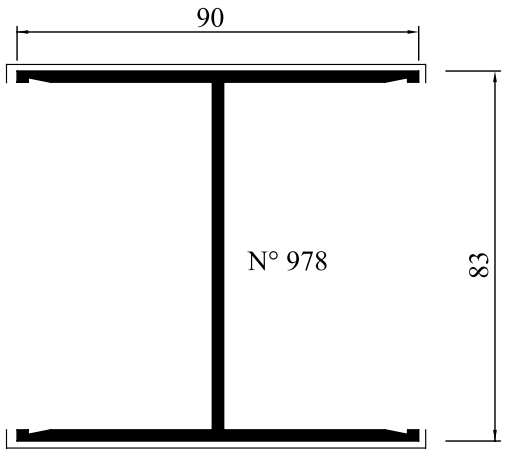
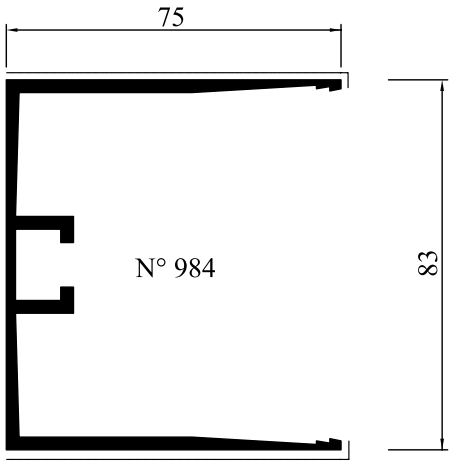
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
H-bar N° 978 for installation of ventilation shutters for series 83: 980/981/982/ 981-50, 981-100 Weight: 1702	
Side frame for horizontal SP-glazing, e.g.: stairways N° 984 Weight: 1687 75/83/2,9 Compl.: 0,526 VS: 0,306	 **Note:** Fitting Halfen-screw: HS20/12, M8x20 nut, washer and support angle min. 60/60/4 mm made of aluminium width: 50 mm

*figure 9-11: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (11)*

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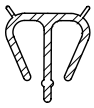
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
Padding profile N° 165 for glass flange Weight: 115	Colour: transparent
	N° 165 double 
Padding profile N° 166 for glass flange Weight: 72	N° 166 single 
Sealing profile N° 170 thermoplast for bottom frames with integrated window sill Weight: 45	Colour: black
	N° 170 
Sealing profile N° 965 + 965GT for door frames Weight: 90	Colour: black
	N° 965 GT/D 

*figure 9-12: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (12)*

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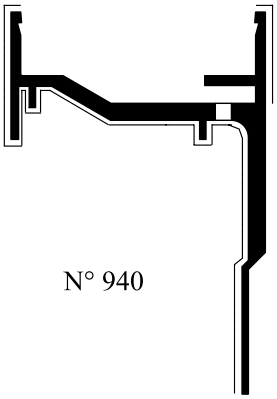
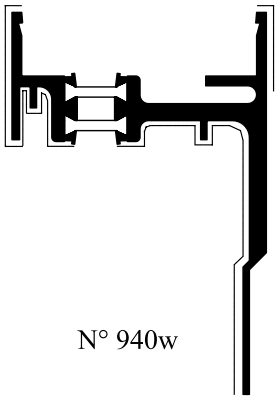
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
N° 940 Shed glazing for double and single glazing, (curtain wall) flange inside (NP) Weight: 1485	 N° 940 60/90/2,0-4,0 Compl.: 0,400 VS: 0,212
N° 940w Thermally insulated shed glazing for double and single glazing, (curtain wall) flange inside (NP) Weight: 1804	 N° 940w 60/90/2,0-4,0 Compl.: 0,455 VS: 0,212

*figure 9-13: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (13)*

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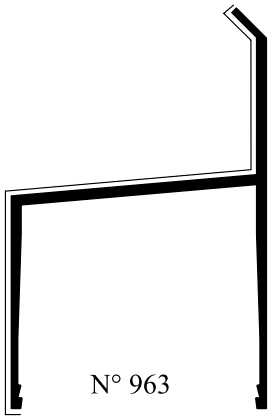
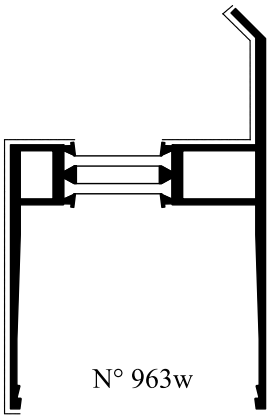
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
N° 963 Top and side frame (curtain wall) Weight: 1145	 60/55/86/2,3-2,5 Compl.: 0,397 VS: 0,144
N° 963w Top and side frame thermally insulated (curtain wall) Weight: 1380	 60/62/94/2,3-2,5 Compl.: 0,427 VS: 0,140

*figure 9-14: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (14)*

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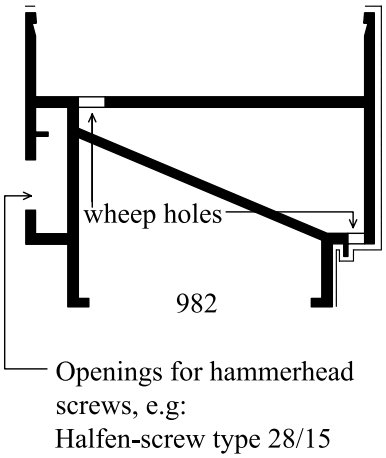
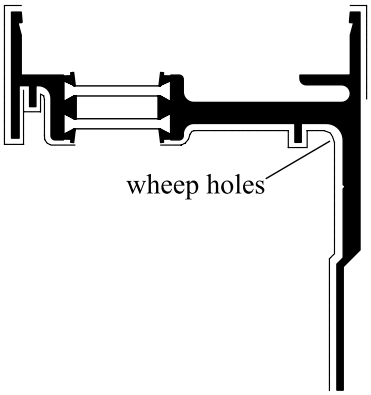
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
N° 982 Top frame for double and single glazing, flange inside (SP) Weight: 2084	 70/83/2,5 Compl.: 0,479 VS: 0,094 max. frame loading as a result of vertical installation, double shell < 2,00 m screw distance 20 cm
N° 982w Bottom frame for double and single glazing, flange inside (SP) heat insulated Weight: 1954	 83/90/2,0-5,0 Compl.: 0,487 VS: 0,275 max. frame loading as a result of vertical installation, double shell < 2,00 m screw distance 20 cm

*figure 9-15: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (15)*

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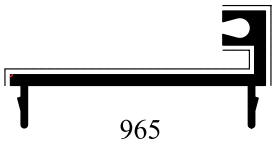
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
Door frame N° 965 GT suitable for all glass doors (Delodur or Klarit) (for use with 977) Weight: 1054	 965 GT with gasket N° 965 GT/D 60/25/2,3 Compl.: 0,315 VS: 0,083
Door frame N° 965 suitable for wooden and metal doors (for use with 977) Weight: 1032	 965 with gasket N° 965 GT/D 60/2,5/2,3 Compl.: 0,223 VS: 0,098

*figure 9-16: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (16)*

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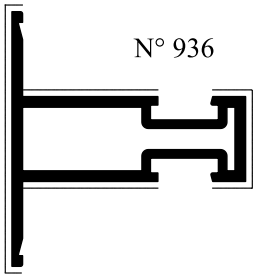
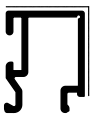
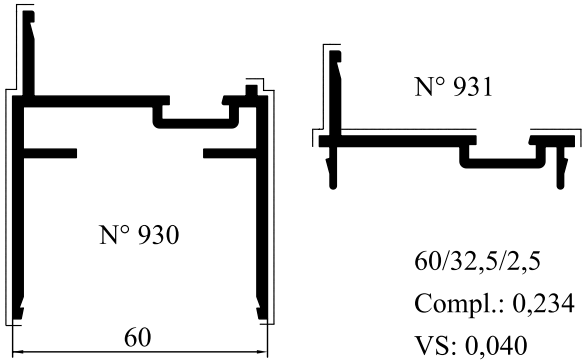
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
Double bar N° 936 for transparent elements Weight: 1315	 N° 936 60/70/2,5 Compl.: 0,439 VS: 0,142
Aluminium clip strip N° 932 for Iso glass up to 24 mm glass thickness Weight: 282	 N° 932 Compl.: 0,439 VS: 0,142
Side frame N° 930 Weight: 1367	 N° 931 N° 930 60 60/32,5/2,5 Compl.: 0,234 VS: 0,040 60/70/2,5 Compl.: 0,439 VS: 0,142
Top, side and bottom profile for transparent elements N° 931 Weight: 669	

*figure 9-17: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (17)*

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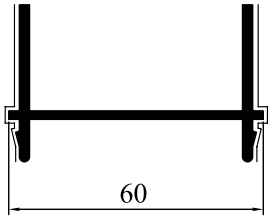
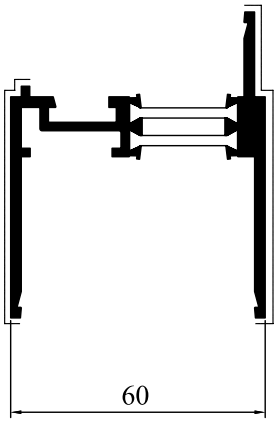
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
Connecting profile between top, side and bottom frame N° 934 Weight: 610	 55/35 Compl.: 0,272 VS: 0,062
Side frame for transparent elements N° 930w Weight: 1437	 Compl.: 0,163 VS: 0,044

*figure 9-18: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (18)*

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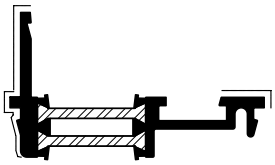
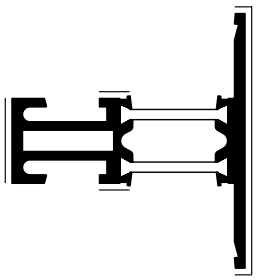
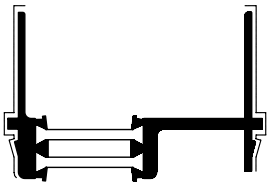
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
Top, side and bottom clamp profile N° 931w Weight: 752	 60/32,5/2,5 Compl.: 0,225 VS: 0,040
Double bar N° 936w for transparent elements Weight: 1227	 55/60/2,5 Compl.: 0,270 VS: 0,085
Ventilation shutter connecting profile N° 934w Weight: 740	 55/35/2,0 Compl.: 0,260 VS: 0,062

*figure 9-19: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (19)*

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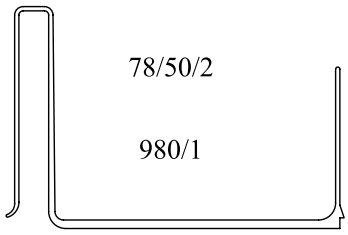
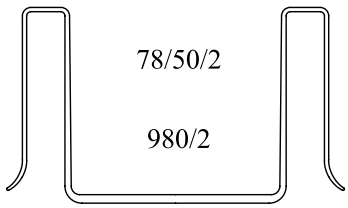
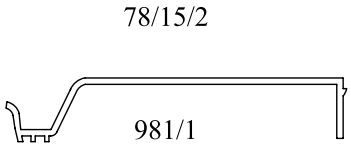
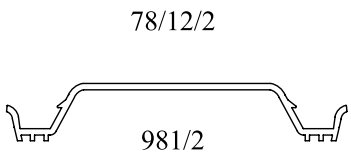
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
Top and side inlay profile N° 980/1 non punched for single glazing Weight: 450	
Top and side inlay profile N° 980/2 non punched for double glazing Weight: 520	
Bottom inlay profile N° 981/1 non punched for single glazing Weight: 235	
Bottom inlay profile N° 981/2 non punched for double glazing Weight: 225	

*figure 9-20: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (20)*

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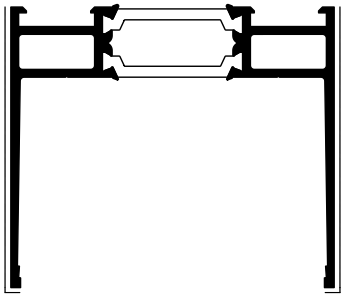
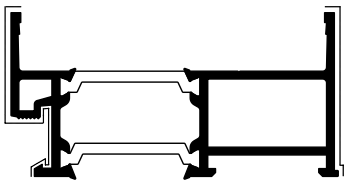
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
Top and side frame N° 810 Weight: 1770	 83/72/2 Compl.: 0,455 VS: 0,149
Bottom frame N° 811 Weight: 1515 with slit	83/42/2 Compl.: 0,337 VS: 0,11 
Window sills and including expansion joint profiles are available in widths: 130 - 240 mm	

*figure 9-21: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (21)*

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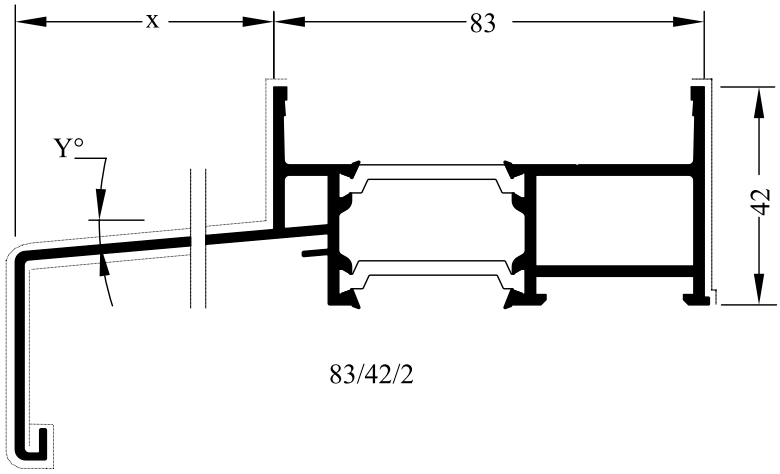
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
Bottom frame No. 811/x with condensation channel and window sill in lengths of: 50, 80, 100, 120, 150, 180 mm Drip edge 40 mm	

Article No	Window sill overhanging x (mm)/ inclination Y°	Completion (m^2/run. metre)	Weight (g/run. metre)	Visib. surface (m^2/run. metre)
811/50	50/10°	0,524	1936	0,252
811/80	80/7,0°	0,583	2073	0,281
811/100	100/5,0°	0,622	2163	0,301
811/120	120/5,0°	0,662	2255	0,321
811/150	150/5,0°	0,694	2523	0,350
811/180	180/3,0°	0,778	2677	0,380

*figure 9-22: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (22)*

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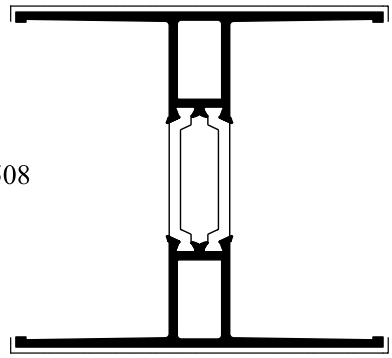
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
H-bar N° 812 for installation of ventilation shutters Weight: 1679	83/91/2 Compl.: 0,508 VS: 0,192  Reduction measurement of Profiles N° 810 and N° 811 for **Profilit™** glazing and ventilation shutters = 80 mm

*figure 9-23: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (23)*

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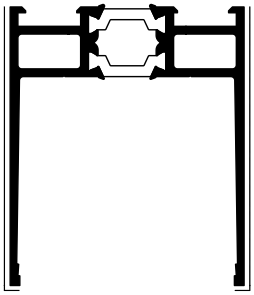
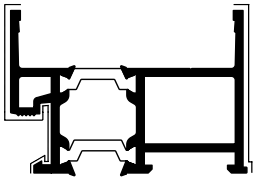
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
Top and side frame N° 820 Weight: 1666	 60/72/2 Compl.: 0,409 VS: 0,149
Bottom frame N° 821 Weight: 1346 with slit	60/42/2 Compl.: 0,291 VS: 0,11 
Window sills and including expansion joint profiles available in widths: 130 - 240 mm	

*figure 9-24: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (24)*

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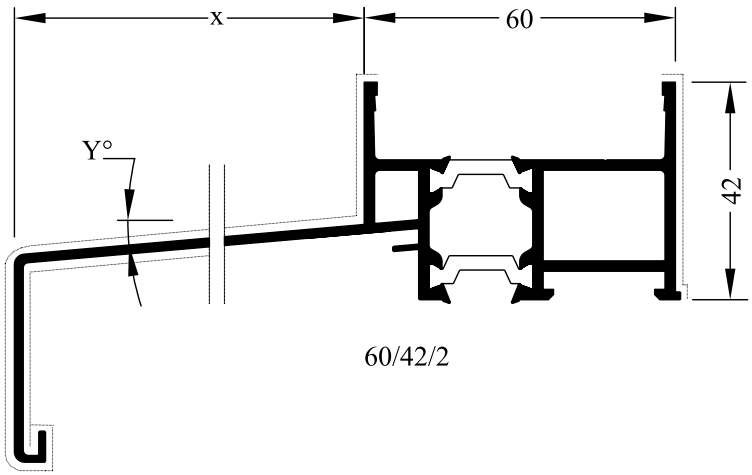
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)			
Bottom frame No. 821/x with condensation channel and window sill in lengths of 50, 80, 100, 120, 150, 180 mm Drip edge 40 mm				
Article No	Window sill over-hanging x (mm)/ inclination Y°	Completion (m^2/run. metre)	Weight (g/run. metre)	Visib. surface (m^2/run. metre)
821/50	50/10°	0,478	1790	0,252
821/80	80/7,0°	0,537	1927	0,281
821/100	100/5,0°	0,576	2017	0,301
821/120	120/5,0°	0,616	2109	0,321
821/150	150/5,0°	0,648	2377	0,350
821/180	180/3,0°	0,732	2531	0,380

*figure 9-25: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (25)*

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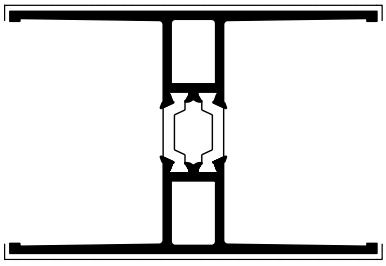
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
H-bar N° 822 for installation of ventilation shutters Weight: 1614	60/91/2 Compl.: 0,462 VS: 0,192  Reduction measurement of Profiles N° 820 and N° 821 for **Profilit™** glazing and ventilation shutters = 80 mm

*figure 9-26: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (26)*

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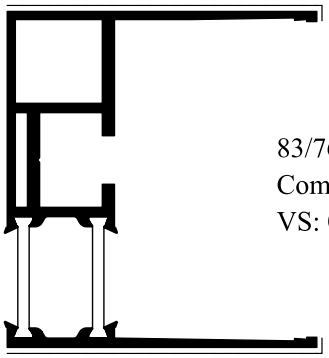
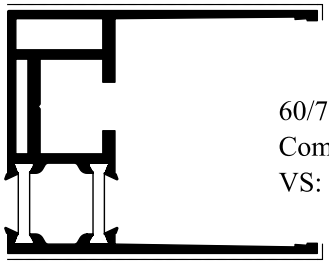
Profile type Weight (g/running metre)	Cross section Dimensions (mm) Completion (m^2/running metre) Visible surface (m^2/running metre)
Side frame N° 884 for horizontal glazing Weight: 2090	 83/76,5/2 Compl.: 0,504 VS: 0,158 **Note:** Fitting Halfen-screw: HS28/15, M8x20 nut, washer and support angle 50/50/4 mm made of aluminium width: 50 mm
Side frame N° 864 for horizontal glazing Weight: 1880 with slit	 60/76,5/2 Compl.: 0,458 VS: 0,158 **Note:** Fitting Halfen-screw: HS28/15, M8x20 nut, washer and support angle 50/50/3 mm (for K22, K25, K32) or 50/50/4 mm (for K50) made of aluminium width: 30 mm

*figure 9-27: Aluminium and plastic profiles for Pilkington **Profilit™** glazing (NP/SP), DXF (27)*

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Chapter 10

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10. Pilkington Profilit™ construction drawings - Index and Work Sheets

10.1. Standard vertical glazing

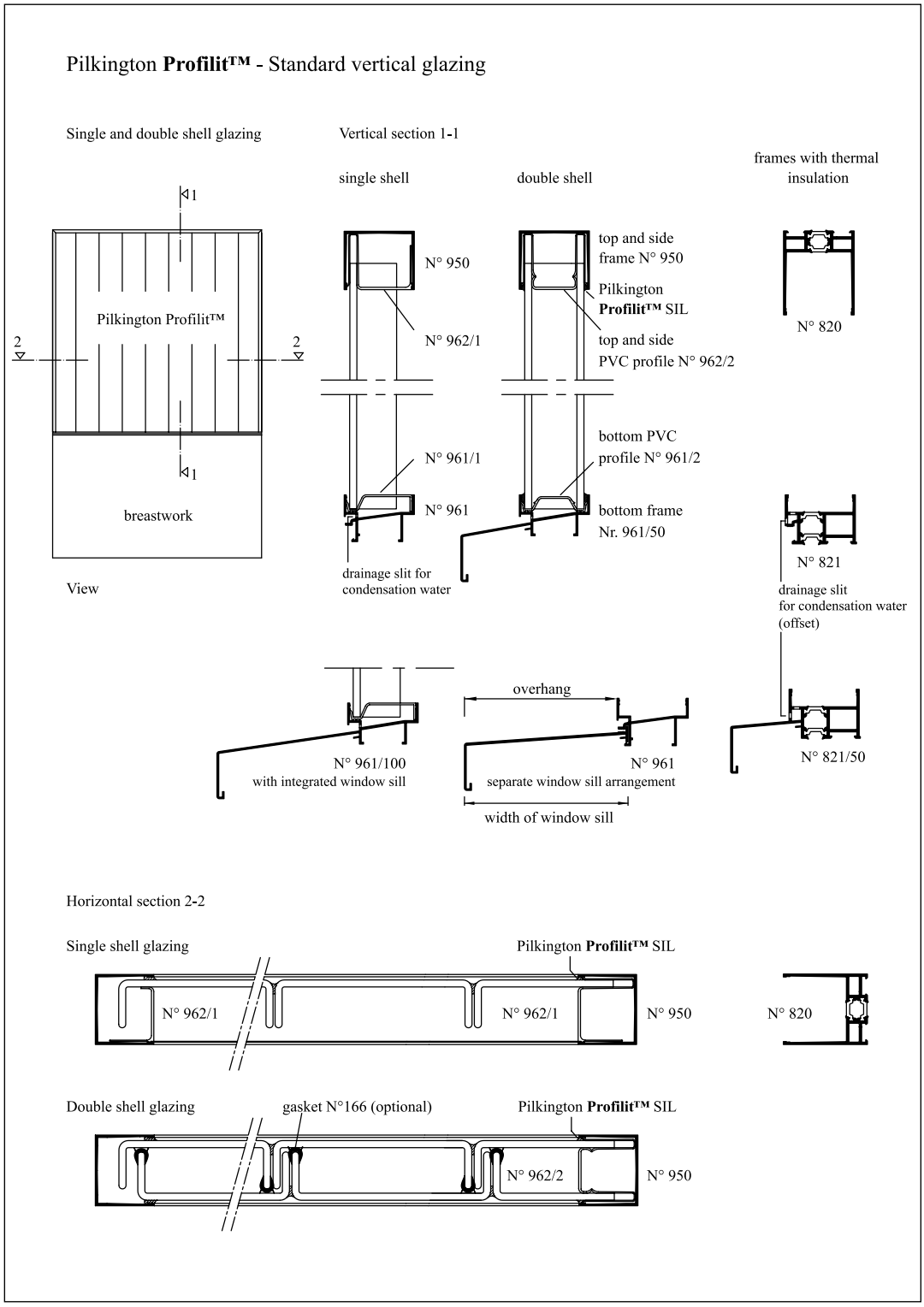

figure 10-1: Standard vertical glazing, DXF (1)

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10.2. Special vertical glazing for sport halls

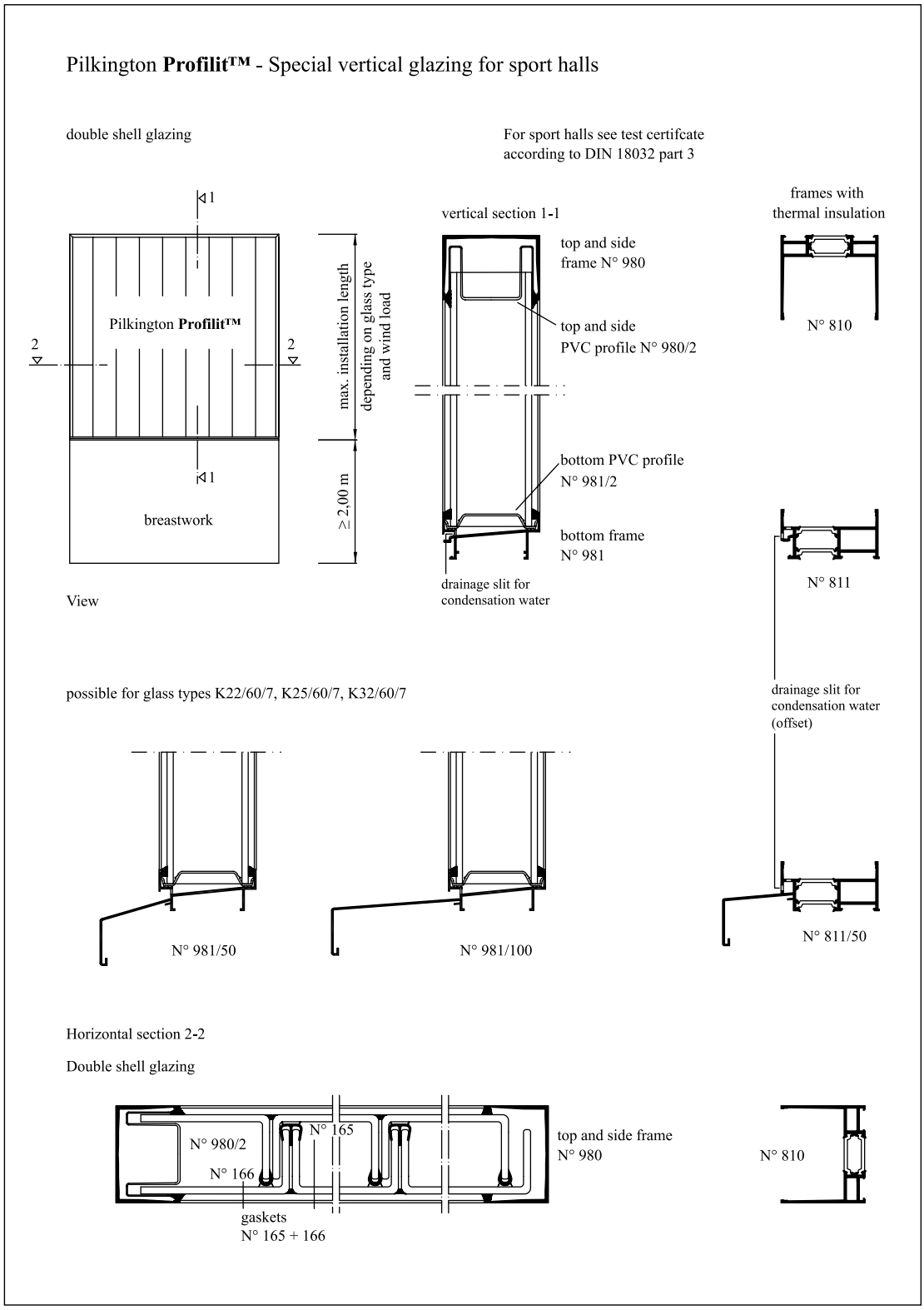

figure 10-2: Special vertical glazing for sport halls, DXF (2)

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10.3. Standard horizontal glazing

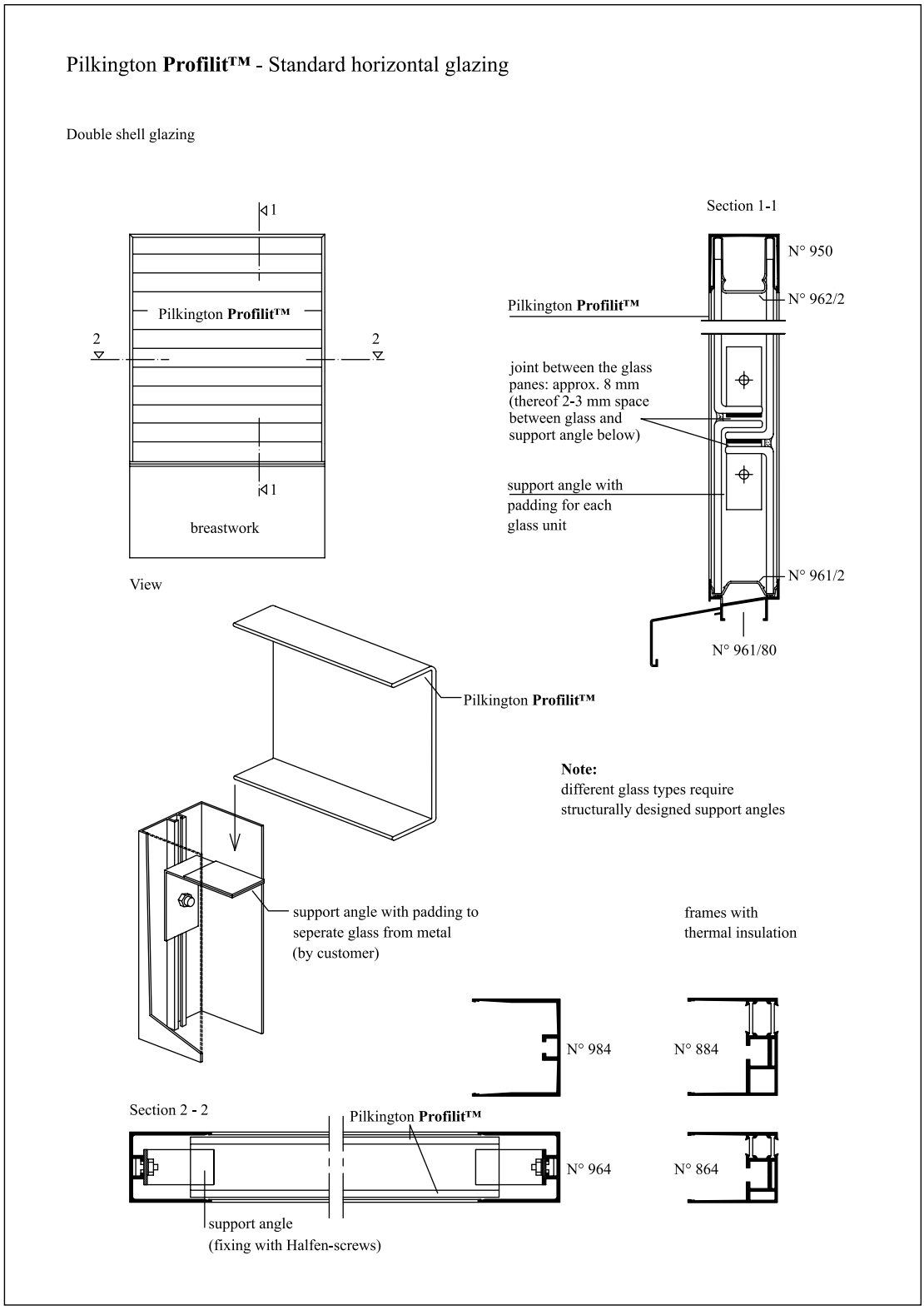

figure 10-3: Standard horizontal glazing, DXF (3)

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Open file as (3)...

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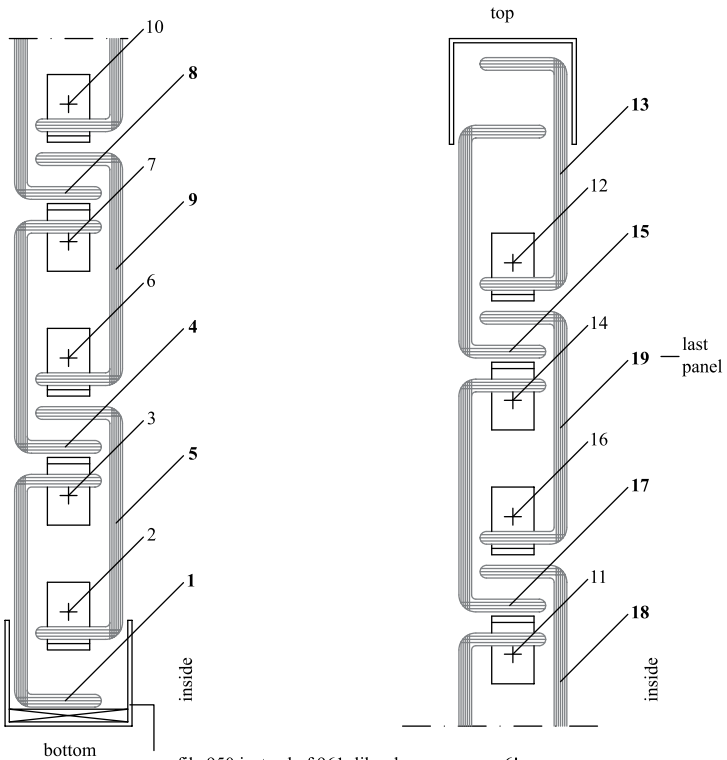
10.4. Installation method (schematic)

Pilkington **Profilit™**
Installation method (schematic)

The Pilkington **Profilit™** panels and support angles should be installed as indicated below.



profile 950 instead of 961, like shown on page 6!

not to scale

The Pilkington **Profilit™** panels can be installed from both sides, inside and outside. All support angles need to be padded with an appropriate padding material. The weight of the Pilkington **Profilit™** glass panels shall only be taken up by the support angles, leading the forces into the construction. Between support angle and the Pilkington **Profilit™** glass panel below, an air space of 2-3 mm is required.

The glass panels need to be installed vertical, i.e. not tilted!

Width of the support angles: for NP glass types 30 mm
for SP glass types 50 mm

figure 10-4: Installation method (schematic), DXF (4)

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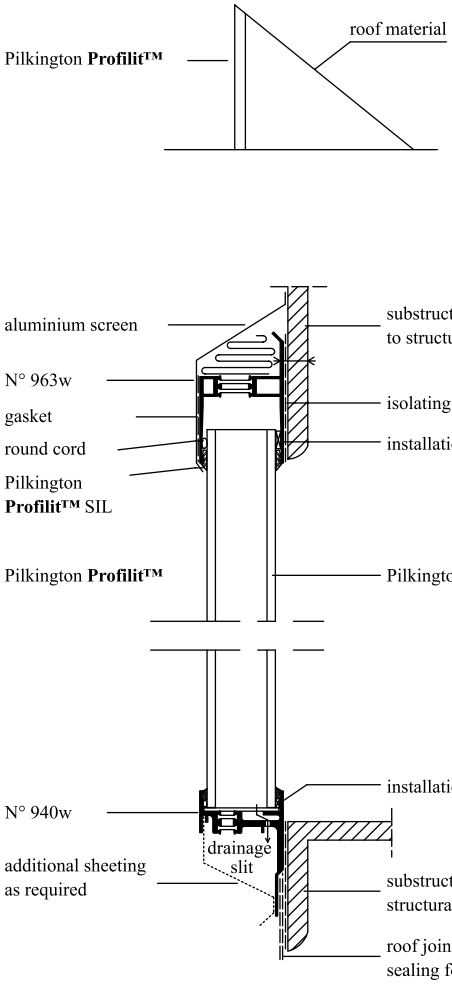
10.5. Roof glazing (vertical shed glazing)

Pilkington **Profilit™** - Roof glazing (vertical shed glazing)

Double shell glazing

System sketch



Note:
No details concerning roof joints, heat-insulating measures, etc. are given here.

The drainage slits for condensation water made by customers are depending on the fixing of the frames and the inclination of the glazing. Max. frame loading in case of vertical installation (e.g. non bearing facades) - double layer - due to weight of glass l ≤ 3.50 m! Max. interval between bolts of 20 cm. In case of thermal broken frame N° 940w l ≤ 3.00 m.

figure 10-5: Roof glazing (vertical shed glazing), DXF (5)

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Adobe® PDF (new window)	DXF

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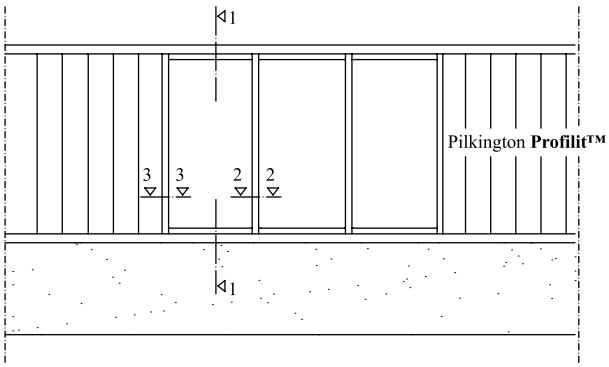
10.6. Profiles for fix window elements

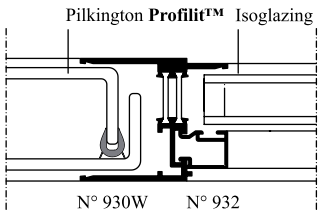
Pilkington **Profilit™** - Profiles for fix window elements

The following sketches are showing Isoglazed elements integrated into the Pilkington **Profilit™** installation system.

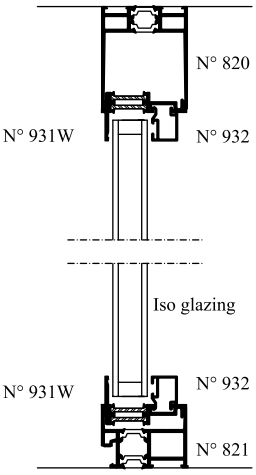


View

Section 3-3



Section 1-1



Section 2-2

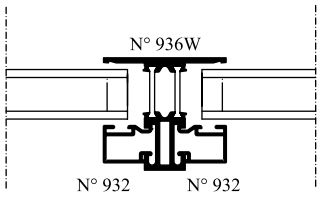


figure 10-6: Profiles for fix window elements, DXF (6)

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Adobe® PDF (new window)	DXF

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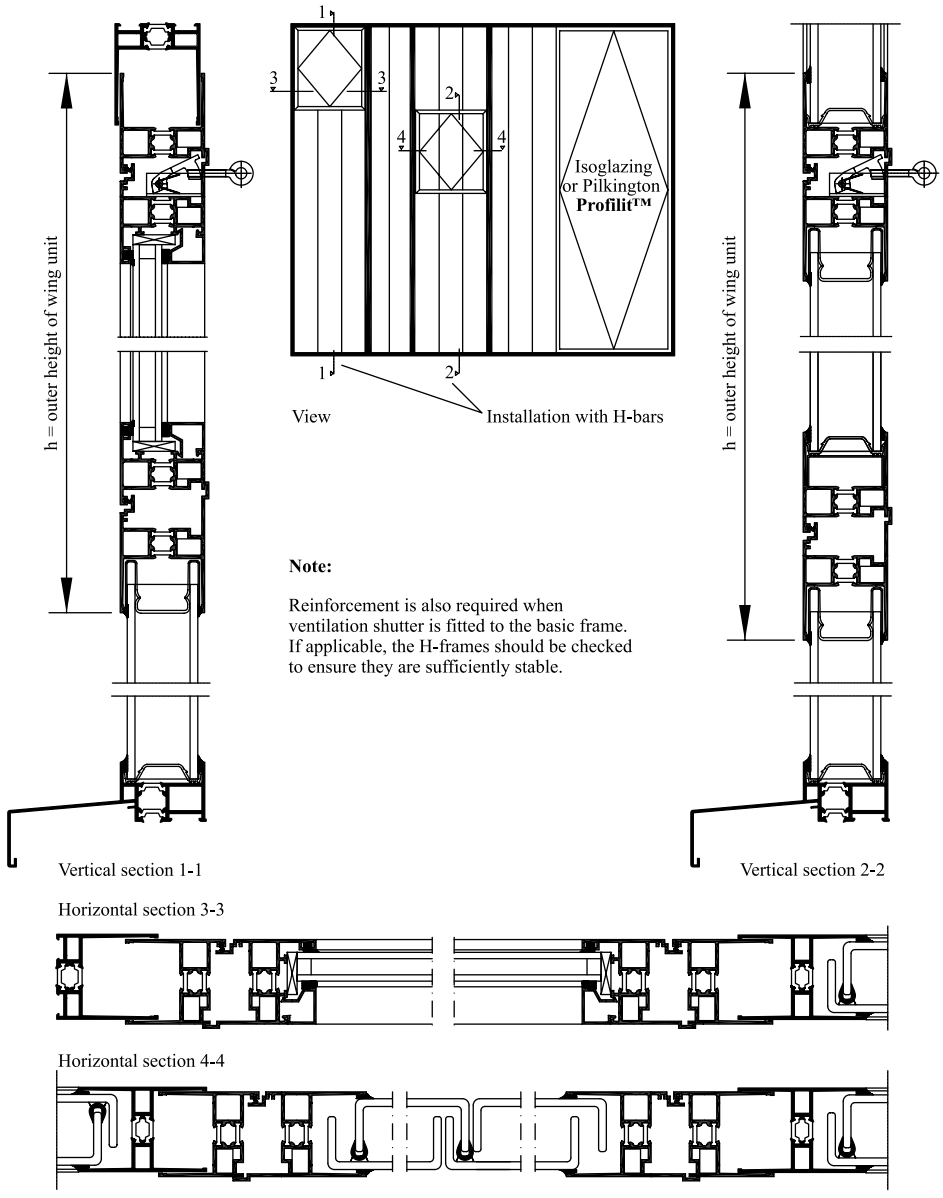
10.7. Installation of ventilation shutters

Pilkington **Profilit™** - Installation of ventilation shutters

Pilkington **Profilit™** installation system
with ventilation shutter unit

The Pilkington **Profilit™** installation system is a modular system essentially comprising the following elements:

- High-quality **aluminium profiles -**
  available as mill finished, anodised, RAL coated or thermally insolated options
- **Plastic insert or support profiles -**
  high impact resistance, light resistance, weatherproof and non warping
- **Ventilation elements -**
  standard sizes or made to order;
  marry perfectly with the Pilkington **Profilit™** installation system, also available as thermally insulated option



Note:

Reinforcement is also required when ventilation shutter is fitted to the basic frame. If applicable, the H-frames should be checked to ensure they are sufficiently stable.

figure 10-7: Installlation of ventilation shutters, DXF (7)

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Adobe® PDF (new window)	DXF

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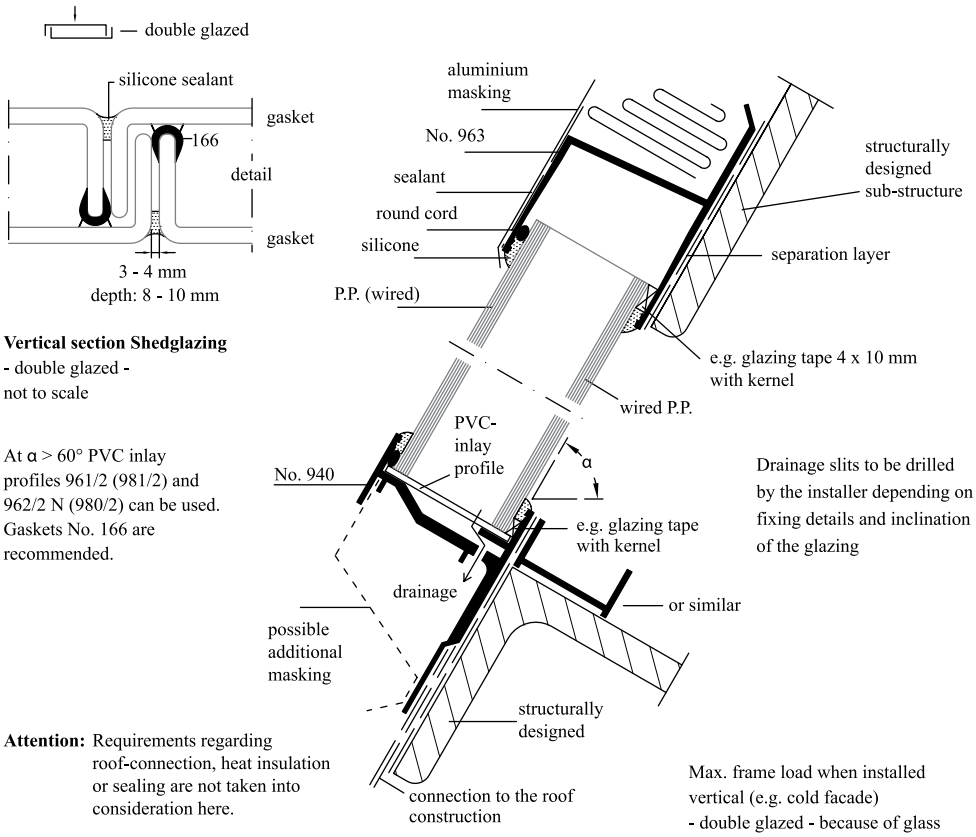
10.8. Shed glazing, 30° inclination towards vertical. Double glazed. Frames not thermally broken.

Example:
Pilkington **Profilit™** Shed glazing, 30° inclination towards vertical.
Double glazed. Frames not thermally broken.

Standard Pilkington **Profilit™** is not a safety glass. For inclined or overhead glazings, national and local building- and safety regulations need to be followed and checked in advance.



Vertical section Shedglazing
- double glazed **-**
not to scale

At α > 60° PVC inlay profiles 961/2 (981/2) and 962/2 N (980/2) can be used. Gaskets No. 166 are recommended.

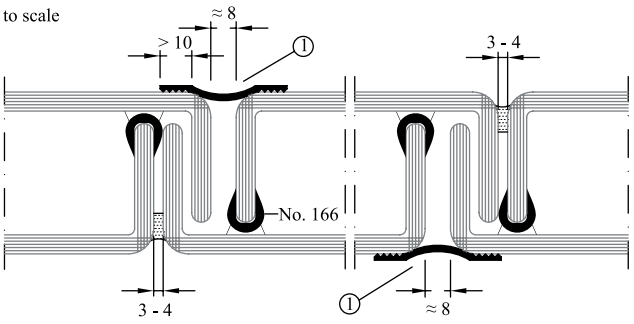
Drainage slits to be drilled by the installer depending on fixing details and inclination of the glazing

Attention: Requirements regarding roof-connection, heat insulation or sealing are not taken into consideration here.

Max. frame load when installed vertical (e.g. cold facade)
- double glazed **-** because of glass weight: l ≤ 3.50 m!
Max. space between bolts 20 cm
For thermally broken frame No. 940W: l ≤ 3.00 m

Example: joint detail of a double glazed shed glazing

not to scale



①
e.g.:
= EGOSILTAPE,
transparent,
30 - 40 mm wide,
glued with
EGOSILKLEBER
according to
manufacturers guidelines

figure 10-8: Shed glazing, 30° inclination towards vertical. Double glazed. Frames not thermally broken, DXF (8)

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10.9. Shed glazing, 30° inclination towards vertical. Double glazed. Thermally broken frames.

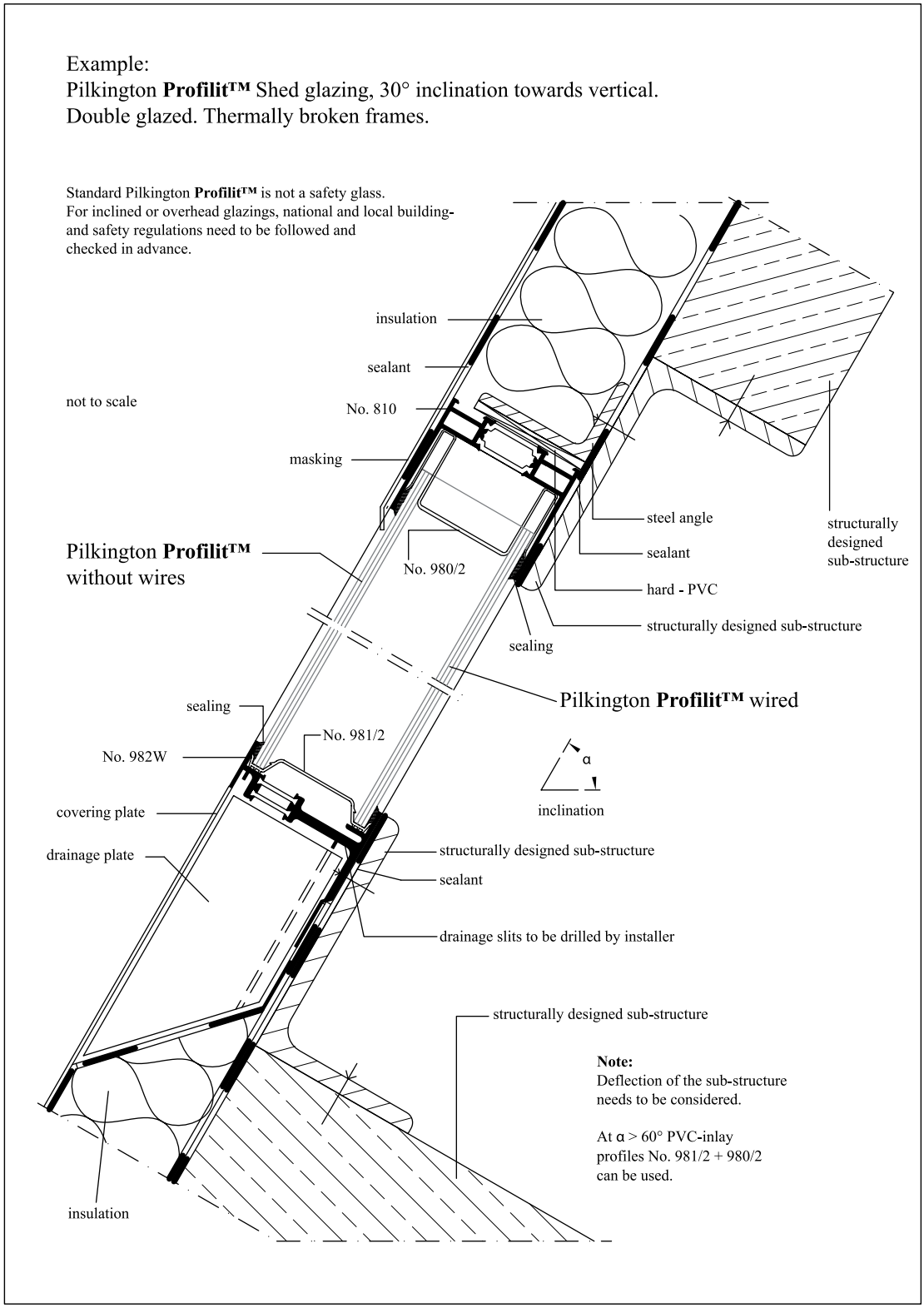

figure 10-9: Shed glazing, 30° inclination towards vertical. Double glazed. Thermally broken frames, DXF (9)

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Adobe® PDF (new window)	DXF

Open file as (9)...

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10.10. Shed glazing / Proposal: Detail at the roofridge

Example:
Pilkington **Profilit™** Shed glazing
Proposal: Detail at the roofridge

Standard Pilkington **Profilit™** is not a safety glass. For inclined or overhead glazings, national and local building- and safety regulations need to be followed and checked in advance.

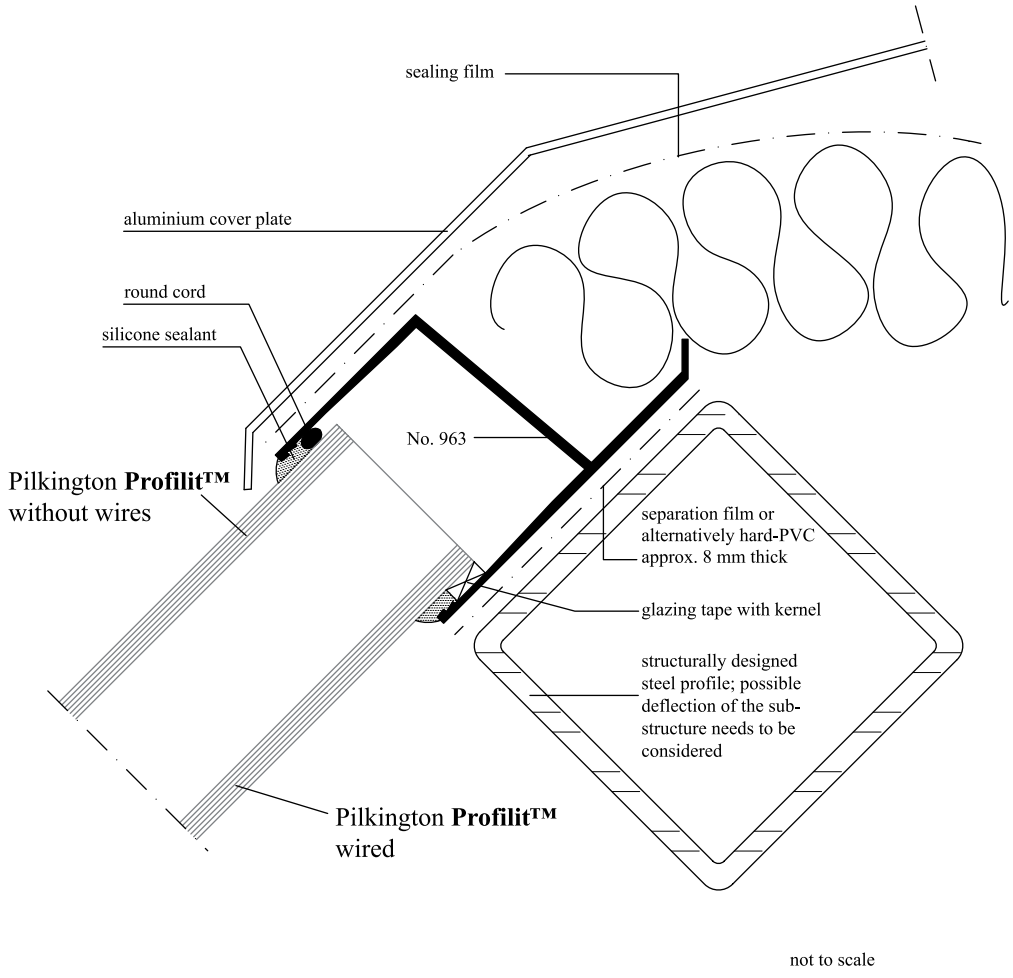

figure 10-10: Shed glazing, Proposal: Detail at the roofridge, DXF (10)

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Adobe® PDF (new window)	DXF

Open file as (10)...

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10.11. Double glazed gable end roof

Example:
Pilkington **Profilit™**
Double glazed gable end roof

Standard Pilkington **Profilit™** is not a safety glass. For inclined or overhead glazings, national and local building- and safety regulations need to be followed and checked in advance.

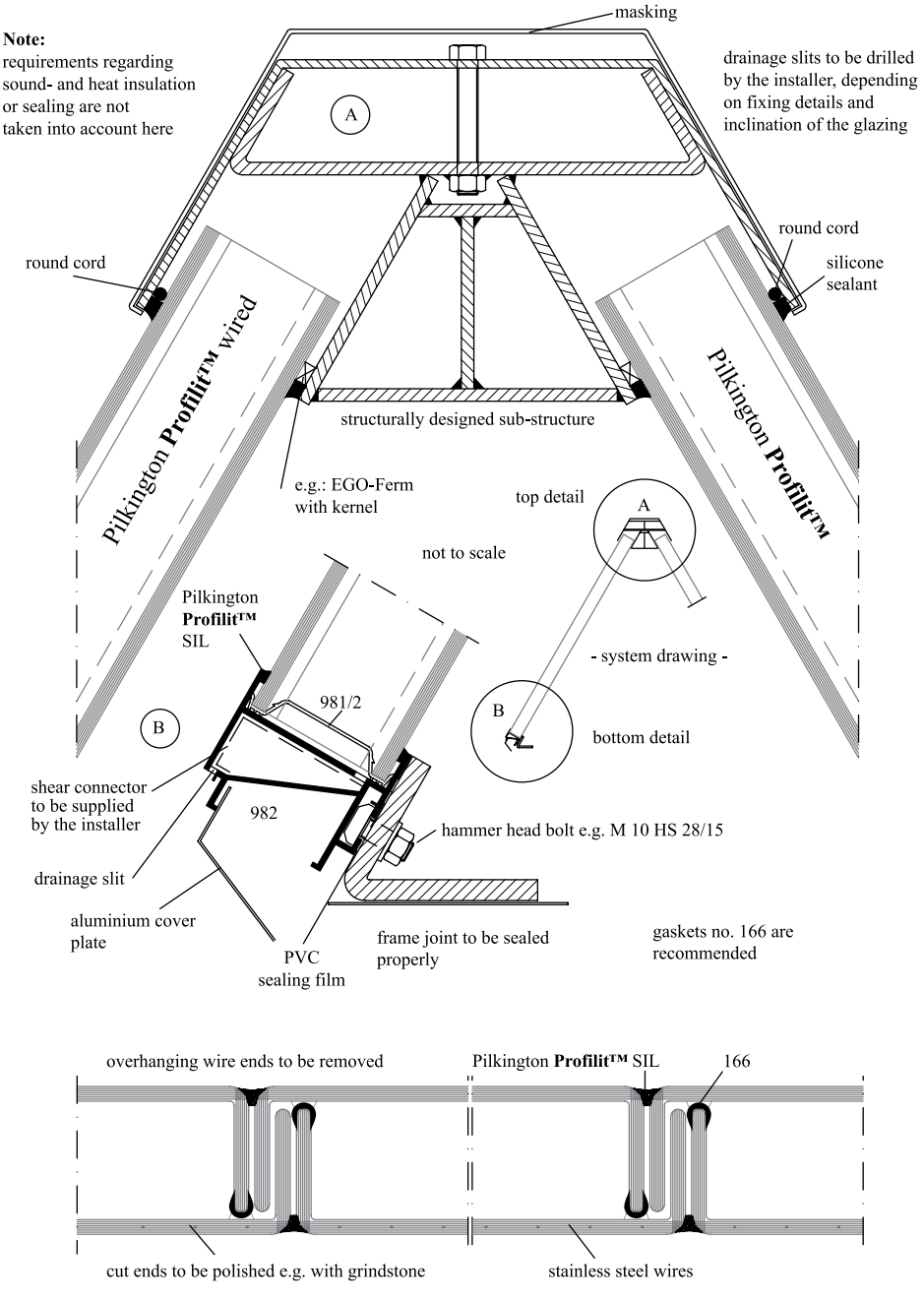

figure 10-11: Double glazed gable end roof, DXF (11)

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Adobe® PDF (new window)	DXF

Open file as (11)...

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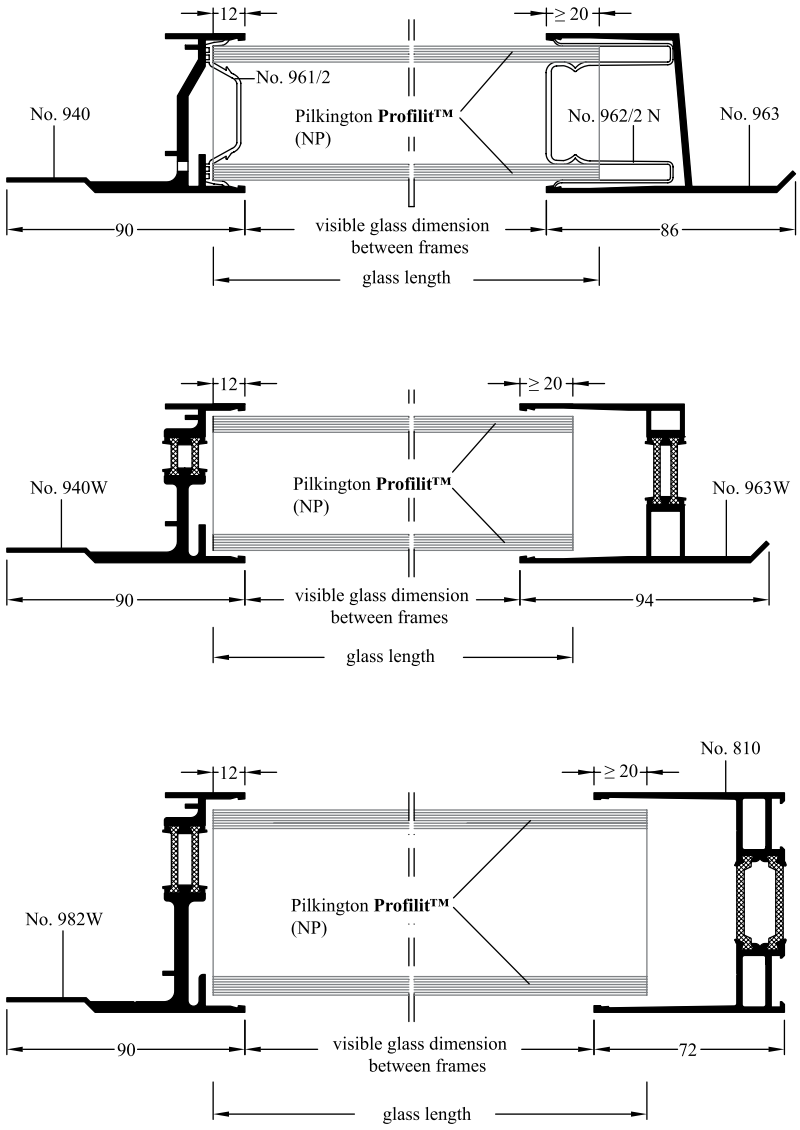
10.12. Frame joint dimensions / System sketch: Vertical shed glazing

Pilkington **Profilit™**
Frame joint dimensions / System sketch: vertical shed glazing



For use e.g. in shed glazings and cold facades

not to scale

figure 10-12: Frame joint dimensions / System sketch: Vertical shed glazing, DXF (12)

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10.13. Single glazed vertical glazing with a wind stay bar behind the glazing surface

Example:
Pilkington **Profilit™**
Single glazed vertical glazing with a wind stay bar behind the glazing surface

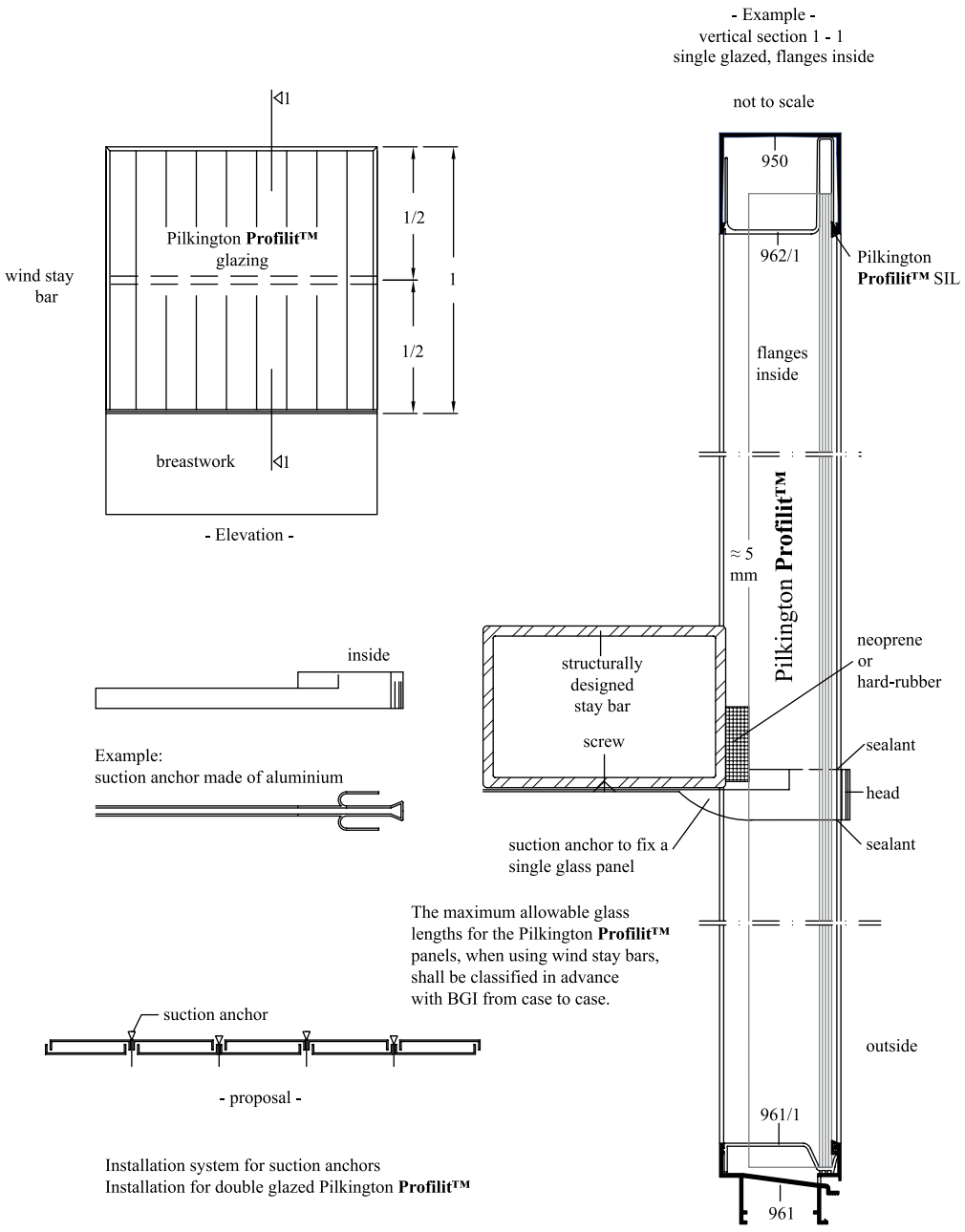

figure 10-13: Single glazed vertical glazing with a wind stay bar behind the glazing surface, DXF (13)

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10.14. Installation of the expansion joint profiles and of the Pilkington Profilit™ window sills

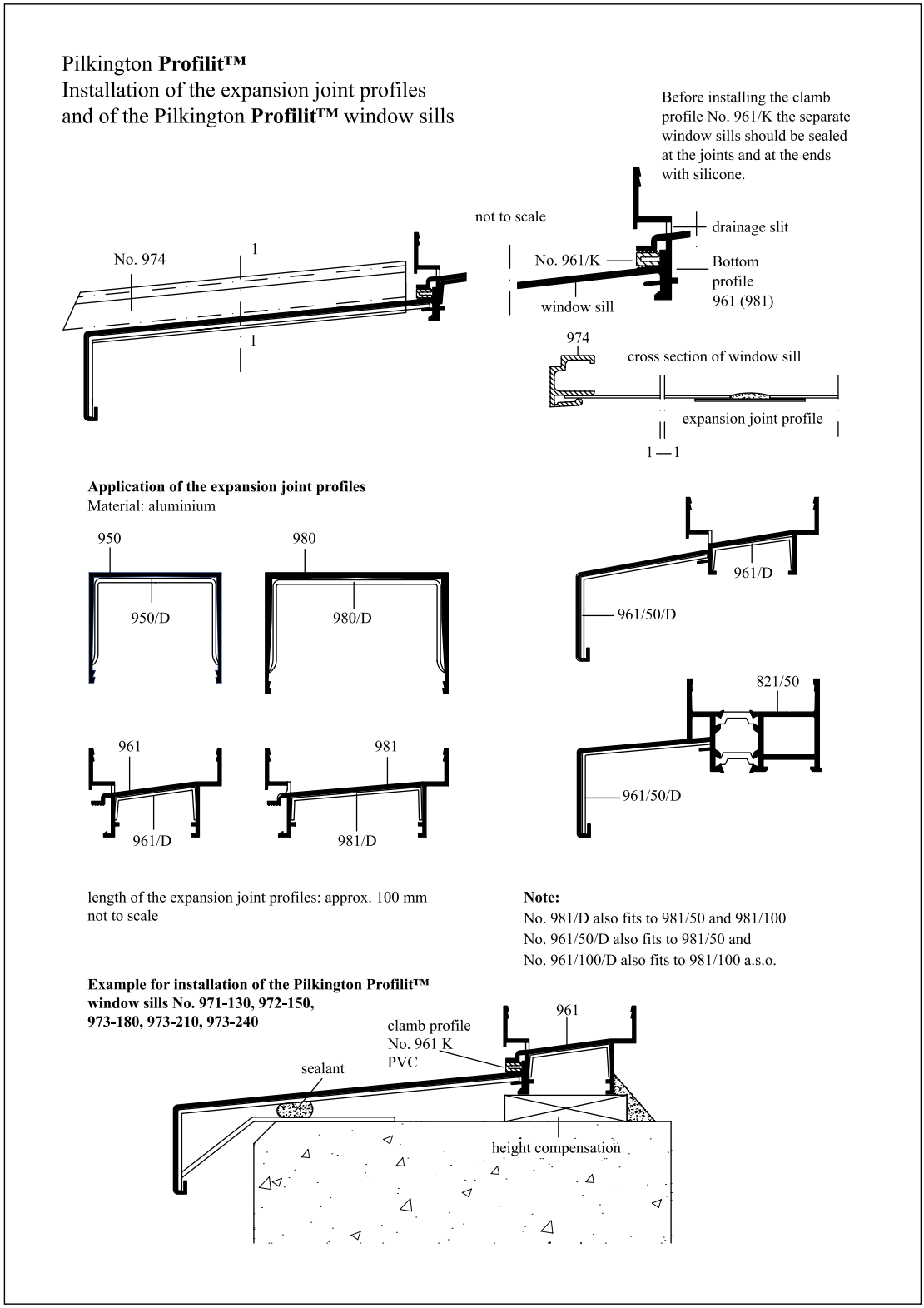

figure 10-14: Installation of the expansion joint profiles and of the Pilkington Profilit™ window sills, DXF (14)

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10.15. Single glazed and double glazed glass corners and zigzag glazing

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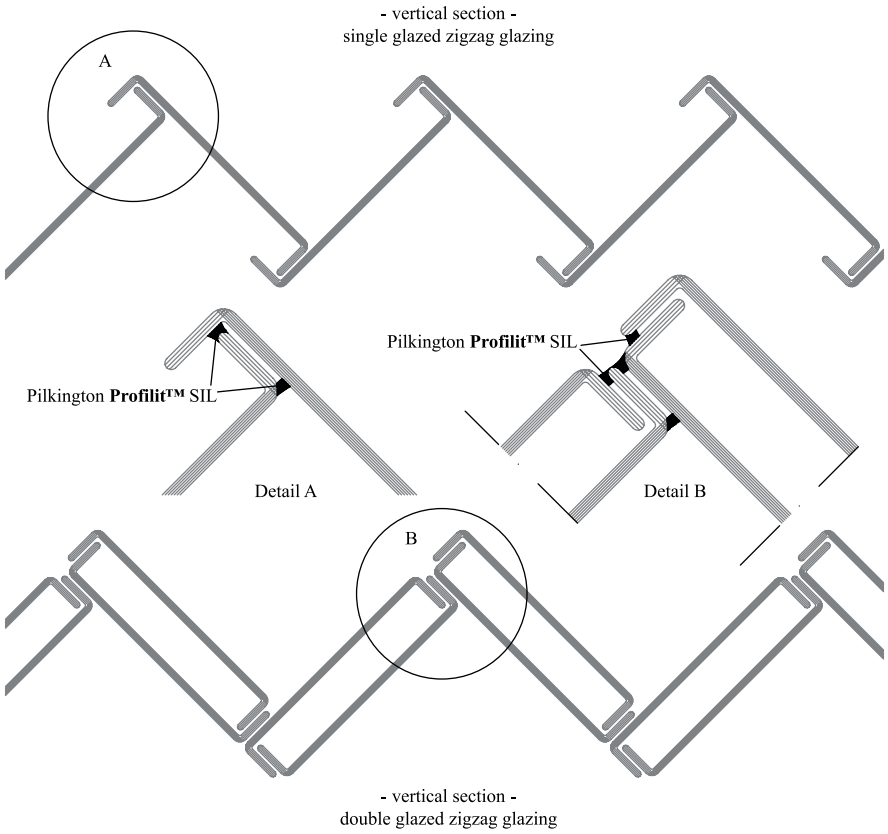
Single glazed and double glazed glass corners
and zigzag glazing



National regulations, standards and safety requirements need to be followed and checked in advance.

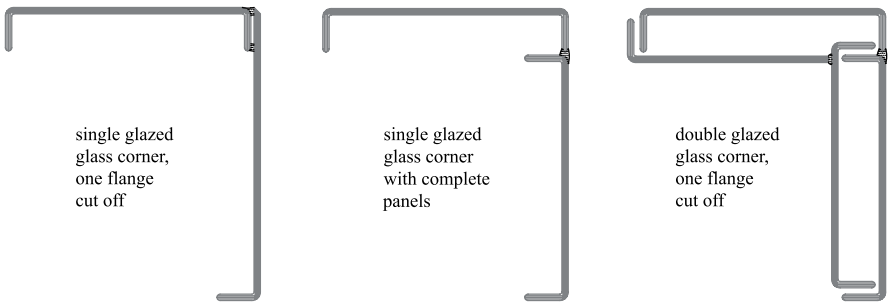


figure 10-15: Single glazed and double glazed glass corners and zigzag glazing, DXF (15)

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10.16. Standard pivoted casement (turning casement) - not thermally broken with catcher for single and double glazing NP-NP and flat- or iso glazing NP-ISO

Example:
Pilkington **Profilit™**
Standard pivoted casement (turning casement) - not thermally broken with catcher for single and double glazing NP-NP and flat- or iso glazing NP-ISO

not to scale

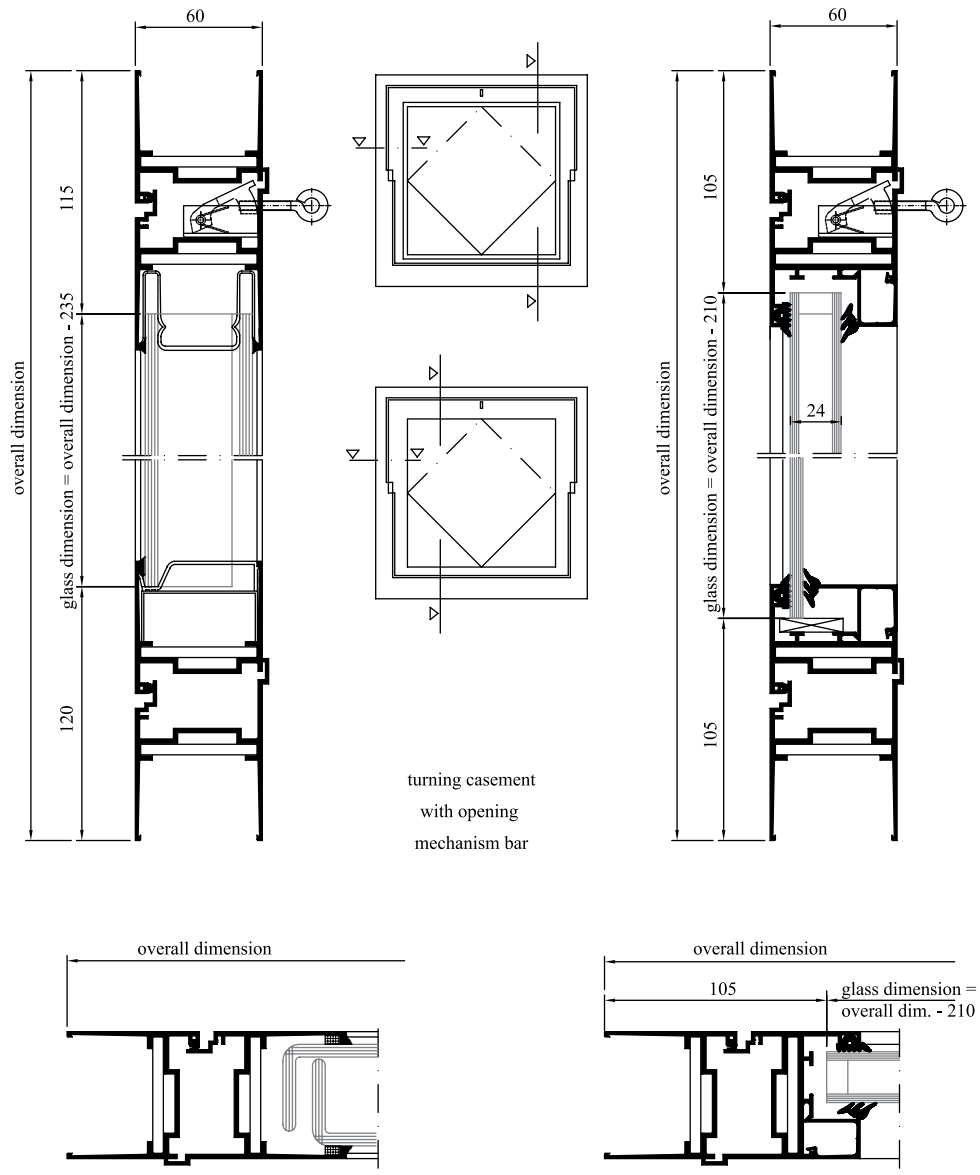

figure 10-16: Standard pivoted casement (turning casement) - not thermally broken with catcher, DXF (16)

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Adobe® PDF (new window)	DXF

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10.17. Standard pivoted casement (turning casement) - thermally broken with catcher for single and double glazing NP-NP and flat- or iso glazing NP-ISO

Example:
Pilkington **Profilit™**
Standard pivoted casement (turning casement) - thermally broken with catcher
for single and double glazing NP-NP and flat- or iso glazing NP-ISO

not to scale

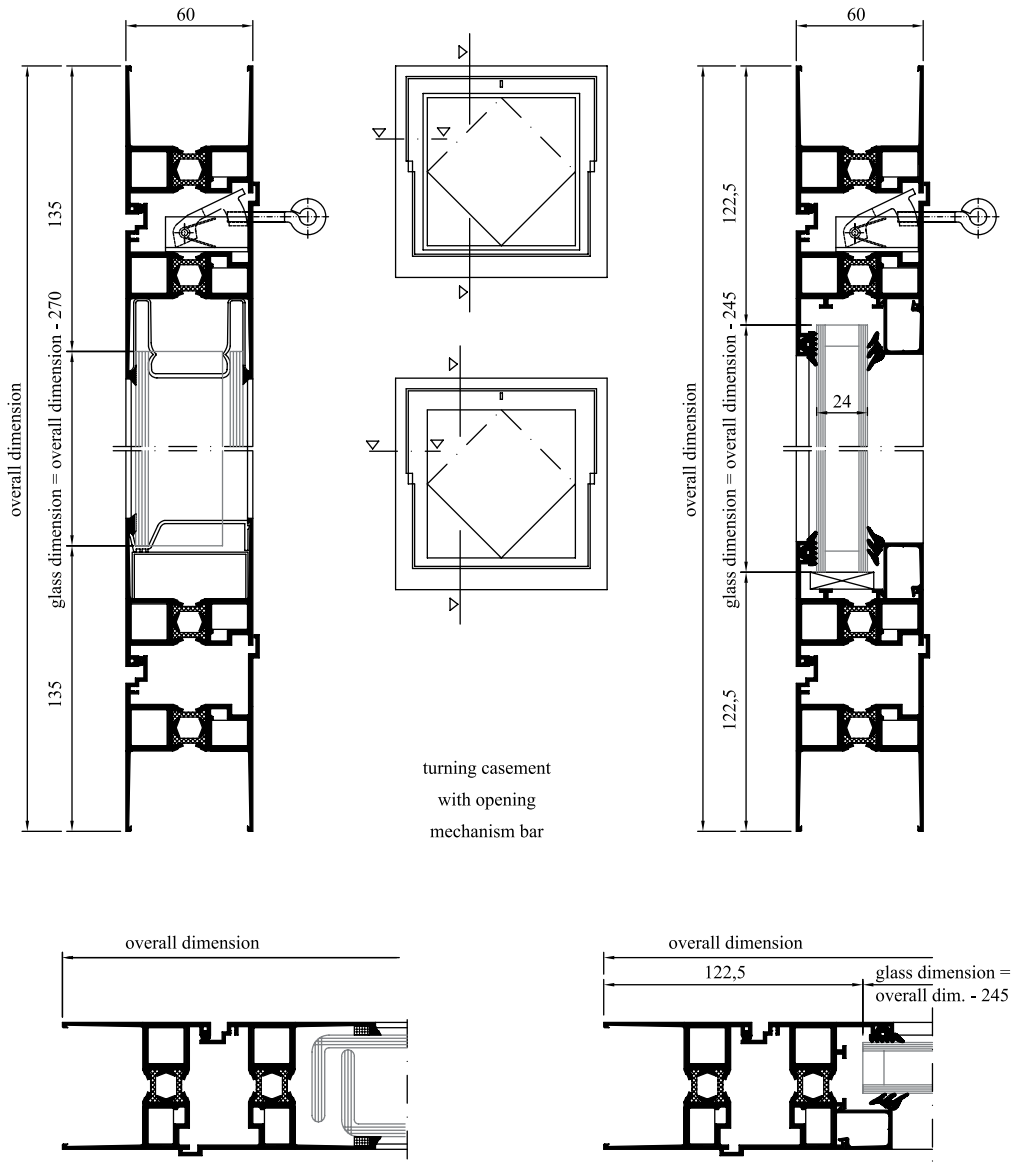

figure 10-17: Standard pivoted casement (turning casement) - thermally broken with catcher, DXF (17)

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10.18. Pivoted casement (turning casement) - thermally broken - for single or double glazing SP-SP and flat- or iso glazing SP-ISO

Example:
Pilkington **Profilit™**
Pivoted casement (turning casement) - thermally broken -
for single- or double glazing SP-SP and flat- or iso glazing SP-ISO

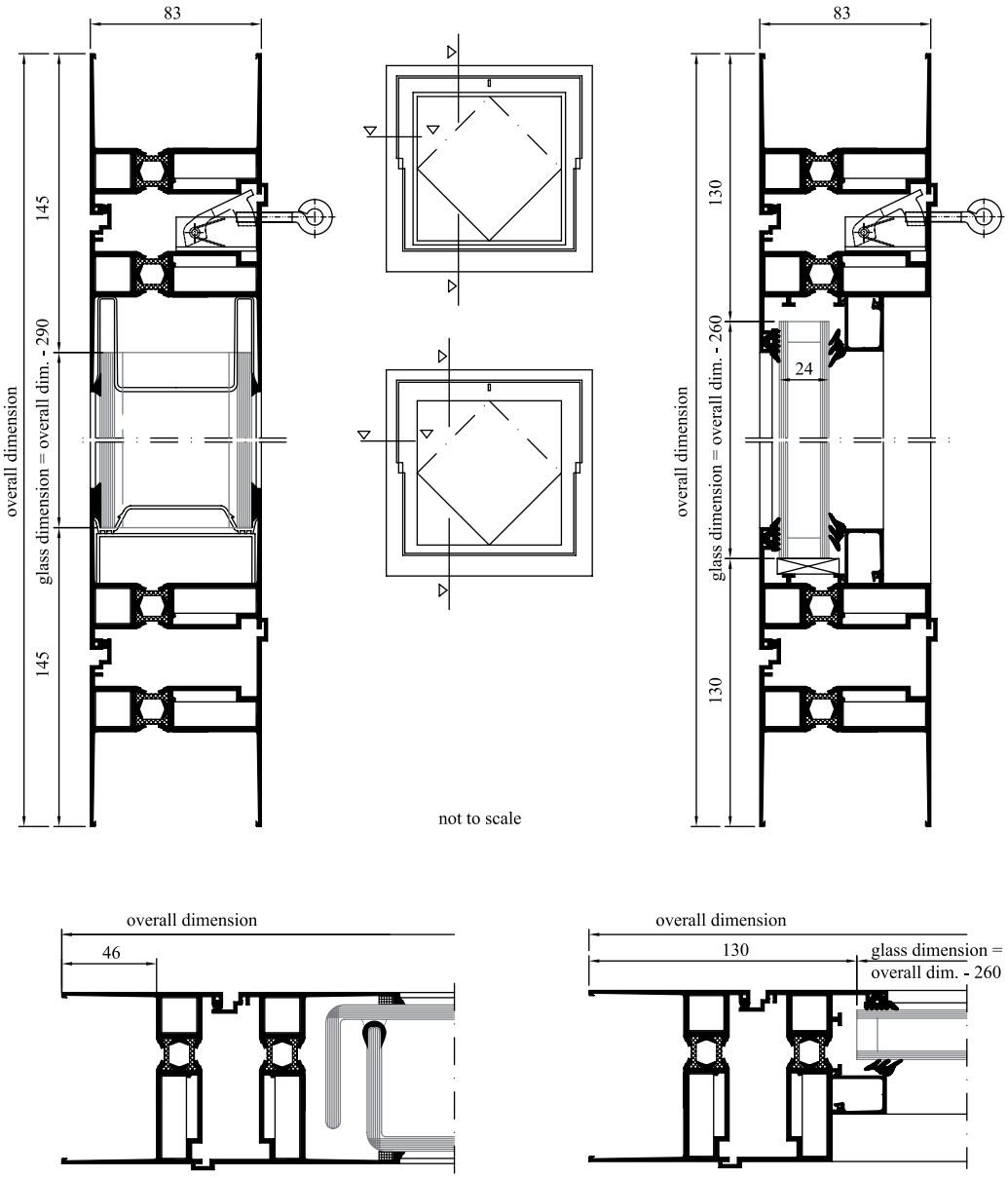

figure 10-18: Pivoted casement (turning casement) - thermally broken -, DXF (18)

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10.19. Element: NP/ISO - tilting casement - fixed unit - or top hung casement - fixed unit - - thermally broken -

Example:
Pilkington **Profilit™**
Element: NP/ISO - tilting casement - fixed unit - or top hung casement - fixed unit - - thermally broken -

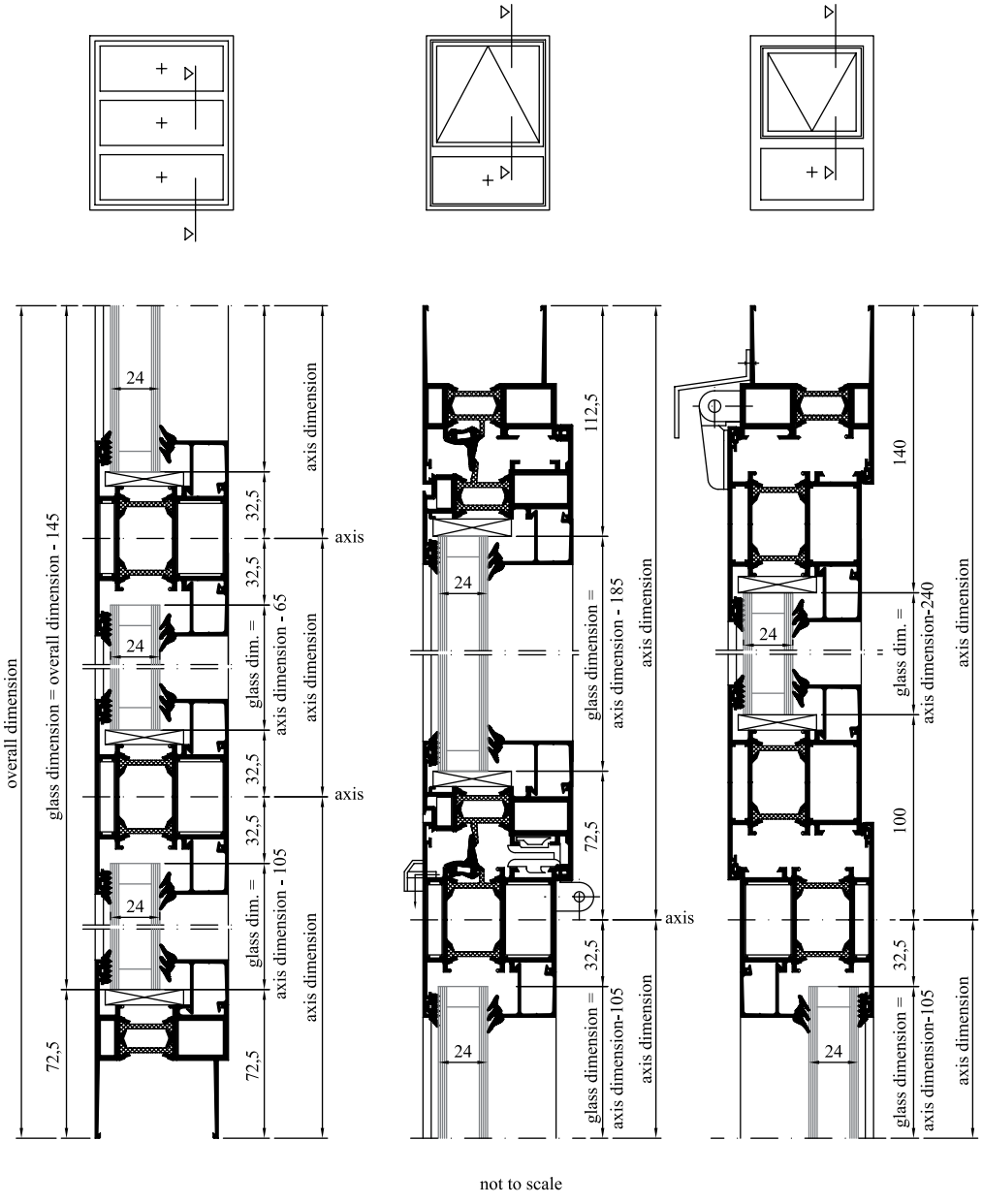

figure 10-19: Element: NP/ISO - tilting casement - fixed unit - or top hung casement - fixed unit - thermally broken -, DXF (19)

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10.20. Swing and swing tilted casement SP/ISO - thermally broken -

Example:
Pilkington **Profilit™**
Swing and swing tilted casement SP/ISO - thermally broken -

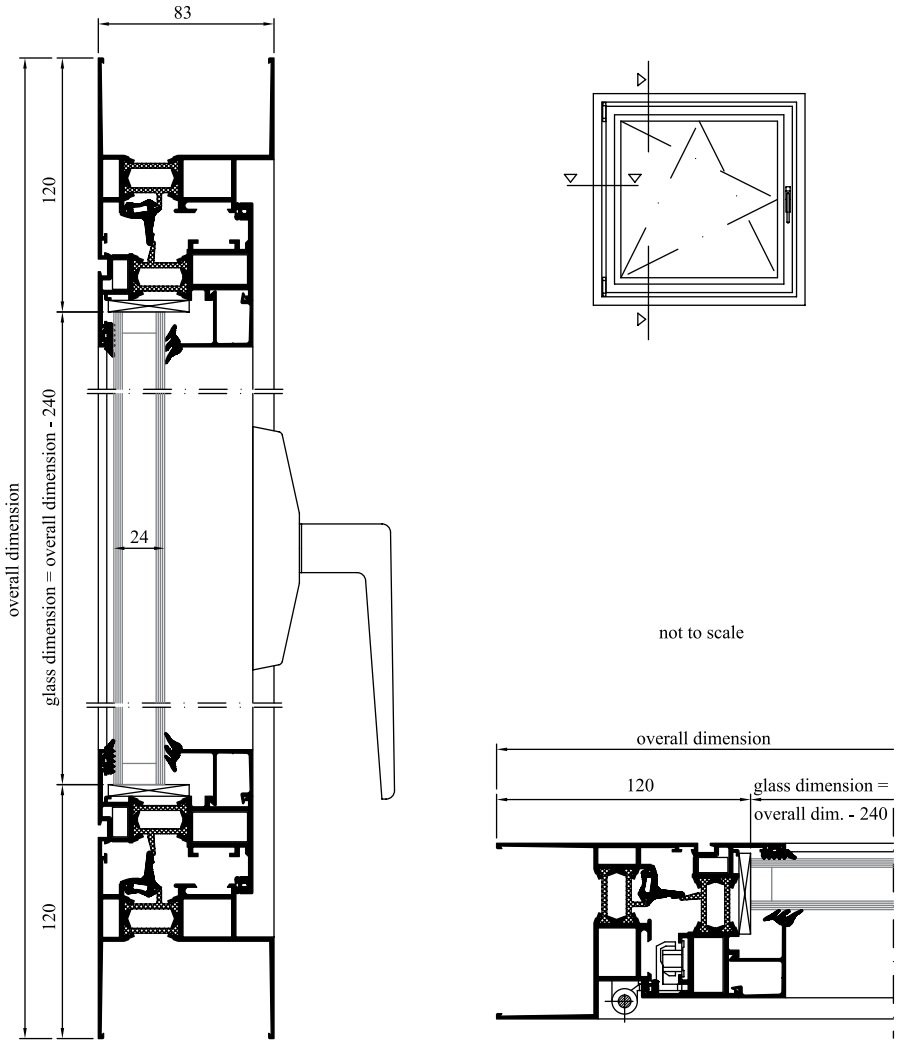

figure 10-20: Swing and swing tilted casement SP/ISO - thermally broken -, DXF (20)

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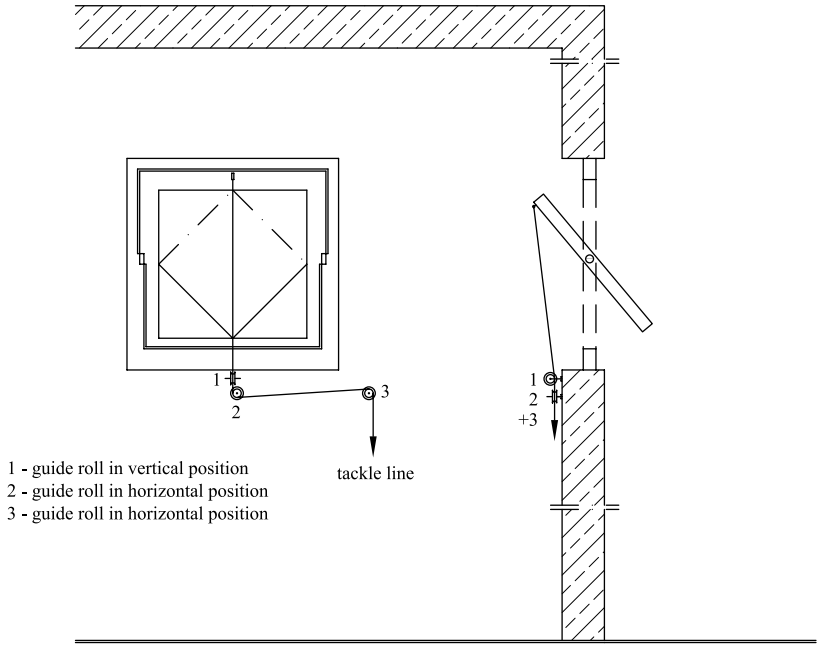
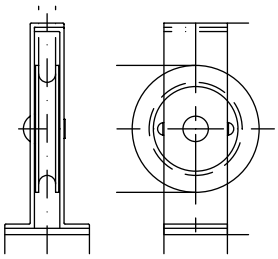
10.21. Principle sketch of a tackle line arrangement with guide rolls

Pilkington **Profilit™**
Principle sketch of a tackle line arrangement with guide rolls



(not to scale)



principle of a guide roll

side view front view

(not to scale)

figure 10-21: Principle sketch of a tackle line arrangement with guide rolls, DXF (21)

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10.22. Principle sketch for installation of NP glass types into wall-systems (example)

Pilkington **Profilit™**
Principle sketch for installation of NP glass types into wall-systems (example)

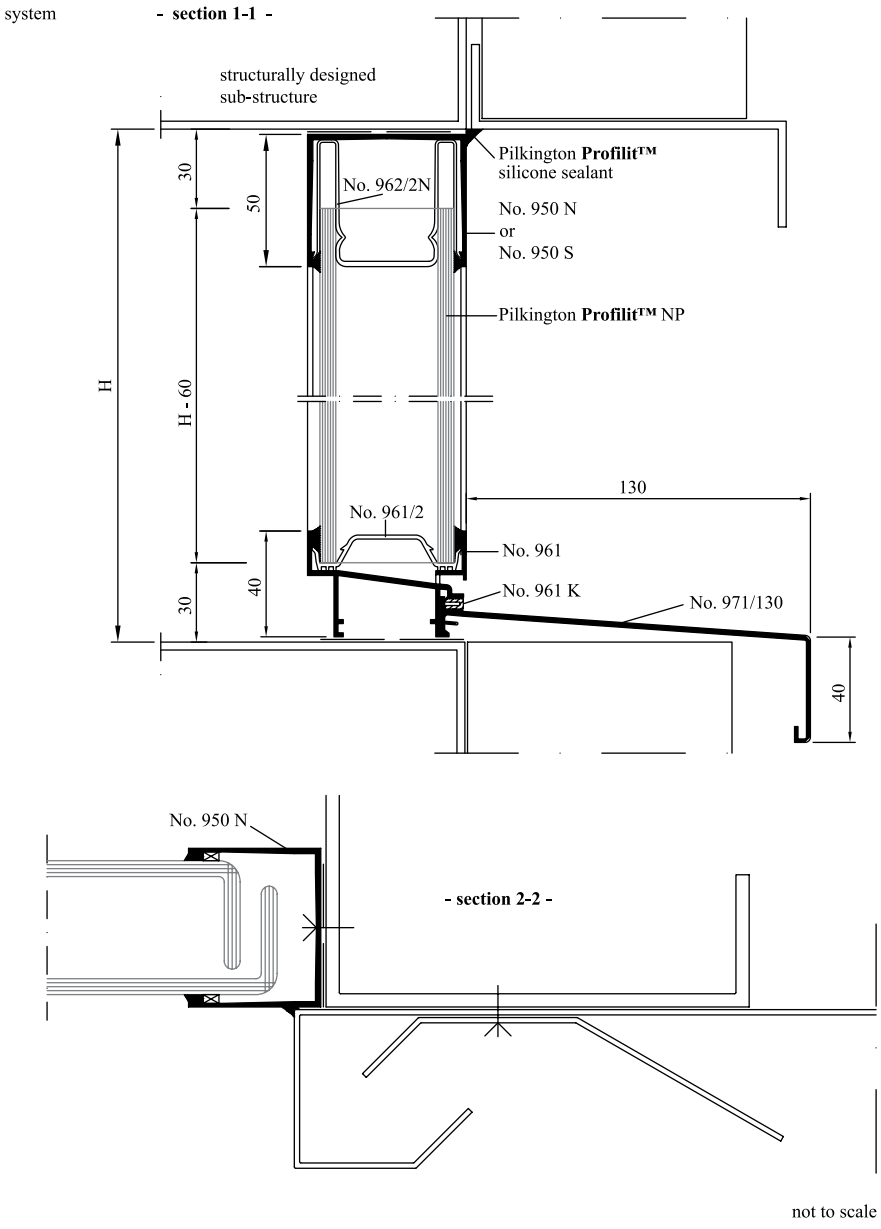

figure 10-22: Principle sketch for installation of NP glass types into wall-systems (example), DXF (22)

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10.23. Principle sketch for installation NP glass types into wall-systems (example)

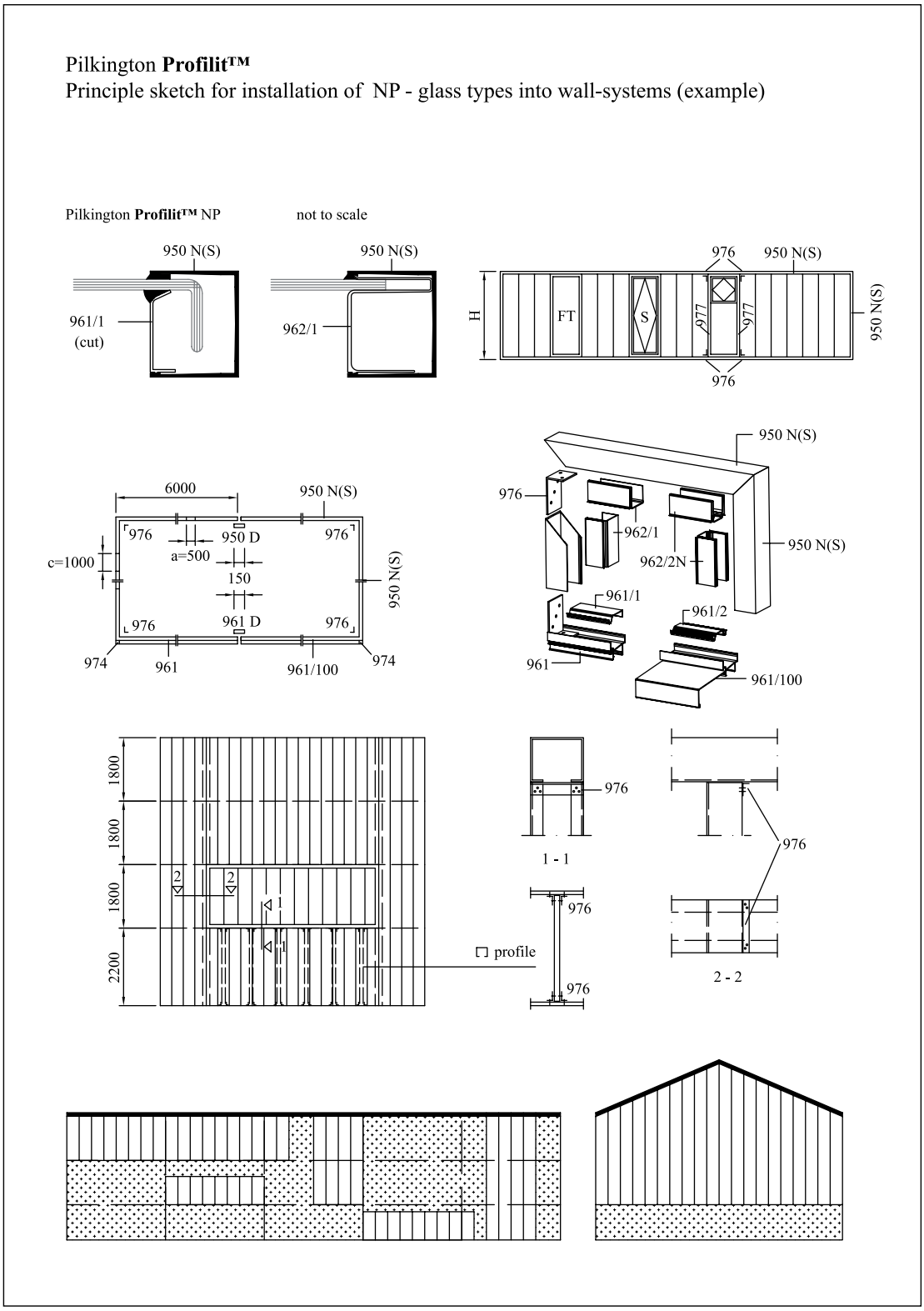

figure 10-23: Principle sketch for installation NP glass types into wall-systems (example), DXF (23)

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10.24. Example: Glazing of industrial halls with and without stiffening beams

Pilkington **Profilit™**
Example: Glazing of industrial halls with and without stiffening beams

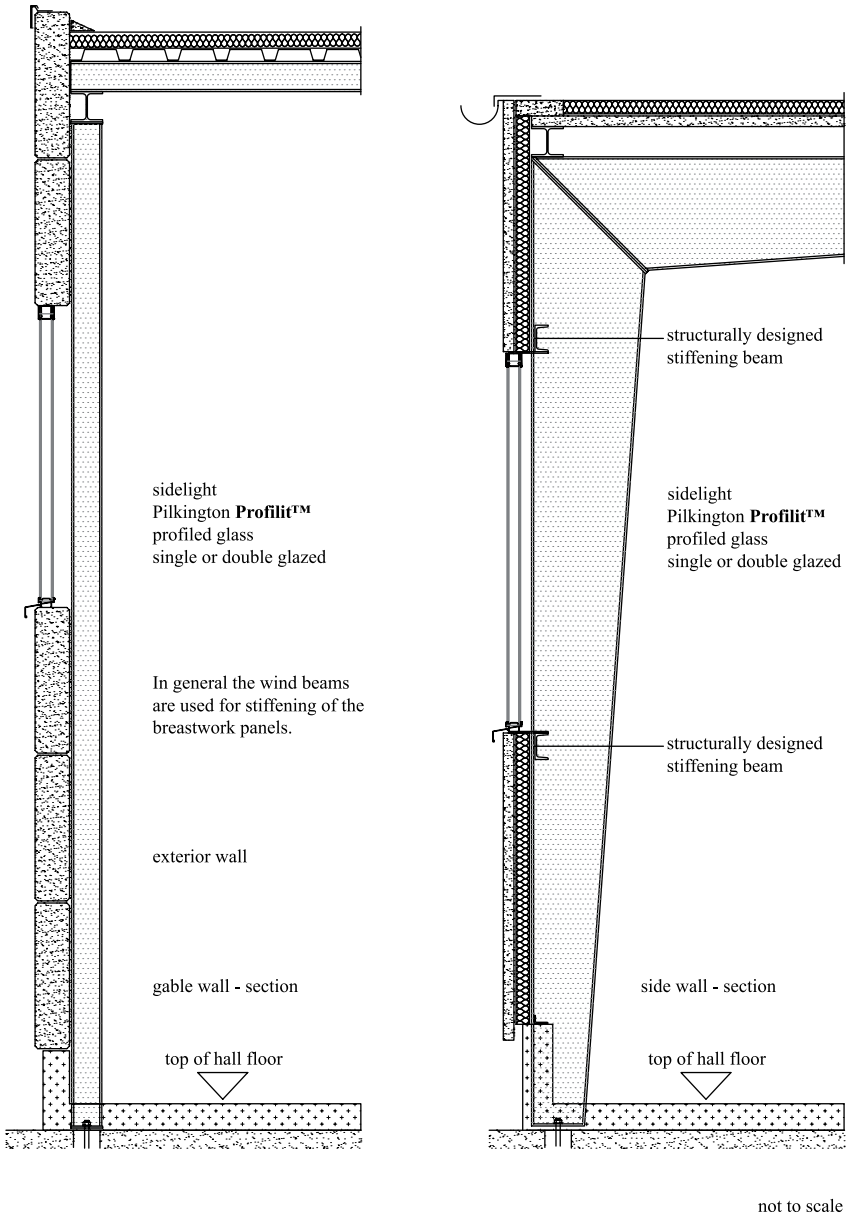

figure 10-24: Example: Glazing of industrial halls with and without stiffening beams, DXF (24)

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Adobe® PDF (new window)	DXF

Open file as (24)...

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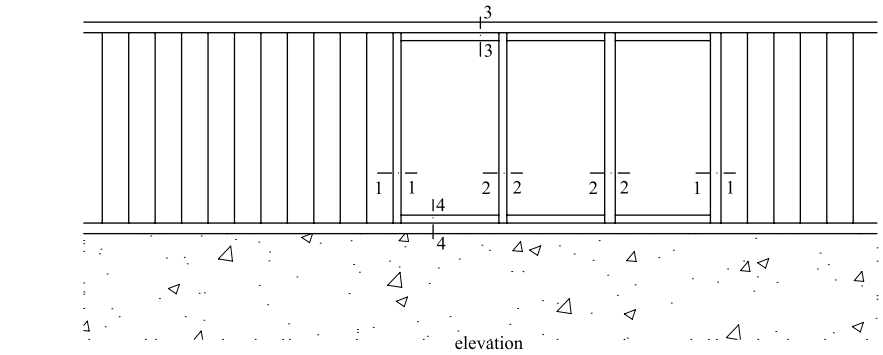
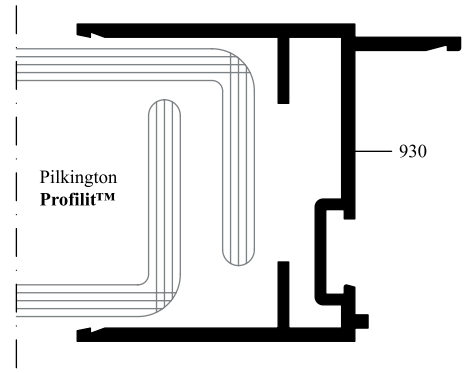
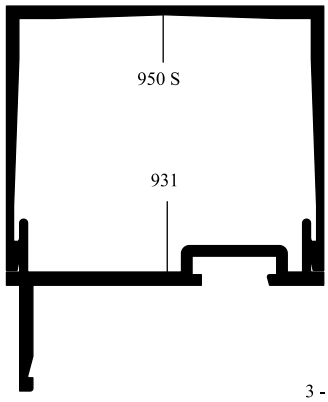
10.25. Profiles for installation of iso glazing units or flat glass units

Pilkington **Profilit™**
Profiles for installation of iso glazing units or flat glass units

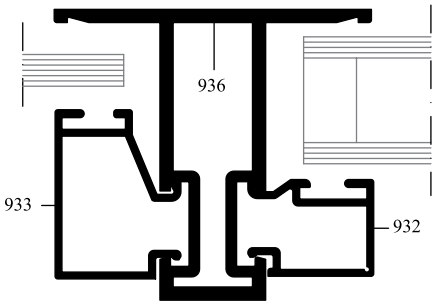




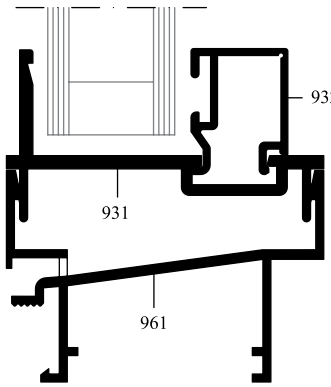
1 - 1



3 - 3



2 - 2



4 - 4

Pilkington **Profilit™** aluminium profiles
not to scale

figure 10-25: Profiles for installation of iso glazing units or flat glass units, DXF (25)

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10.26. Installation of framing components for iso glazing- and flat glass elements

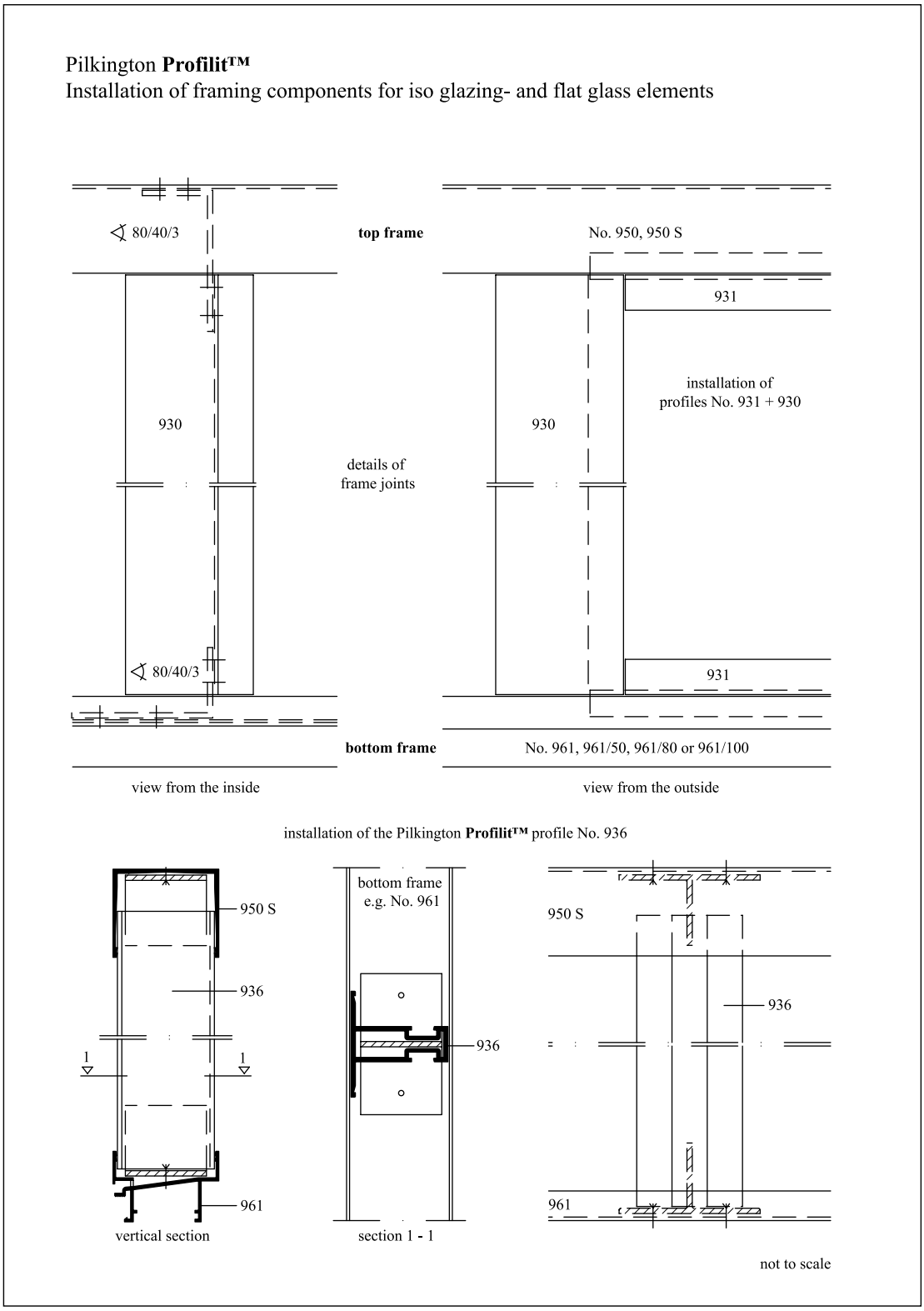

figure 10-26: Installation of framing components for iso glazing- and flat glass elements, DXF (26)

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10.27. Triple shell glazing for improved sound insulation (vertical installation)

Pilkington **Profilit™**
Triple shell glazing for improved sound insulation (vertical installation)

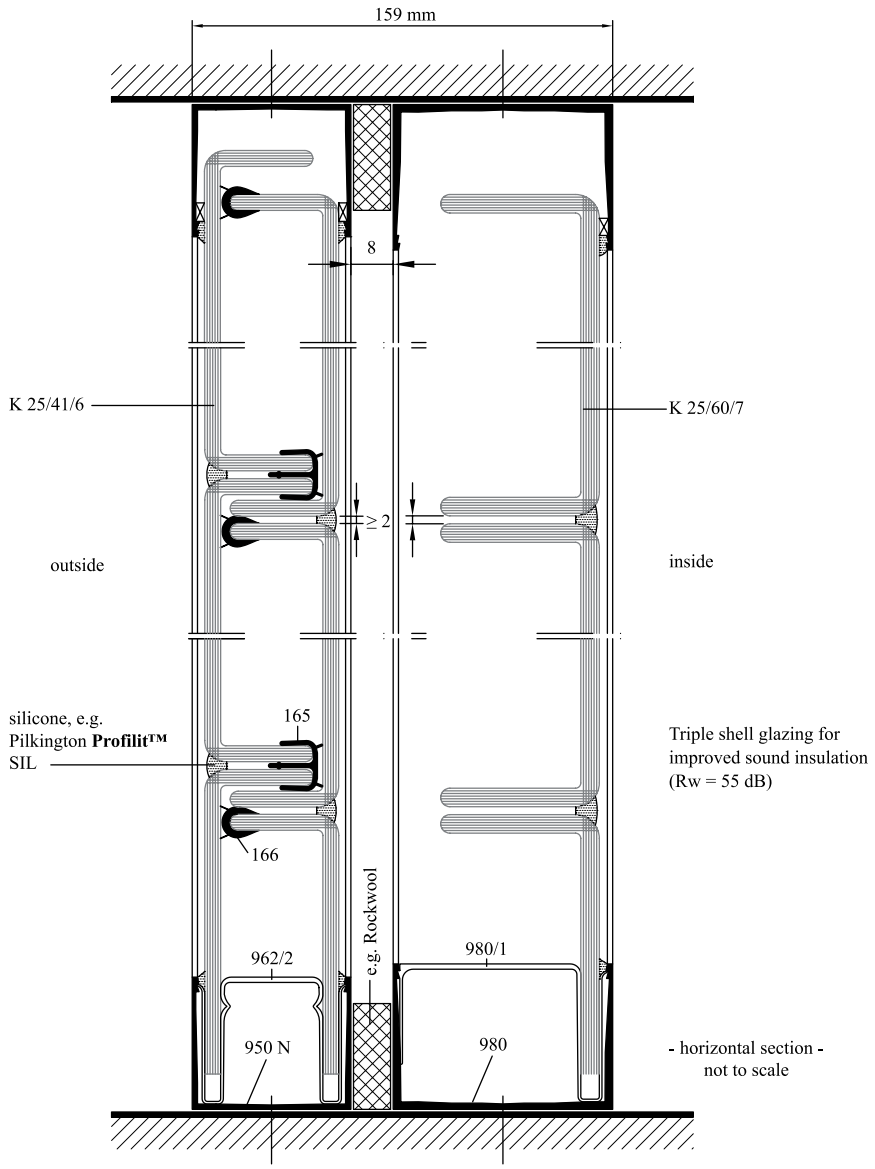

figure 10-27: Triple shell glazing for improved sound insulation (vertical installation), DXF (27)

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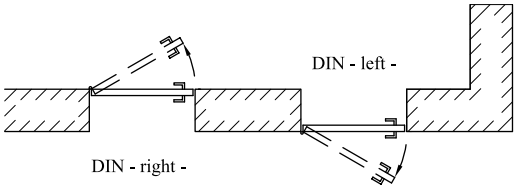
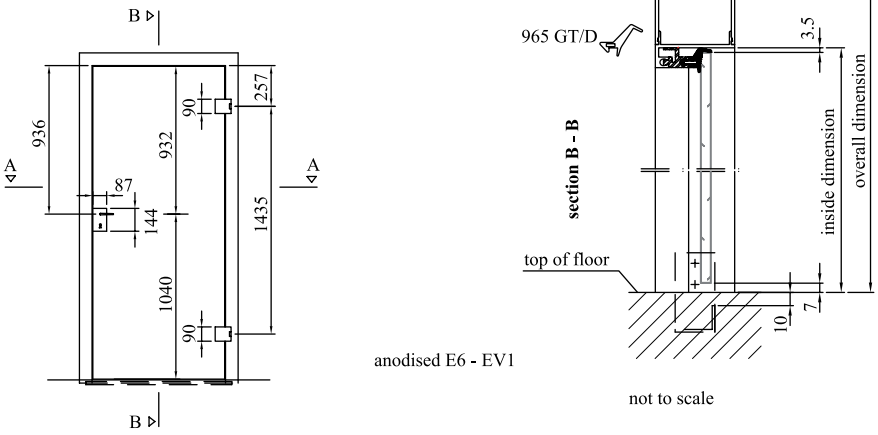
10.28. Pre-fabricated door frame No. 965 GT for glass doors, e.g. Delodur

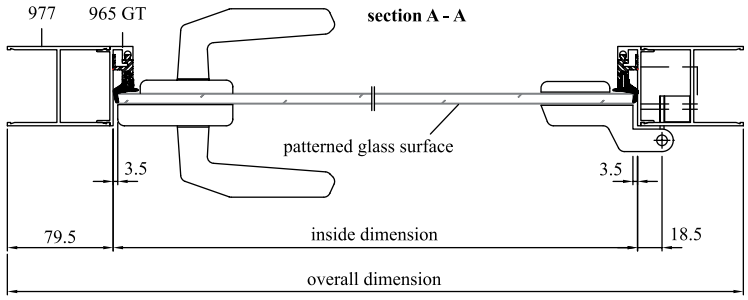
Pilkington **Profilit™**
Pre-fabricated door frame No. 965 GT for glass doors, e.g. Delodur

Note: hinges not included



	width / height in mm	
Gr.	overall dimension	inside dimension
1	875 x 2063	716 x 1983
2	1000 x 2063	841 x 1983





not to scale

figure 10-28: Pre-fabricated door frame No. 965 GT for glass doors, e.g. Delodur, DXF (28)

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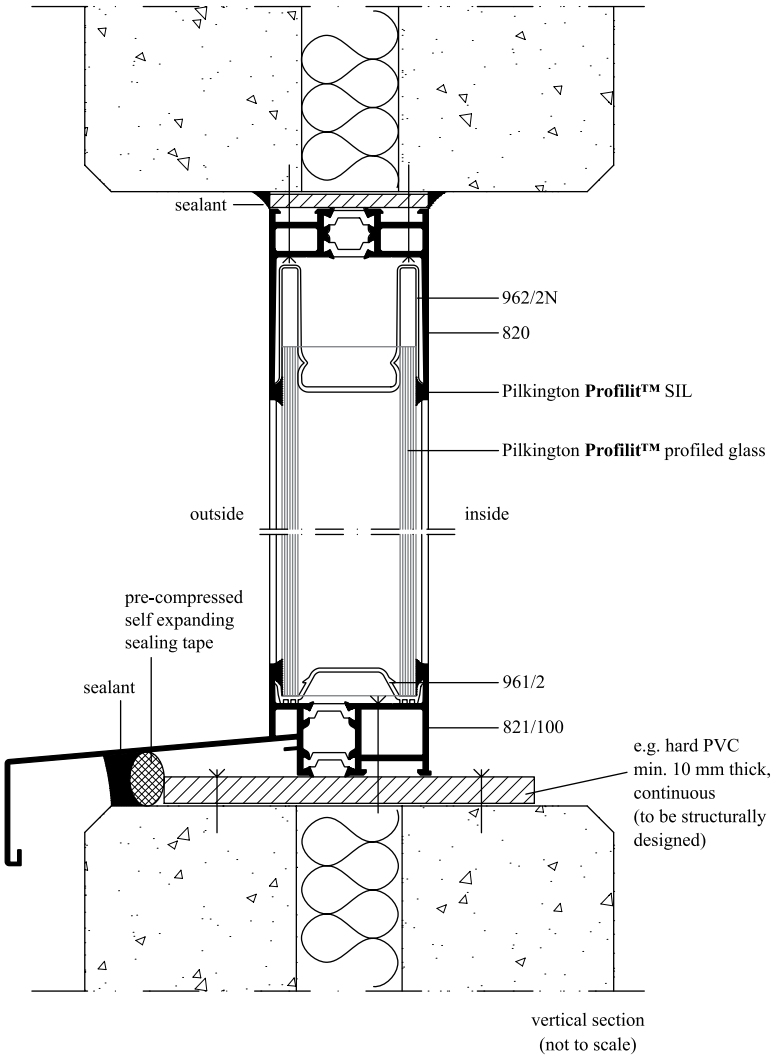
10.29. Installation of thermally broken frames in sandwich construction

Example:
Pilkington **Profilit™**
Installation of thermally broken frames in sandwich construction



Note:
Please take into account, that the insulation of the sandwich construction must be dry when the glazing is installed and that existing humidity can escape to the outside.

figure 10-29: Installation of thermally broken frames in sandwich construction, DXF (29)

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Adobe® PDF (new window)	DXF

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10.30. Profile No. 983 - Installation guideline and recommendations -

Pilkington **Profilit™**
Profile No. 983 - Installation guideline and recommendations -

The following profiles could be combined with profile No. 983:

Series 60: No. 950, No. 950N, No. 977, No. 820, No. 822, No. 930, No. 930W, No. 931, No. 931W, No.934 No. 934W, No. 936, No. 936W
Series 80: No. 980, No. 810, No. 812

Furthermore the Pilkington **Profilit™** ventilation shutters could be connected to this profile.

Examples:

figure 10-30: Profile No. 983 - Installation guideline and recommendations -, DXF (30)

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Adobe® PDF (new window)	DXF

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10.31. Frame joint dimensions / principle - sketches -

Example:
Pilkington **Profilit™**
Frame joint dimensions / principle - sketches -

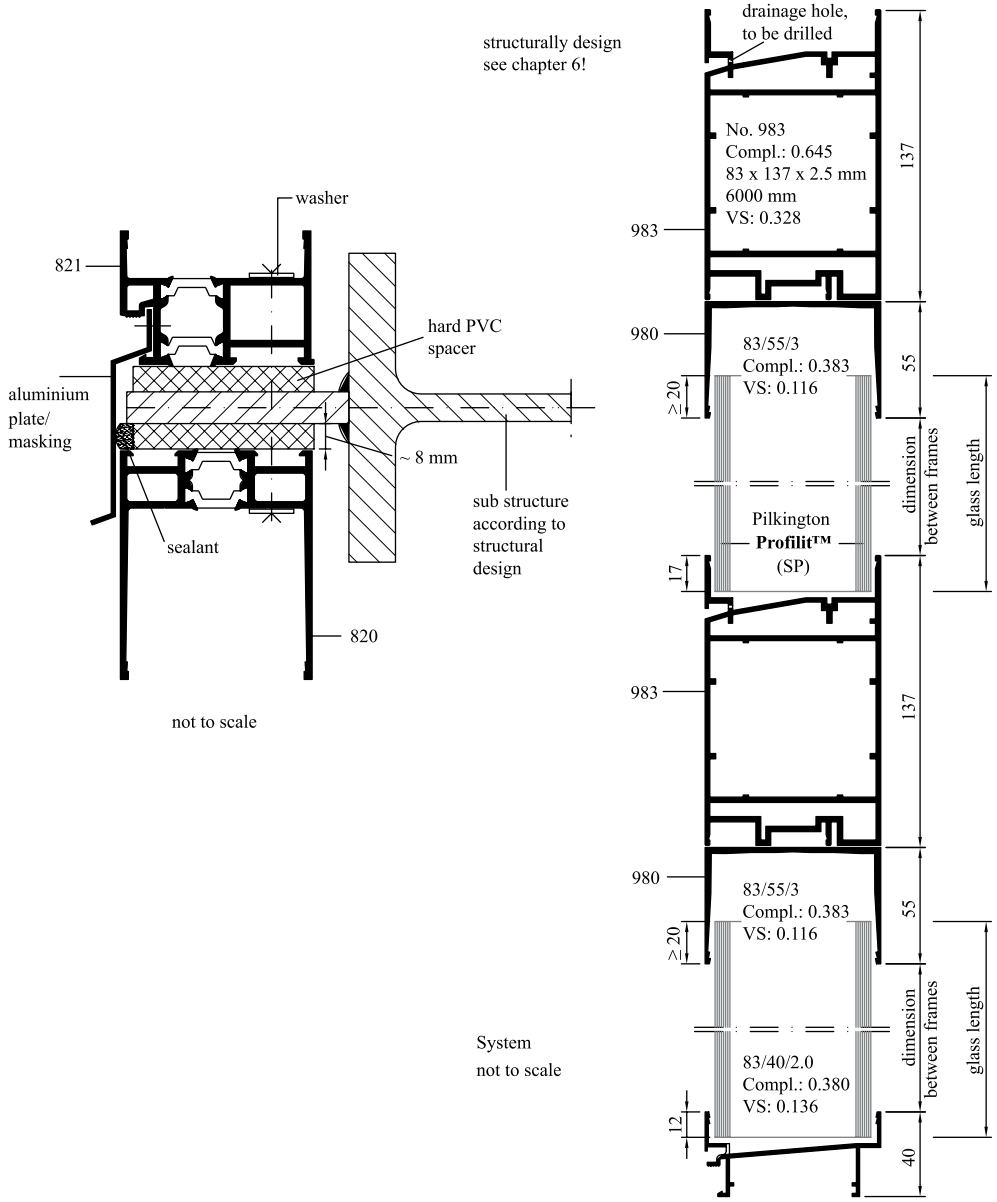

figure 10-31: Frame joint dimensions / principle - sketches -, DXF (31)

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Open file as (31)...

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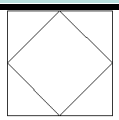
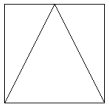
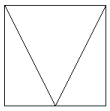
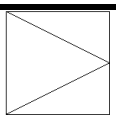
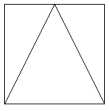
10.32. Pilkington Profilit™ ventilation shutters

10.32.1. Series 60

Determination of glass size for Pilkington Profilit™ ventilation shutters for installation in Pilkington Profilit™ glass walls

- standard-profiles (NP)-series
- non thermal insulated

Type	Appli-cation	Symbol	Desig-nation	Kind of glazing			Maximal size in mm	Minimal size in mm
				Pilkington Profilit™ standard-profiles (NP) single/double	Isoglass up to 24 mm and single glazing up to 8 mm			
				Glass dimension = outer height of casement minus following mass (mm) - only for single casement unit, element with separate unit				
				Only height mm	Width mm	Height mm		
A	Pure indus-trial con-struction		Pivoted casement S and turning casement W	235	210	210	1200 * 1800 with skylight opener 1050 * 2000 with rope manipulation with additional locking device and turning casement	500 * 500
B		 inwards	Tilting casement Ki	235	With Iso- and single glazing only possible type “E”		1200 * 1800 or 1800 * 1000 with skylight opener 1050 * 2000 with catcher	500 * 600
C		 outwards	Top hung casement Kl	235	With Iso- and single glazing only possible type “G”		1200 * 1800 or 1800 * 1200 with skylight opener 1050 * 2000	500 * 600
D	Raised kind of con-struction	 pivot left or right	Vertical pivoted casement D	Glazing within the wing not possible with Pilkington **Profilit™** see B and C	225*)	225*)	1050 * 2000 or 1200 * 1600	600/650
E		 inwards	Tilting casement Ki		225	225	1050 * 2000 or 1800 * 1200 with skylight opener 1050 * 2000 with catcher	500/600

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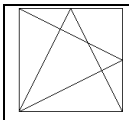
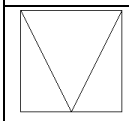
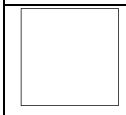
F		 pivot left or right	Swing and swing-tilted casement DK		225	225	1050 * 2000 or 1200 * 1600	600/650
G		 outwards	Top-hung casement Kl		280	280	1200 * 1800 or 1800 * 1000 with skylight opener 1050 * 2000	500/600
H		 FT	Fixed unit FT		145	145	1050 * 2250 without reinforcement 1050 * 4000 with reinforcement	500/500

*table 10-1: Pilkington **Profilit™** ventilation shutters, standard-profiles, non thermal insulated*

*) not valid for opening outward (emergency exit)

10.32.2. Series 83

- special-profiles (SP)-series
- non thermal insulated

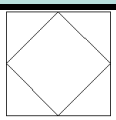
Type	Appli-cation	Symbol	Desig-nation	Kind of glazing			Maximal size in mm	Minimal size in mm
				Pilkington Profilit™ special-profiles (SP) single/double	Isoglass up to 24 mm	Single glazing up to 8 mm		
I	General con-struction		Pivoted case-ment S	260	230	230	1200 * 1800 with skylight opener 1050 * 2000 with rope manipulation	500/600

*table 10-2: Pilkington **Profilit™** ventilation shutters, special-profiles, non thermal insulated*

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10.32.3. Determination of glass size for Pilkington Profilit™ ventilation shutters for installation in Pilkington Profilit™ glass walls

- thermal insulated
- standard-profiles (NP)-series

Note: The space for the block of wood is considered

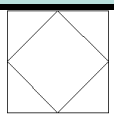
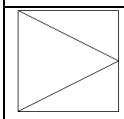
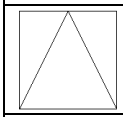
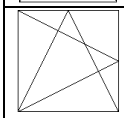
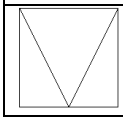
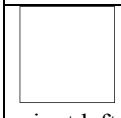
Type	Appli-cation	Symbol	Desig-nation	Kind of glazing			Maximal size in mm	Minimal size in mm
				Pilkington Profilit™ standard profiles (NP) single/double	Isoglass up to 24 mm			
				Glass dimension = outer height of wing unit minus following mass (mm)				
				Only height mm	Width mm	Height mm		
K	Pure indus-trial con-struction		Pivoted casement S and turning casement W	270	245	245	like “A”	like “A”
L		 pivot left or right.	Vertical pivoted casement D	Glazing within the wing not possible with Pilkington **Profilit™**	225*)	225*)	like “D”	like “D”
M			Tilting casement Ki	270	225	225	like “E”	like “E”
N		 pivot left or right	Swing and swing-tilted casement DK	Glazing within the wing not possible with Pilkington **Profilit™**	225	225	like “F”	like “F”
O			Top-hung casement Kl	270	280	280	like “G”	like “G”
P		 pivot left or right FT	Fixed unit FT	Glazing within the wing not possible with Pilkington **Profilit™**				

*table 10-3: Pilkington **Profilit™** ventilation shutters, standard-profiles, thermal insulated*

*) not valid for opening outward (emergency exit)

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Special profiles (SP)-series, thermal insulated

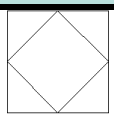
Type	Appli-cation	Symbol	Desig-nation	Kind of glazing			Maximal size in mm	Minimal size in mm
				Pilkington Profilit™ special profiles (SP) single/double	Isoglass up to 24 mm	Single glazing up to 8 mm		
J	General con-struction		Pivoted casement S	290	260	260	1200 * 1800 with skylight opener 1050 * 2000 with rope manipulation	like "I"

*table 10-4: Pilkington **Profilit™** ventilation shutters, special-profiles, thermal insulated*

If, in the case of pivoted casement, top-hung or pivot-hung casement, the hand lever from the bar of the skylight opener needs to be mounted on the side part of the H-bar, then the lateral shaft must be fitted to the left or to the right, and the hand lever needs to be cranked as per existing soffit.

The customer should indicate this when placing his order.

Max. bar length: 5000 mm
In case of a larger length a crank transmission is needed.

The IGUs' are glassed with a glazing gasket (EPDM-glazing gaskets) like represented in the drawings.

Attention!

All indicated frame joint dimensions for the determination of the glass sizes for Pilkington Profilit™ Iso- and Floatglass refer to single ventilation shutters, not to elements and ventilation shutter combinations.

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10.32.4. Pilkington Profilit™ pivoted casement - standard sizes

Suitable for Pilkington Profilit™ single or double shell	Size of outer height of wing unit insulated and non thermal insulated b * h in mm S = with installation of H-bar	Avail-able on stock	Profiled glass within the wing, single or double shell Glasslength = I in mm	Single- or Isoglass within the wing Dimensions of the isolated glass unit = B * H in mm	Profiled glass within the wing, single or double shell Glasslength = I in mm	Single- or Isoglass within the wing Dimensions of the isolated glass unit = B * H in mm
			I = h - 235 mm with NP-types I = h - 260 mm with SP-types	B = b - 210 mm H = h - 210 mm with NP-types B = b - 230 mm H = h - 230 mm with SP-types	I = h - 270 mm with NP-types I = h - 290 mm with SP-types	B = b - 245 mm H = h - 245 mm with NP-types B = b - 260 mm H = h - 260 mm with SP- types
			Non thermal insulated	Non thermal insulated	Thermal insulated	Thermal insulated
K 22 (below or above ventilation shutter)	745 * 745	-	510	535 * 535	475	500 * 500
	S 695 * 695	-	460	485 * 485	425	450 * 450
K 25 (3 x K 25 below or above ventilation shutter)	835 * 835	-	600	625 * 625	565	590 * 590
	S 785 * 785	-	550	575 * 575	515	540 * 540
K 32/ K 50 (3 x K 32 or 2 x K 50 below or above ventilation shutter)	1050 * 1050	+	815	840 * 840	780	805 * 805
	S 1000 * 1000	-	765	790 * 790	730	755 * 755
K 32/ K 50 ventilation shutter over entire height of skylight	Non thermal insulated 1050 * 1195*)	-	960	840 * 985	925	805 * 950
	Thermal insulated 1050 * 1170	-	-	-	-	-
K 22/60/7 (4 x K 22/60/7 below or above ventilation shutter)	980 * 980	-	720	750 * 750	690	720 * 720
	S 930 * 930	-	670	700 * 700	640	670 * 670
K 25/60/7 (4 x K25/60/7 below or above ventilation shutter)	1100 * 1100	-	840	870 * 870	810	840 * 840
	S 1050 * 1050	-	790	820 * 820	760	790 * 790

*table 10-5: Pilkington **Profilit™** pivoted casement - standard sizes*

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10.32.5. Determination of outer height of wing unit of whole Pilkington Profilit™ glasses, single or double shell

A) non thermal insulated casements

1) NP-types: pivoted-/turning and tilting-/top-hung casement

whole Pilkington **Profilit™** glasses within the casement	(n * b) + 220 mm
whole Pilkington **Profilit™** glasses below or above casement	
without H-bar installation	(n * b) + 50 mm
with H-bar installation	n * b mm

2) SP-types: pivoted-/turning casement

whole Pilkington **Profilit™** glasses within the casement	(n * b) + 260 mm
whole Pilkington **Profilit™** glasses below or above casement	
without H-bar installation	(n * b) + 50 mm
with H-bar installation	n * b mm

B) thermal insulated casements

1) NP-types: pivoted-/turning and tilting-/top-hung casement

whole Pilkington **Profilit™** glasses within the casement	(n * b) + 260 mm
whole Pilkington **Profilit™** glasses below or above casement	
without H-bar installation	(n * b) + 50 mm
with H-bar installation	n * b mm

2) SP-types: pivoted-/turning casement

whole Pilkington **Profilit™** glasses within the casement	(n * b) + 280 mm
whole Pilkington **Profilit™** glasses below or above casement	
without H-bar installation	(n * b) + 50 mm
with H-bar installation	n * b mm

It means:

n = number of glasses
b = width of glass

Glass widths:

K22 = 232 mm
K25 = 262 mm
K32 = 331mm
K50 = 498 mm
K22/60/7 = 232 mm
K25/60/7 = 262 mm
K32/60/7 = 331 mm

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10.32.6. Most common Pilkington Profilit™ ventilation shutter types for standard profiles (NP), symbols and glazing possibilities: (non thermal insulated)

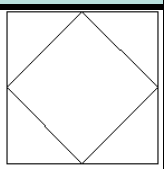
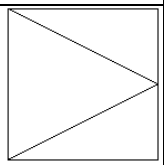
Type	Kind of opening	Symbol	Designation	Glazing within the wing	Maximal size in mm	Possible manipulation, fitting and gasket	Stand-ard sizes
A	Pivoted casement		Pivoted casement Off centre storage	Pilkington **Profilit™** (NP), Flatglass, Isoglass	1200 * 1800 with skylight opener 1050 * 2000 with rope manipulation	a) Catcher b) Skylight opener with gasket c) In addition to a) an inside locking device is possible d) Opening mechanism via button e) Opening mechanism via bar	Yes
D	Vertical pivoted casement inwards pivot right		Vertical pivoted casement Pivot left or right inwards	Flatglass, Isoglass	1050 * 2000 1200 * 1600	handle additional gasket in frame	No

*table 10-6: Most common Pilkington **Profilit™** ventilation shutter types for standard profiles (NP)*

10.32.7. Most common Pilkington Profilit™ ventilation shutter types for standard profiles (NP), symbols and glazing possibilities: (non thermal insulated)

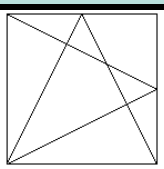
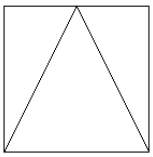
Type	Kind of opening	Symbol	Designation	Glazing within the wing	Maximal size in mm	Possible manipulation, fitting and gasket	Stand-ard sizes
F	Swing/and swing tilted casement pivot right		Swing/and swing tilted casement pivot left or right	Flatglass, Isoglass	1050/2000 1200/1600	Hidden fitting, additional gasket in frame, one hand operation	No
B E	Tilting casement inwards		Tilting casement inward	1) Pilkington **Profilit™** (NP) 2) Flatglass, Isoglass	1200 * 1800 or 1800 * 1000 with skylight opener 1050 * 2000 with catcher	a) Catcher + scissors b) Skylight opener c) Handle + scissors with NP/Iso d) With gasket	No

*table 10-7: Most common Pilkington **Profilit™** ventilation shutter types for standard profiles (NP)*

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10.32.8. Most common Pilkington Profilit™ ventilation shutter types for standard profiles (NP), symbols and glazing possibilities: (non thermal insulated)

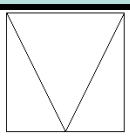
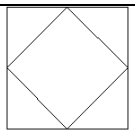
Type	Kind of opening	Symbol	Designation	Glazing within the wing	Maximal size in mm	Possible manipulation, fitting and gasket	Stand-ard sizes
C G	Top hung casement outwards		Top hung casement outwards	1) Pilkington **Profilit™** (NP) 2) Flatglass, Isoglass	1050 * 2000 or 1800 * 1000 with skylight opener	Skylight opener or handle, gasket	No
	Turning casement pivot right (left inwards)		Turning casement pivot right	Pilkington **Profilit™** (NP) Flatglass, Isoglass	1200 * 1800 1050 * 2000	With handle or prepared for opening of window groups, gasket	No

*table 10-8: Most common Pilkington **Profilit™** ventilation shutter types for standard profiles (NP)*

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Chapter 11

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11. Product information Pilkington Profilit™ T / T Color

11.1. Definition

Thermally toughened channel shaped safety glass:

Glass within which a permanent surface compressive stress has been induced by a controlled heating and cooling process in order to give it greatly increased resistance to mechanical and thermal stress and prescribed fragmentation characteristics.

Horizontal toughening:

Process in which the glass is supported on horizontal rollers.

11.2. Normative references

Basic product: Pilkington **Profilit™** produced according to EN 572-7.

Toughening: According to the methodology of EN 12150-1:2000 and according to PR EN 15683-1 (as described below).

Heat soak test: According to Bauregelliste 11.4.2

Safety characteristics: Impact Test according to the Methodology of EN 12600

11.3. Dimensions and tolerances

11.3.1. Tolerances on nominal width (B), height of flange (d) and thickness (c)

The tolerances on nominal width B, height of flange d, and thickness c, according to EN 572-7 are given in the table below.

Width, B [mm]		Height of flange, d [mm]		Thickness, c [mm]	
Nominal	**Tolerance**	**Nominal**	**Tolerance**	**Nominal**	**Tolerance**
232 to 498 232 to 331	± 2,0 ± 2,0	41 60	± 1,0 ± 1,0	6 7	± 0,2 ± 0,2

table 11-1: Tolerances on nominal width (B), height of flange (d) and thickness (c)

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11.3.2. Flange deviation

The deviation of the flange, z, from perpendicular to the web is determined with a right angle, as shown below.

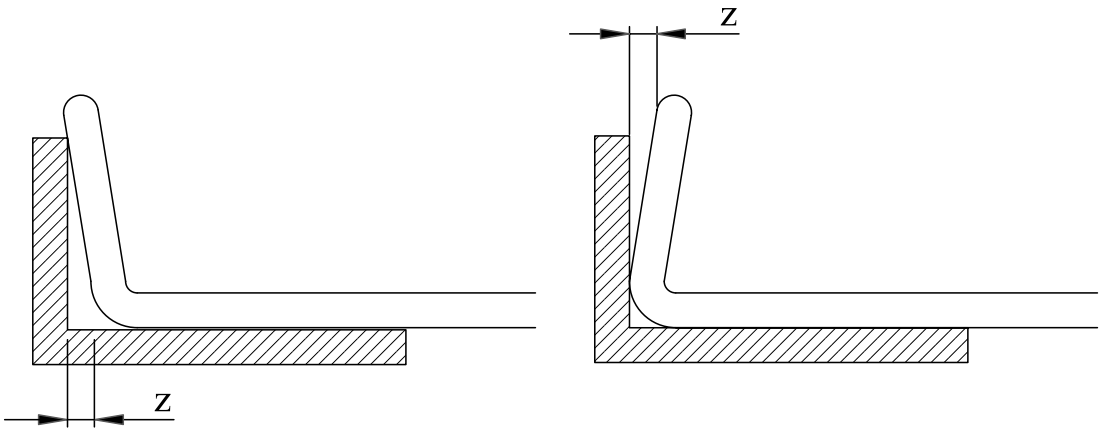

figure 11-1: Flange deviation

The flange deviation, z, should not exceed 1.0 mm.

11.3.3. Squareness of cut

The out of squareness of the web and flanges is determined at both cut ends. It is measured relative to a plane perpendicular to the direction of draw of the glass at the intersection of the centre line of the web and of the cut edge. The deviation of the flange plane is measured.

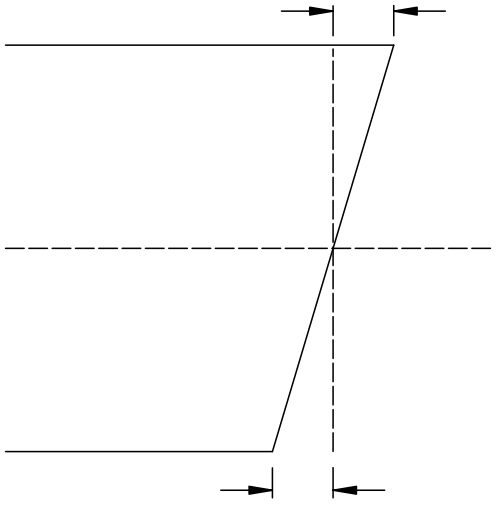

figure 11-2: Squareness of cut

The deviation shall not exceed 3.0 mm.

11.3.4. Flatness

By the very nature of the toughening process, it is not possible to obtain a product as flat as annealed glass. The difference depends on the nominal thickness, the web and flange dimensions and the length. Therefore a distortion known as overall bow may occur.

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11.3.4.1. Measurement of overall bow

The pane of glass shall be placed in a horizontal position on one flange and supported by two load bearing blocks at the quarter points (see figure below).

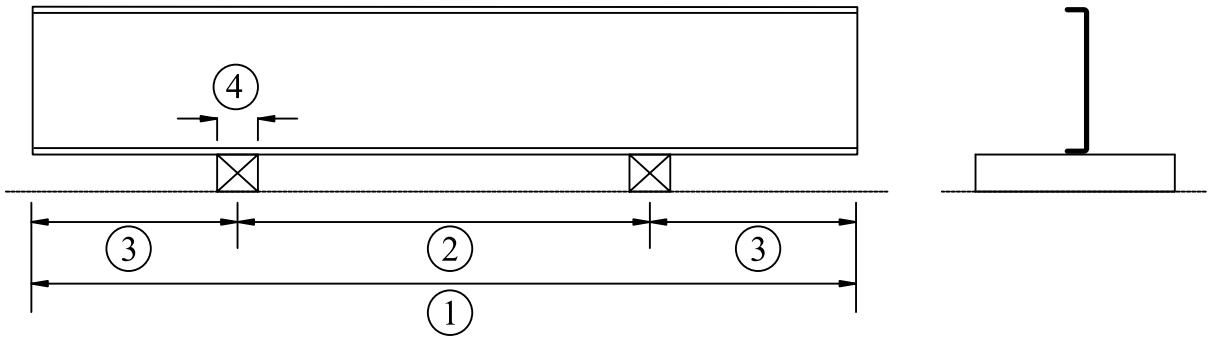

figure 11-3: Measurement of overall bow

1) Length of glass panel L
2) L / 2
3) L / 4
4) maximum 100 mm

The deformation shall be measured along the middle axis of the web between the cut edges of the channel shaped glass as the maximum distance between a straight metal ruler, or a stretched wire, and the concave surface of the channel shaped glass. The measurement shall be carried out at room temperature.

The overall bow should not exceed 0.004 mm / mm.

11.4. Edge working of channel shaped glass before toughening

The cut edges of every glass that shall be thermally toughened have to be edge worked prior to toughening.

11.5. Fragmentation test

The fragmentation test determines whether the glass breaks in the manner prescribed for a thermally toughened channel shaped safety glass.

11.5.1. Dimensions and number of test specimens

The length of the test specimens shall be 2100 mm, without holes, notches or cut-outs. The width is determined by the glass type.

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11.5.2. Test procedure

Each test specimen shall be impacted, using a pointed steel tool, at a position 13 mm from the cut edge of the test specimen at the mid-point of that edge, until breakage occurs (see figure below).

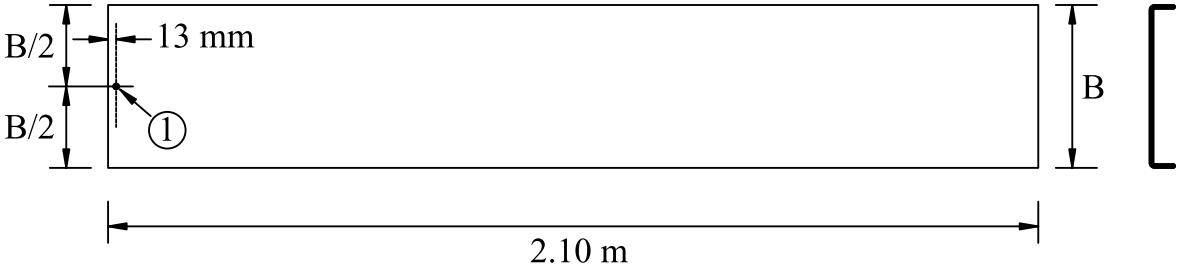


figure 11-4: Test procedure

The test specimen shall be laid flat on a table without any mechanical constraint. In order to prevent scattering of the fragments, the specimen shall be simply held at the edges, e.g. by a small frame, adhesive tape etc., so that the fragments remain interlocked after breakage yet extension of the specimen is not hindered.

11.5.3. Assessment of fragmentation

The particle count and measuring of the dimensions of the largest particle shall be made between 4 min to 5 min after fracture. An area of radius 100 mm, centred on the impact point, and a border of 25 mm, round the cut edge of the test specimen (see figure below) and the flanges, shall be excluded from the assessment.

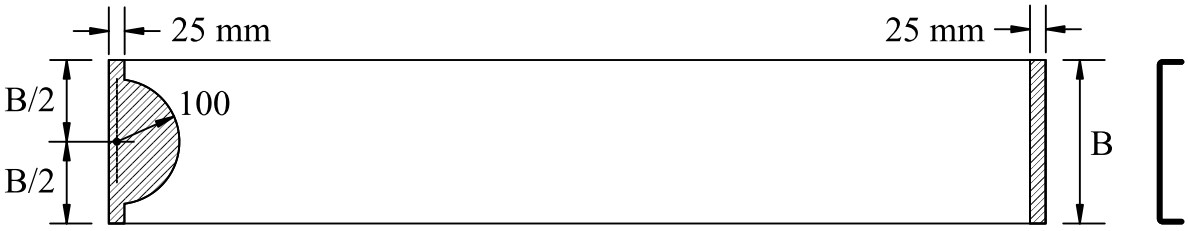
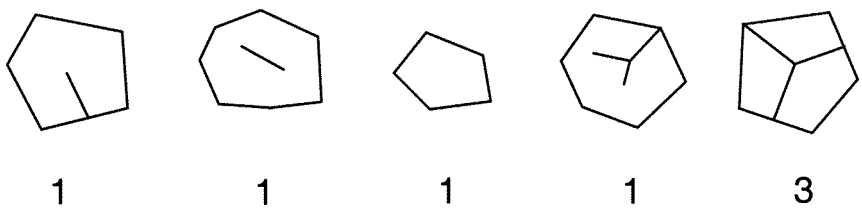


figure 11-5: Assessment of fragmentation

The particle count shall be made in the region of coarsest fracture (the aim being to obtain the minimum value). The particle count shall be made by placing a mask of (50 ± 1) mm x (50 ± 1) mm on the test piece. The number of crack-free particles within the mask shall be counted. A particle is 'crack-free' if it does not contain any cracks which run from one edge to another (see figure below).

Examples of crack-free particles and the assessment regarding the number:



In the particle count, all particles wholly contained within the area of the mask shall be counted as one particle each and all the particles, which are partially within the mask shall be counted as ½ particle each.

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Example of particle count:

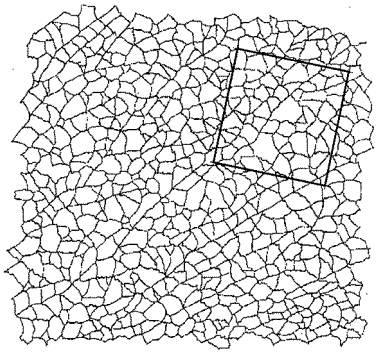
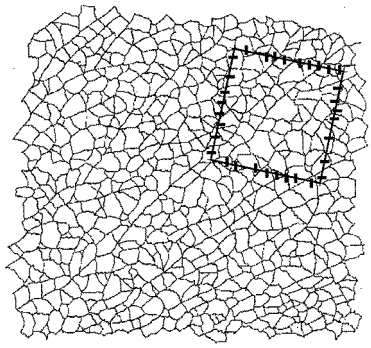
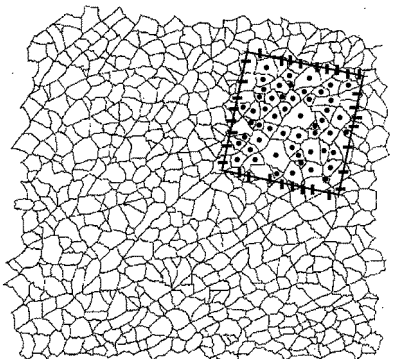


Figure 1: **Select the area of coarsest fracture, place the template on the test specimen and draw round the template.**



Number of particles = 32 / 2 = 16

Figure 2: **Mark and count the perimeter fragments as ½ particle each.**



Number of central = 53
Total number of particles = 16 + 53 = 69

Figure 3: **Mark and count the central fragments and add these to the perimeter count to obtain the particle count for the specimen.**

11.5.4. Minimum values from the particle count

In order to classify a glass as a thermally toughened channel shaped safety glass, the particle count of each test specimen shall not be less than the values given in the following table.

Glass type	Glass thickness (c) [mm]	Minimum particle count
Pilkington **Profilit™** T	6	40
	7	40

table 11-2: Minimum particle count values

11.5.5. Selection of the longest particle

The longest particle shall be chosen from the body of the test specimen. It shall not be in the excluded area. The length of the longest particle shall not exceed 100 mm.

11.6. Other physical characteristics

11.6.1. Optical distortion

While the hot glass is in contact with the rollers during the toughening process, a surface distortion is produced by a reduction in surface flatness, known as ‘roller wave’. Roller wave is generally noticed in reflection. The web can show signs of small imprints in the surface (‘roller pick-up’).

11.6.2. Anisotropy (iridescence)

The toughening process produces areas of different stress in the cross section of the glass. These areas of stress produce a bi-refringent effect in the glass, which is visible in polarised light.

When thermally toughened channel shaped safety glass is viewed in polarised light, the areas of stress show up as coloured zones, sometimes known as ‘leopard spots’. Polarised light occurs in normal daylight. The amount of polarised light depends on the weather and the angle of the sun. The bi-refringent effect is more noticeable either at a glancing angle or through polarised spectacles.

11.6.3. Thermal durability

Thermally toughened channel shaped safety glass is capable of resisting both sudden temperature changes and temperature differentials up to 200 K.

11.6.4. Mechanical strength

The value of mechanical strength can only be given as a statistical value associated with a particular probability of breakage and with a particular type of loading. The mechanical strength values apply to quasi-static loading over a short time, e.g. wind loading, and relate to a 5 % probability of breakage at the lower limit of the 75 % confidence interval.

Breaking stresses and corresponding installation lengths:

The breaking stresses for thermally toughened Pilkington **Profilit™** T glass types have been tested by an independent testing laboratory according to the methodology of EN 1288 and according to Allgemeine Bauaufsichtliche Zulassung Z-70.4-43, Annex 2.

For corresponding allowable installation lengths in a concrete project application please contact our applications technology department.

11.6.5. Classification of performance under accidental human impact

Thermally toughened channel shaped safety glass can be classified, as to its performance under accidental human impact, by testing in accordance to the methodology of EN 12600.

Impact tests:

Pilkington **Profilit™** T K25 has been tested according to the methodology of EN 12600. Detailed test data can be provided on request by our applications technology department.

The tests have been surveyed by an independent test laboratory.

Tested products:	Pilkington **Profilit™** T, K25 and K 25/60/7
Height of tested setup:	H = 3.50 m
Drop height reached without any breakage:	Class 1, drop height 1200 mm
Type of installation:	double glazed, sealed, vertical, with gaskets no. 165 and no. 166

11.7. Marking

Every thermally toughened Pilkington **Profilit™** T panel shall be permanently marked with “Profilit™ T”. In case the panel has been heat-soak-tested according to Bauregelliste 11.4.2, the marking on the panel shall be “Profilit™ T-H”. The marking is placed at one end of the panel approx. 30 mm away from the panel edge in the centre of the web.

11.8. Application of Pilkington Profilit™ T

The requirements for the application of thermally toughened Pilkington **Profilit™** in the various markets have to be checked by the installer with the local building authorities by taking into account the relevant national and international standards and regulations.

Remarks:

- **The feasibility of inclined cuts or model cuts can be checked upon request.**
- **Thermally toughened Pilkington Profilit™ T cannot be mechanically treated (e.g. cutting, drilling) after tempering.**

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11.9. Pilkington Profilit™ T Color (thermally toughened and enamelled profiled glass)

As Pilkington **Profilit™** T however with an additional ceramic frit (enamel) applied on the inside of the U-profile. For the enamel a wide range of different RAL colours are available. Not available are luminous colours, violet/purple, and metallic colours. Possible colours can be checked upon request provided the exact type of colour (RAL No.) is available.

11.10. Important remark (Please note!)

11.10.1. Pilkington Profilit™ T / T Color (thermally toughened profiled glass)

The maximum supply length for thermally toughened Pilkington **Profilit™** T would be 7.00 m and for thermally toughened and enamelled Pilkington **Profilit™** T Color 4.50 m.
The product Pilkington **Profilit™** T / T Color would be supplied according to the standard EN 572 part 7 and according to the methodology of EN 12150 part 1. For the application in facades we recommend for Pilkington **Profilit™** T / T Color a heat-soak-test. The heat-soak-test will be according to Bauregelliste 11.4.2. For double glazed installation of Pilkington **Profilit™** T / T Color gaskets no. 165 and no 166 shall be used.

The requirements for the application of thermally toughened Pilkington **Profilit™** T in the various markets have to be checked by the installer with the local building authorities by taking into account the relevant national and international standards and regulations.

Please note that it is not possible to change the glass length after having placed the order. Furthermore we inform you that a treatment (cutting, drilling, etc.) of the product after tempering is not allowed.

11.10.2. Coated glass (see also 11.6.2 Anisotropy)

For coated thermally toughened glass products characteristics like e.g. colour, U-value or g-value can vary caused by the toughening process. Therefore we cannot guarantee the product characteristics for these products.

Amethyst:
A metal oxide coating that is applied to the inside of the glass profile provides an attractive amethyst-coloured appearance. Caused by the metal oxide coating, the installation situation and influences of the environment, irisation effects and changed colour impressions might occur, depending on the point of view. Dirt and settlements on the coating can cause irregular appearance. These effects are typical for this product and give no reason for complaint. The coating on the inside of the profile is bonded with the glass to be scratch-resistant.

“Antisol” (sun protection) / “Plus 1,7” (heat insulation):
Caused by the metal oxide coating, the installation situation and influences of the environment, irisation effects and changed colour impressions might occur, depending on the point of view. These effects are typical for this product and give no reason for complaint.

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Annexe

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A-1 General text for tender (recommendations) for Pilkington Profilit™

(Adobe® PDF and Microsoft® DOC: see below!)

A-2 Installation lengths for vertically installed Pilkington Profilit™ glazing

(Adobe® PDF: see below!)

A-3 Survey - Pilkington Profilit™ installation components

(Adobe® PDF: see below!)

A-4 Pilkington Profilit™ delivery program

(Adobe® PDF: see below!)

A-5 Brochures

(Adobe® PDF: see below!)

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A-5	Facade 2005 Adobe® PDF (new window) Facade 2007 Adobe® PDF (new window) Facade 2009 Adobe® PDF (new window) General Brochure Adobe® PDF (new window) **Profilit™** T / **Profilit™** T Color Adobe® PDF (new window) Technical Information Adobe® PDF (new window)	

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