

# European Product Standard. Windows and External Pedestrian Doorsets.





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# European Construction Products Regulation → CPR No 305/2011

**The Construction Products Regulation (CPR) No 305/2011 of the European Union lays down harmonised conditions for the marketing of construction products.**

It has been fully effective in all EU member states since 1 July 2013.

The Construction Products Regulation is a European law which replaced the Construction Products Directive and essentially regulates the following:

- the basic requirements for construction works,
- the obligation to mark construction products,
- the obligations of manufacturers, importers of products from third countries, distributors and authorised representatives,
- the market surveillance bodies and their penalty options,
- the product contact points in each country.

The basic requirements for construction works are:

- Mechanical resistance and stability
- Safety in case of fire
- Hygiene, health and the environment
- Safety and accessibility in use
- Protection against noise
- Energy economy and heat retention
- Sustainable use of natural resources

For windows and doors, the harmonised product standard DIN EN 14351-1:2006+A2:2016 regulates the type of characteristic values covering the basic requirements.

New requirements relating to life cycle, climate protection, accessibility and the sustainable use of natural resources have been added. These are, however, only applicable after the inclusion of relevant specifications in the harmonised European standards.

The key document required under the Construction Products Regulation is the declaration of performance. By drawing up the declaration of performance, the manufacturer assumes responsibility for the conformity of the construction product with the declared performance.

The Construction Products Regulation provides a detailed specification of the obligations of manufacturers. Manufacturers must, among other things, draw up technical documentation describing all the relevant elements related to the required system of assessment and verification of constancy of performance. They are required to keep the technical documentation and the declaration of performance for a period of ten years after the construction product has been placed on the market.

The declaration of performance is based on factory production control (FPC) and initial type testing (ITT) by a notified testing laboratory. It indicates the performance of the construction product in relation to the essential characteristics as specified by the applicable product standard.



Each unit must be identifiable by means of a number and the manufacturer's information. This identification number can be used to assign the declaration of performance and CE marking to the relevant construction product.

Finstral affixes the manufacturer's information with address and identification number in the form of a high-grade label in the frame rebate at the top on the hinge side. For all units with sashes, the label is still visible to the end customer after installation. With fixed glazing, the label is affixed behind the glazing bead for reasons of appearance.

The prescribed operating instructions and safety information are issued to the end customer in the form of a brochure. The two documents "Operating instructions and safety information. Windows." and "Operating instructions and safety information. Doors." present guidance on the use and safety of Finstral units. Both brochures are available online at [finstral.com/manuals](https://www.finstral.com/manuals) or can be ordered from Finstral free of charge.

Distributors of construction products are issued with the relevant installation guidelines. They must observe the manufacturer's storage and transport conditions so as to ensure that conformity of the construction product with the declaration of performance is not compromised. The storage and transport conditions for Finstral units are printed in the Finstral price lists.

To prevent end customers from being misled, manufacturers and distributors are obliged to include only those performance values in their promotional information that also appear in the declaration of performance. This means that all offers, brochures, product data sheets, Internet content, PR copy, advertisements, product descriptions at trade fairs and in exhibitions must always be up-to-date.

If a company puts a construction product on the market under its own name or trademark, e.g. by fitting hardware or ventilation components to windows or doors, or by purchasing windows and doors without glass and having these glazed by others, then it thereby changes the product's declared performance values and, under the Construction Products Regulation, becomes the manufacturer. As manufacturer, it is required to amend the technical documentation, have tests on the modified product performed by notified testing bodies and re-draft all relevant documents. This is because, by affixing the CE marking, it takes responsibility for the conformity of the product with its declared performance.



Frame label with identification number

**Market surveillance bodies**

The market surveillance body is a new public law instrument, which conducts retrospective governmental inspections of construction products to ensure the uniform and equivalent enforcement of the provisions of the Construction Products Regulation. At the same time, it has severe penalty options at national level.

**Product contact points**

Each Member State is required to have “product contact points for construction”. These must provide transparent and easily understandable information on the minimum national requirements for the construction product.

**Further information on the Construction Products Regulation:**

The regulation can be viewed on and downloaded from the Internet at:  
<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32011R0305>



The EPW (European Plastic Window Association), FEMIB (Federation of the European Building Joinery Associations) and UEMV (European Glaziers Association) have published Guidance Sheet CE.02: 2014-12 “Declaration of Performance and CE marking of windows and external pedestrian doorsets according to the CPR”. This is available as a free download at the following link:

[https://www.eurowindow.eu/wp-content/uploads/2023/02/CE02\\_1412\\_EN.pdf](https://www.eurowindow.eu/wp-content/uploads/2023/02/CE02_1412_EN.pdf)



The obligation to provide a declaration of performance and affix a CE marking applies to construction products covered by harmonised EN standards (published in the Official Journal of the European Union).

The material-independent performance characteristics of windows and external pedestrian doorsets are governed by EN 14351-1.

# European Product Standard for windows and external pedestrian doorsets → EN 14351-1

**The European standard (EN 14351-1) applies throughout Europe and is incorporated into national standards without amendment.**

In other words, although national standards remain effective, they must be fully aligned with European standards. They are adopted by the national standards bodies (e.g. DIN in Germany). For the versions published and effective in the individual countries, the standard national prefix is added to the “EN” designation (e.g. with “DIN EN” used for Germany).

In a national foreword, the national standards bodies can give information and explanations regarding application of the standard and its relationship with existing national standards. However, these are for information purposes only. These explanations must not contain any supplementary normative rules. As a result, the same standards apply throughout Europe. Specification of the required minimum performance levels on the basis of this European standard is nonetheless at the individual countries’ discretion.

## Scope of application

European standard 14351-1:2006+A2:2016 has been effective since December 2016 and governs the material-independent performance characteristics for:

- Windows
- External pedestrian doorsets (including unframed glass doorsets, escape and panic doorsets)
- Screens

Openable windows and external pedestrian doorsets subject to smoke-proofing and fire protection requirements are covered by EN 16034.

## Windows can be basically divided into three categories:

- Punched windows  
Loads are transmitted directly, by means of fixings, to the masonry at the sides and bottom.
- Horizontal windows  
Several windows are arranged adjacent to each other, with direct load transmission via the floor, the apron wall and the ceiling (window walls).
- Vertical windows  
Several windows are arranged on top of one another, each being fixed to the wall so as to be self-supporting in that no loads are transmitted to the unit below.

**Product standard EN 14351-1 covers:**

- Fixed windows or fixed lights, manually or power-operated windows and door-height windows (casement doors), and screens for installation in vertical apertures and roof windows for installation in roofs, together with:
  - related hardware, if any;
  - weatherstripping/gaskets, if any;
  - glazed apertures, where glazed apertures are planned;
  - with or without incorporated roller shutters and/or roller shutter boxes and/or blinds; and manually or power operated windows, roof windows, door-height windows (casement doors) and screens that are fully or partially glazed, including non-transparent infill panels;
  - fixed or partially fixed or openable with one or more sashes (e.g. top-hung sashes, pivot sashes, turn-only sashes, sliding sashes).
- Manually operated external pedestrian doorsets with flush or panelled leaves, complete with:
  - integral fanlights, if any;
  - adjacent parts (sidepanels) that are contained within a single frame for inclusion in a single aperture, if any.

The windows covered by this standard are not assessed regarding their ability to release (to open).  
The products covered by this European Standard are not assessed for structural applications.

**It does not apply to:**

- Rooflights (EN 1873 and EN 14963)
- Curtain walling (EN 13830)
- Industrial, commercial and garage doors and gates (EN 13241)
- Internal pedestrian doorsets (EN 14351-2)
- Revolving doorsets
- Power-operated pedestrian doorsets to EN 16361
- Windows intended to be part of an internal partition wall

Roof windows (i.e. in the plane of the roof pitch) are also covered by the standard, though are not discussed in this document.

# Performance characteristics for windows and doors to EN 14351-1

**The essential characteristics must be specified in the declaration of performance. These are:**

- Watertightness
- Dangerous substances
- Resistance to wind load
- Load-bearing capacity of safety devices
- Acoustic performance
- Thermal transmittance
- Total solar energy transmittance
- Light transmittance
- Air permeability
- Impact resistance (for doors)
- Clear height (for doors)

**Other important characteristics that are explained in greater detail here:**

- Burglar resistance
- Repeated opening and closing test
- Tabular summary of performance classifications for windows and doors to EN 14351-1

**The descriptions contain:**

- Normative references
- Description of characteristic
- Classification summaries
- Classification of Finstral products
- Application notes

# → Resistance to wind load

## Description

The resistance to wind load classification reflects a building element's behaviour when exposed to wind action. Wind loads have implications in relation to the loadbearing capacity of openable units, the behaviour of frame components and the connection of infill components (panels, glass) to the sashes or frames. The tests must be carried out in accordance with EN 12211. The results must be expressed in accordance with EN 12210 and apply for units of a size not exceeding the frame width and height of the test specimen.

The requirements placed on the window units are regularly verified on the test stand.



### Classification

The classification is based on a combination of the:

- maximum permissible deflection of the main structural element
- maximum achieved positive pressure applied to the unit

### Classification of relevant deflection

Class	Relative frontal deflection	Comments
A	< 1/150	Low/medium requirement
B	< 1/200	High requirement (e.g. minimum RAL requirement)
C	< 1/300	Very high requirement

### Classification of wind load

Class	P1 (Pa)	P2 (Pa)	P3 (Pa)	Comments
0	Not tested	Not tested	Not tested	Low/medium requirement
1	400	200	600	
2	800	400	1200	High requirement
3	1200	600	1800	
4	1600	800	2400	Very high requirement
5	2000	1000	3000	

P1 = Load for measuring deflection of structural elements (design load)

P2 = Allows for positive/negative loads

P3 = (safety tests) Allows for short gusts of wind (10 Pa = 10 N/m<sup>2</sup>, corresponding to 1 kg/m<sup>2</sup>)

### Note:

In the design of structural elements to class C, it is not necessary to verify the permissible material stresses as the limited deflection will prevent the limit values from ever being reached. A verification of stresses is required for permissible deflections of less than 1/200. The design of glazing is not covered by EN 14351-1.

Nor is the load transmission, fixing and anchorage of windows and doors regulated at European level. In Germany, for instance, this is covered by DIN 1055.

**EN 12210: Classification of Finstral systems**

System	Version	Classification	Comments
FIN-Window	1-sash window/door, tilt & turn	C4 / B4	Very high requirement
FIN-Window	2-sash fl. mullion window/door, turn-only/tilt & turn	C1 / B2	Medium/high requirement
FIN-Window	1-sash parallel sliding door	C1 / B2	
FIN-Project	1-sash window/door, tilt & turn	C4 / B4	Very high requirement
FIN-Project	2-sash fl. mullion window/door, turn-only/tilt & turn	C1 / B2 to C2 / B3	
FIN-Slide	1-sash lift-and-slide door 90 Step-line	C2 / B2	
FIN-Slide	1-sash lift-and-slide door 38 Slim-line	C1 / B2	High requirement
FIN-Slide	1-sash lift-and-slide door 38 Cristal/Nova-line Plus	C2 / B2	
FIN-Slide	1-sash lift-and-slide door 38 Nova-line Plus Cristal	C2 / B2	
FIN-Scroll	1-sash sliding door	C1 / B1	Low/medium requirement
Door	1-leaf door	C2 / B2	High requirement

The stated classification relates to the reference size for windows and doors. Other unit sizes may diverge from this classification.

**Application notes**

A maximum deflection of 1/200 (class B) represents a reasonable requirement. It is also accepted by the RAL Quality Assurance Association (RAL-Gütegemeinschaft). Higher requirements should only be specified for very high wind loads as these necessitate greater stiffening provision for the frame components and sashes or larger frame cross-sections. The higher metal content also has a negative impact on the thermal insulation properties.

A maximum deflection of 1/150 (class A) should never be selected: the high permissible deflection would entail the possibility of the stress limit value being reached and, most importantly, an increase in the loads acting on the insulating glass units. This would have a negative impact on the long-term quality of the glass. This is particularly critical for glass units with wide gaps between the panes and for triple glazing.

# → Watertightness

## Description

Watertightness is a key quality characteristic of windows and external doors. Yet, as it is not subject to any building regulations requirements, it is appropriate for the specifying body to impose its own requirements. Watertightness must be tested to EN 1027. The results must be expressed in accordance with EN 12208 and apply for units up to +50 % of the total area of the test specimen. Classification is based on the pressure at which no water penetration as yet occurs.

Water penetration is defined not only as the possible ingress of water into the interior, but also as water ingress into the assembly, which, in turn, can lead to the destruction of this or the adjoining wall. Provision is thus required for the controlled drainage of water through the assembly.

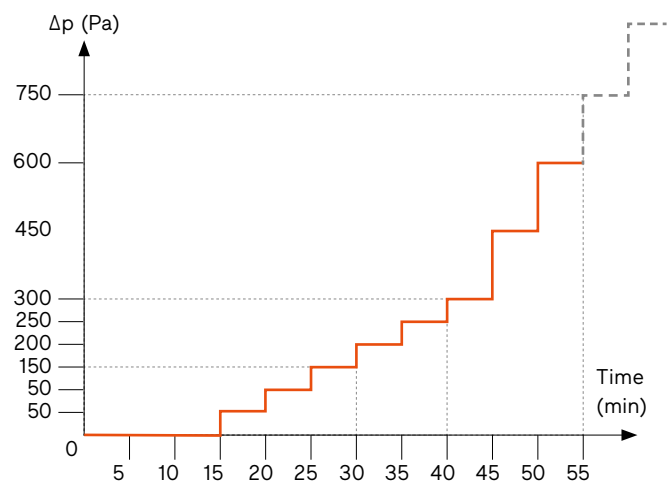
## Classification

The details below relate only to units installed at an unshielded location.

### Classification table

Test pressure (Pa)	Classification	Comments
0	1A	
50	2A	Low requirement
100	3A	
150	4A	Medium requirement
200	5A	
250	6A	High requirement
300	7A	
450	8A	
600	9A	Very high requirement
> 600	E xxx	

### Test procedure



The test specimen is fully sprayed by nozzles (2 ltr/min per nozzle) located at the top.

## EN 12208: Classification of Finstral systems

System	Version	Classification	Comments
FIN-Window	1-sash window/door, tilt & turn	9A	
FIN-Window	2-sash fl. mullion window/door, turn-only/tilt & turn	9A	Very high requirement
FIN-Window	1-sash parallel sliding door	9A	
FIN-Project	1-sash window/door, tilt & turn	9A	Very high requirement
FIN-Project	2-sash fl. mullion window/door, turn-only/tilt & turn	9A	
FIN-Slide	1-sash lift-and-slide door 90 Step-line	8A	Very high requirement
FIN-Slide	1-sash lift-and-slide door 38 Slim-line	7A	High requirement
FIN-Slide	1-sash lift-and-slide door 38 Cristal/Nova-line Plus	6A	
FIN-Slide	1-sash lift-and-slide door 38 Nova-line Plus Cristal	8A	Very high requirement
FIN-Scroll	1-sash sliding door	5A	Medium requirement
Door	1-leaf door	5A	Medium requirement

The stated classification relates to the reference size for windows and doors. Other unit sizes may diverge from this classification.

### Application notes

Middle gasket systems should be incorporated in case of heavy exposure to driving rain. By virtue of their profile cross-section, these ensure reliable water drainage. They also cater for a clear separation of drainage and hardware levels such that, in the closed position, the hardware does not come into contact with water or dirt. Classifications between 7A - 9A are recommended for windows and doors with full-perimeter frame profiles. For doors with flat, wheelchair-accessible thresholds and lift-and-slide doors, values of 6A - 7A already imply very good quality.

Good-practice installation is especially important in combating driving rain: particular attention must be given to guaranteeing reliable water drainage at windowsills and thresholds. Installation is not covered by EN 14351-1.



Cross-section through a typical Finstral middle gasket system

# → Air permeability

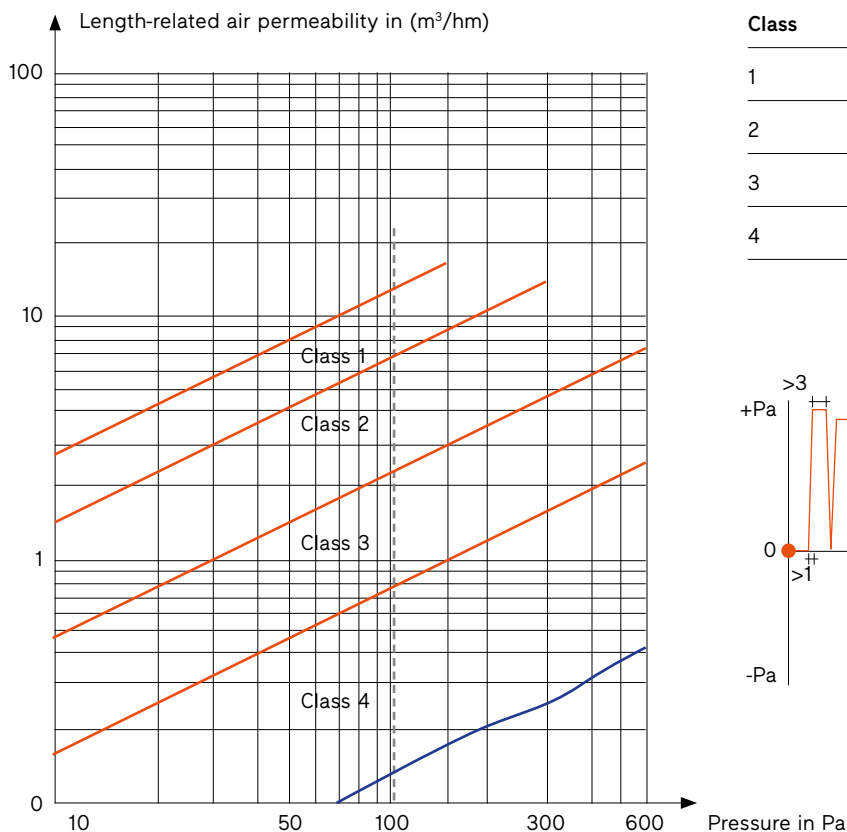
## Description

The test involves determining air permeability in function of the test pressure and relating this to the joint length of the openable sash and to the square-metre area of the overall unit. The test to EN 1026 is performed under positive and negative pressure, the classification to EN 12207 being based on their mean values. The classification applies for units up to +50% of the total area of the test specimen. According to Annex I of EN 14351-1, class 2 may also be used for fixed and openable windows with a continuous gasket profile (and class 1 for external pedestrian doorsets).

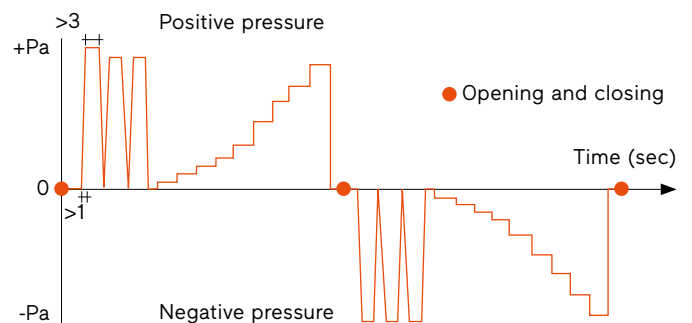
## Classification

The classification is based on the leakage rate of the units, as shown in the relevant diagram.

## Test procedure



Class	Explanation
1	Low tightness
2	Medium tightness
3	Good tightness
4	Very good tightness



The lower the air loss (m<sup>3</sup>/hm) in relation to the applied pressure, the higher the class and the better the tightness.

**EN 12207: Classification of Finstral systems**

System	Version	Classification	Comments
FIN-Window	1-sash window/door, tilt & turn	4	
FIN-Window	2-sash fl. mullion window/door, turn-only/tilt & turn	4	Very high requirement
FIN-Window	1-sash parallel sliding door	4	
FIN-Project	1-sash tilt & turn window	4	
FIN-Project	2-sash fl. mullion window/door, turn-only/tilt & turn	4	Very high requirement
FIN-Slide	1-sash lift-and-slide door	4	Very high requirement
FIN-Scroll	1-sash sliding door	3	High requirement
Door	1-leaf door	4	Very high requirement

The stated classification relates to the reference size for windows and doors. Other unit sizes may diverge from this classification.

**Application notes**

For windows and doors with full-perimeter frame profiles, class 3-4 versions are recommended in order to limit ventilation heat losses.

Values of 2-3 are realistic for doors with flat thresholds and for lift-and-slide doors.

Better values tend to be achieved with middle gasket systems as these normally create two continuous, full-perimeter sealing levels. With weatherstripping systems, the drainage millings and hardware at the stay positions have a negative impact on the classification.

# → Repeated opening and closing test

## Description

This performance characteristic is subject to individual agreement between the client and manufacturer. However, should the client or specifying body require the performance of repeated opening and closing tests on windows and doors, then these must be carried out in accordance with EN 1191 and the resulting performance classified in accordance with EN 12400. The repeated opening and closing test is a non-mandated characteristic and does not need to be specified in the declaration of performance.

## Classification

### Doors and windows

Class	Number of cycles
0	Not tested
1	5,000
2	10,000
3	20,000

### Doors

Class	Number of cycles
4	50,000
5	100,000
6	200,000
7	500,000
8	1,000,000



Finstral windows meet class 2 requirements in terms of repeated opening and closing.

## EN 12400: Classification of Finstral systems

Finstral system	Classification	Comments
FIN-Window	2	Medium requirement
FIN-Project	2	Medium requirement

## 1 cycle comprises

1 x turn and 1 x tilt.

10,000 cycles correspond to approx. 20 years of normal service.

### Minimum 60-year service life

Finstral firmly believes that, by making windows last twice as long, it can save an entire material life-cycle and thus enormous carbon emissions. At the Institut für Fenstertechnik (ift) Rosenheim, Finstral successfully passed the repeated opening and closing test, with a certified 60-plus-year product life-cycle.

Key system features of Finstral windows and doors vouching for 60-plus-year mechanical durability include:

- Bonded sash for long-term angular stability, guaranteeing low maintenance and minimum wear
- Sash lifter for frictionless closing
- Roller bolts for low-wear locking and unlocking
- High-grade hardware with 65,000 turn and 65,000 tilt cycles (RAL Quality Assurance Association tests for 20,000 cycles)
- Middle gasket for clean, dry hardware
- Rotproof material on exterior and in core
- High-quality material on exterior (climate class S PVC for Mediterranean climate, aluminium coating to Quali-coat Seaside standard)
- Dark colours only with aluminium facing



Repeated opening and closing test on a 90 x 230 cm Finstral aluminium-uPVC casement door, carried out at the Institut für Fenstertechnik (ift) Rosenheim with 65,000 cycles to the relevant test standard (EN 12400:2002-10); this is equivalent to over three times the RAL Quality Assurance Association requirement.

## Finstral windows are better. Standards for comfort and durability.

### Rotproof material at weather-exposed locations

- Climate class S PVC for Mediterranean climate
- Dark colours only with aluminium facing

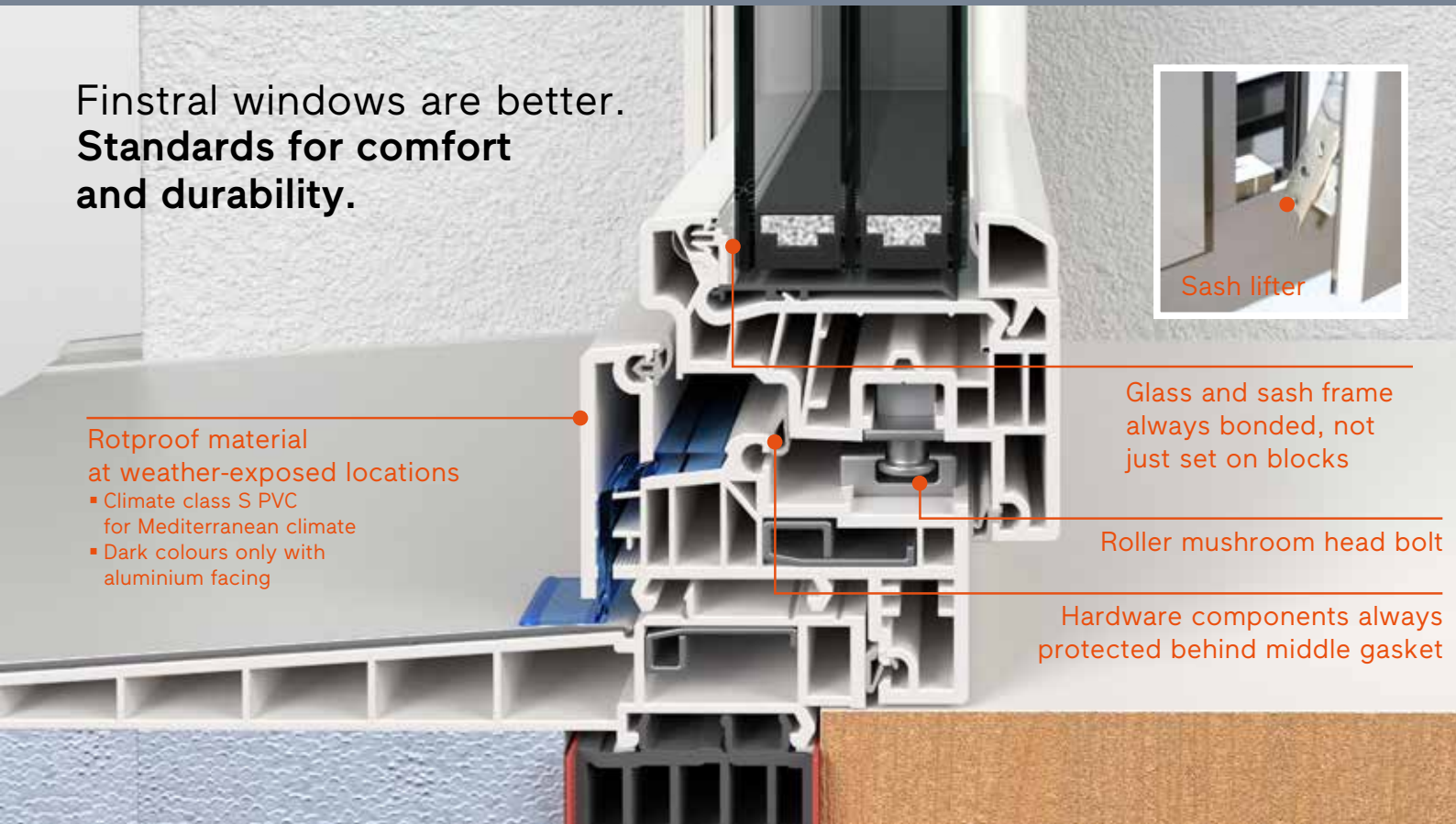
Glass and sash frame always bonded, not just set on blocks

Roller mushroom head bolt

Hardware components always protected behind middle gasket



Sash lifter



# → Load-bearing capacity of safety devices

## Description

Tilt-and-turn hardware and assemblies serving the normal, intended purpose of a window are not subject to the requirements governing safety devices, but form part of the window hardware. These are tested to EN 13126-8.

To guarantee hardware safety, the specification of long-term performance requirements is recommended (see p. 18).

Finstral regularly performs repeated opening and closing tests on its units in the testing laboratory.



# → Dangerous substances

## Description

Construction products must not release into the building interior any substances that are potentially dangerous to hygiene, health or the environment. Detailed specifications for construction materials complete with associated limit values and verification procedures are under preparation at European level.

The materials used by Finstral are subject to strict guidelines in terms of quality, durability, recyclability and protection of building occupant health.

To certify the health assessment of windows made from lead- and cadmium-free uPVC, the Institut für Fenstertechnik (ift) Rosenheim performed VOC emission class tests to ISO 16000-6 and ISO 16000-9. In its test report, it confirmed achievement of the best possible rating, i.e. very low to no emissions. The requirements of the German Committee for Health-related Evaluation of Building Products (AgBB) are hereby met.



Health-related evaluation of VOC emissions  
from construction products

## Finstral uPVC profiles have been lead- and cadmium-free since 2004

Incorporating lead-containing uPVC recycled from old windows in today's new profiles would prevent or, at least, severely limit their future recyclability at the end of the window's service life. Given that uPVC is our principal material, we are naturally committed to the principle of circularity, i.e. to the use of pure, unmixed, contaminant-free, recyclable materials.

Since 2004, Finstral has produced only lead- and cadmium-free uPVC profiles. The recycled uPVC component has likewise been lead-, cadmium- and barium-free since 2004. In other words, the Finstral uPVC profiles installed in the past 20 years are 100% recyclable at the end of the window's service life – bringing further key added value for all of our customers since 2004. Accordingly, Finstral's uPVC profiles do not require affixation of the "Contains  $\geq 0.1\%$  lead" label, which, under the circular economy, has been mandatory since December 2024 to facilitate future segregation of non-recyclable, lead-containing profiles.

# → Burglar resistance

## Description

EN 1627 specifies six resistance classes (designated using the abbreviation “RC” since September 2011) for burglar-resistant windows and doors. Resistance class RC 2N has been added more recently. The classes correspond to standard methods of attack used by burglars. This document covers only the first three classes as the quadruple- or quintuple-laminated glass required for the higher classes is inappropriate for normal window assemblies.

Burglar resistance is a non-mandated characteristic and does not need to be specified in the declaration of performance.

## Classification

Class	Method of attack	Recommended use
RC 1N	Resistance class 1 components offer basic protection against break-in attempts using physical force, e.g. kicking, jumping against unit, shoulder-barging, pushing up and tearing out (vandalism).	Basic security for low risk
RC 2N	The burglar additionally uses simple tools, e.g. screwdriver, pliers and wedges, in an attempt to force open the closed unit.	
RC 2	Safety glazing to EN 356 is mandatory.	Standard security for normal risk
RC 3	The burglar uses a second screwdriver and crowbar in an attempt to force open the locked and bolted window.	Enhanced security for greater risk of burglary

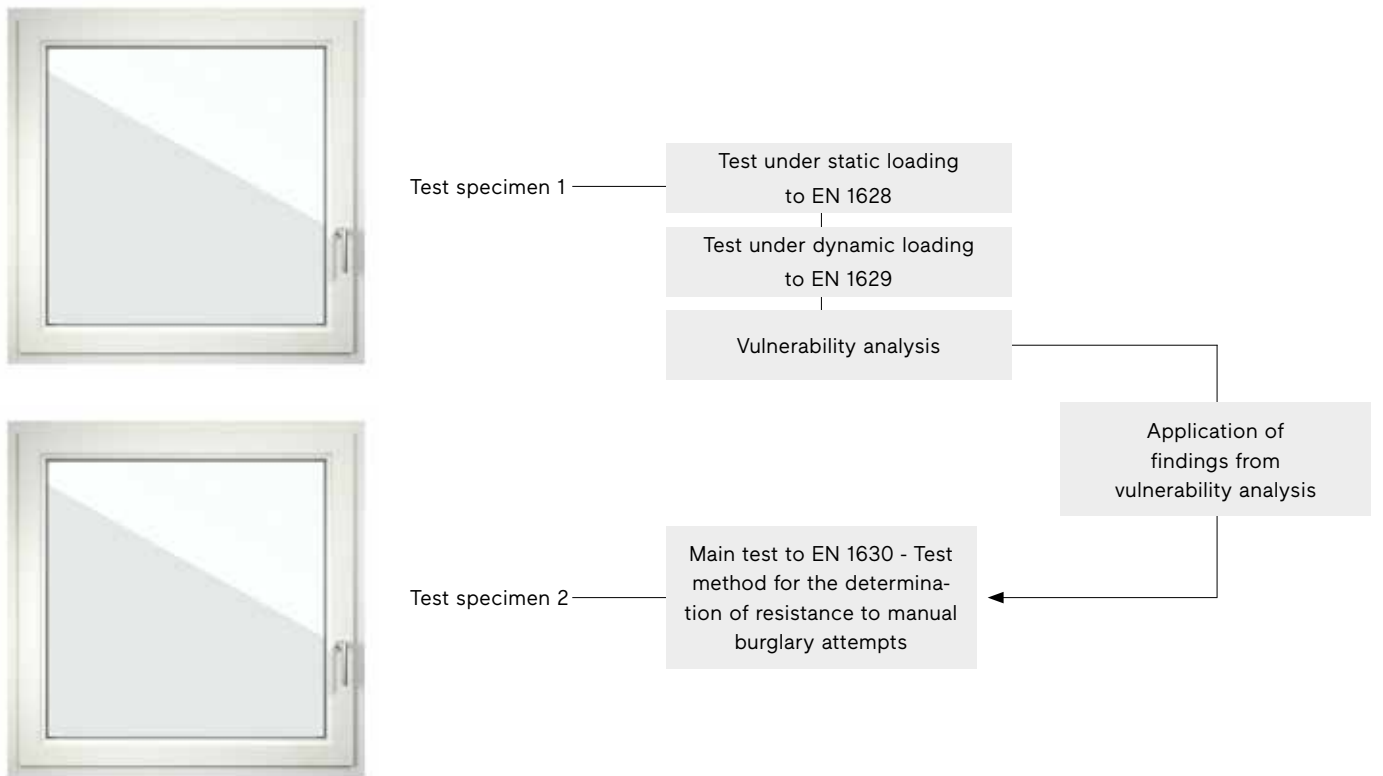
## Glass required for resistance classes

Class	Glass classification
For RC 1N, RC 2N	No safety glass required
For RC 2	Laminated safety glass P4A
For RC 3	Laminated safety glass P5A



The ift regularly tests the security offered by Finstral's window units.

### Burglary test procedure to EN 1627 – requirements and classification



## EN 1627: Classification of Finstral systems

### Finstral FIN-Window systems (single-sash window and double-sash flying mullion window), FIN-Project (single-sash window) and FIN-Slide (two-part)

Finstral fits all its turn-only/tilt-and-turn windows as standard with at least four security locking points and roller mushroom head bolts so as to make it more difficult to prise them open. Smaller windows may have fewer locking points.

Description	Resistance class	Available with
All-point security locking and additional securing at corner hinge, lockable handle, drill protection, secure glass fixing, P4A laminated safety glass	RC 2	FIN-Window Classic-line, Slim-line, Step-line, Nova-line, Nova-line Plus FIN-Project Classic-line, Slim-line, Ferro-line, Nova-line, Nova-line Twin
Multi-point security locking and additional locking point at bottom threshold, lockable handle, drill protection, P4A laminated safety glass	RC 2	FIN-Slide Step-line, Step-line Door
All-point security locking, additionally secured at several points around perimeter and anti-lift device, lockable handle, drill protection, P4A laminated safety glass	RC 3	FIN-Project Nova-line Plus with special steel-reinforced exterior facing for window frame

### Finstral door system (single-leaf door)

Description	Resistance class
Multi-point locking 1-leaf door with glass at least P4A or sound insulation, secured glazing beads, hinges with hinge safeguard, security cylinder with cylinder safeguard for push handles or handle plate with drill and pull protection for cylinder	RC 2



Security hardware with roller mushroom head bolts, drill protection and lockable handles offer enhanced burglary protection for Finstral windows.

**Application notes**

The proper coordination of individual components is essential for security windows. This necessitates in-depth design, manufacturing and installation expertise.

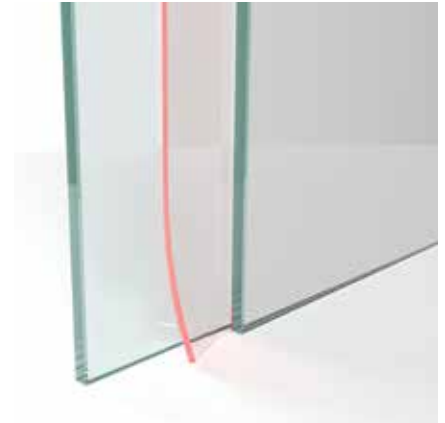
Should enhanced burglar resistance be required, then the requirements must be specified in accordance with EN 1627 and not with other imprecisely formulated design criteria.

Product certification with associated labelling affixed to the unit is mandatory for classes RC 2 and RC 3. The contractor responsible for final installation must also supply evidence of compliance with the specific installation guidelines for burglar-resistant windows and doors.

The installation of security windows without safety glass basically makes little sense. Which is why the Finstral security packages (RC 1N, RC 2N) are fitted with safety glass even though this is not required by the standard.

**Note:**

Laminated safety glass with only one (0.38 mm PVB) safety interlayer offers virtually no protection against burglary and serves only to guard against injury in the event of breakage. The classification only applies for properly closed windows. Tilted windows are already classed as open under the standard.



Multiprotect laminated safety glass with highly tear-resistant polyvinyl butyral (PVB) film in three resistance classes

# → Acoustic performance

## Description

The sound reduction index  $R_w$  for windows must be determined by testing to EN ISO 10140-2 (reference method) and the results expressed in accordance with EN ISO 717-1. No other measurement methods are permitted. The determined values apply only to the tested design. Their application to other profile systems or models is not permitted.

Alongside the use of laboratory measurements, EN 14351-1 also provides for determination of the sound insulation of various window types in function of their glazing and design characteristics using tabulated values.

Here, the sound insulation of the glazing can be taken from the declaration of performance or CE marking of the deployed glass (determined by measurement or table in accordance with EN 12758). The tabulated values apply only to single-sash windows. Their application to other units, e.g. to windows with flying mullions, is not permitted. Their application to units with fixed mullions is possible to a limited extent, provided the profile geometry essentially matches that of the window frame.

Sound insulation helps to shield the interior  
from sustained noise disturbance.



### Classification

EN ISO 717-1 provides for three reference curves, distinguished by type of outdoor noise.

The following must therefore be specified:





- Weighted sound reduction index  $R_W$
- Spectrum adaptation term C
- Spectrum adaptation term  $C_{Tr}$

The spectrum adaptation terms express the reduction of the weighted sound reduction index in function of noise source.

**Table A.1: Relevant spectrum adaptation term for different types of noise source**

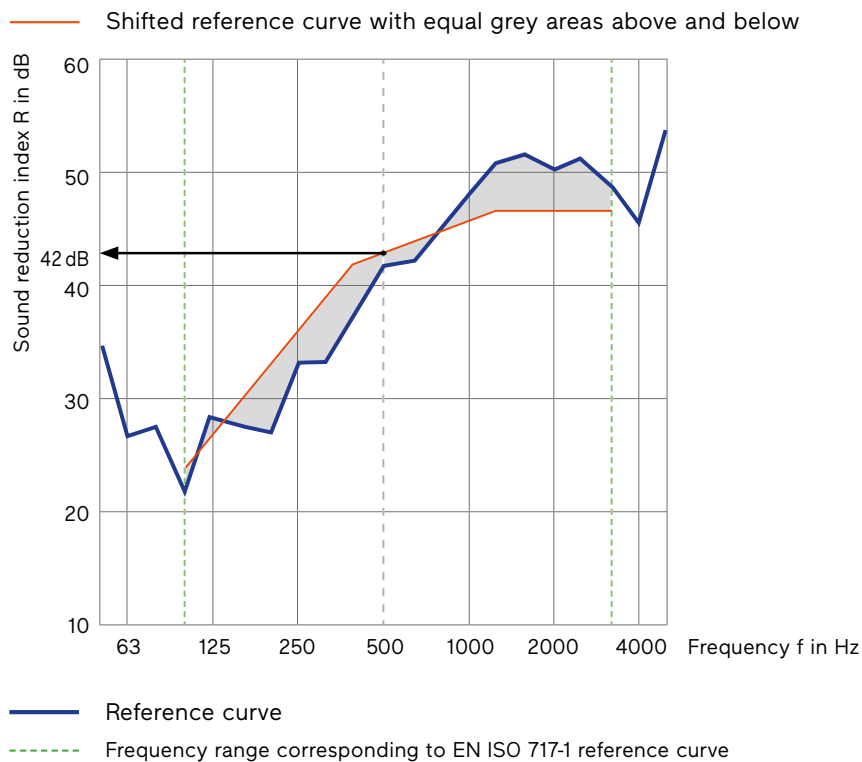
Type of noise source	Relevant spectrum adaptation term
Living activities (talking, music, radio, TV) Children playing Railway traffic at medium and high speed Motorway road traffic > 80 km/h Jet aircraft, short distance Factories emitting mainly medium- and high-frequency noise	C (spectrum No. 1)
Urban road traffic Railway traffic at low speeds Aircraft, propeller-driven Jet aircraft, large distance Disco music Factories emitting mainly low- and medium-frequency noise	$C_{Tr}$ (spectrum No. 2)

### Achievable noise protection

Road noise in function of traffic density	Sound insulation class under VDI (Association of German Engineers) Guide-line 2719	Noise protection by windows
 Residential street (10-50 vehicles/h) equivalent to approx. 55-64 dB	I 25–29 dB	Old windows with double glazing: Sound reduction of -25 dB
	II 30–34 dB	Finstral windows with double insulation glazing: Minimum sound reduction of -32 dB
 Residential street (50-200 vehicles/h) equivalent to approx. 65-69 dB	III 35–39 dB	Finstral windows with double insulation glazing: Sound reduction of -38 dB
 Main road (1,000-3,000 vehicles/h) equivalent to approx. 70-79 dB	IV 40–44 dB	Finstral windows with double insulation glazing comprising Multiprotect (LSG) or as Twin coupled sash: Maximum sound reduction of -46 dB
	V 45–49 dB	
 Main road (3,000-5,000 vehicles/h) equivalent to over 80 dB	VI > 50 dB	Finstral double window: Maximum sound reduction of -59 dB

**Determination by laboratory test. Specimen sound reduction curve.**

Measurement of airborne sound insulation of components on test stand

**Extrapolation rules for different window sizes**

Window size range	Glazing composition	Sound insulation value for window
Test results for test specimen of any size	Tabulated values	Sound insulation value for window
-100 % to +50 % of test specimen overall area	Overall area $\leq 2.7 \text{ m}^2$	$R_W$ and $R_W + C_{Tr}$
+50 % to +100 % of test specimen overall area	$2.7 \text{ m}^2 < \text{overall area} \leq 3.6 \text{ m}^2$	$R_W$ and $R_W + C_{Tr}$ corrected by -1 dB
+100 % to +150 % of test specimen overall area	$3.6 \text{ m}^2 < \text{overall area} \leq 4.6 \text{ m}^2$	$R_W$ and $R_W + C_{Tr}$ corrected by -2 dB
+150 % of test specimen overall area	$4.6 \text{ m}^2 < \text{overall area}$	$R_W$ and $R_W + C_{Tr}$ corrected by -3 dB

The area intervals indicated for tabulated values are identical to the intervals for test results using the recommended test specimen size of 1.23 m x 1.48 m.

**Application notes**

Effective acoustic seals to joints and rebates are key to ensuring that windows are well insulated against sound. To achieve high sound reduction indices, three gaskets should be incorporated wherever possible. In terms of hardware, it is also essential to observe the specified spacing between locking points. The sound reduction indices are essentially dictated by the glazing. Thick, heavy glass is better than lightweight glass; flexible glasses serve to increase sound insulation.

Particularly important is the use of inner and outer panes of different thickness. Where possible, the gaps between the panes should exceed 12-14 mm.

A slight improvement in sound insulation is achieved by triple glazing due to the two gaps between panes. Sound insulation gases are no longer used today for environmental reasons.

Good-practice design and installation of the building connection is of paramount importance in guaranteeing high, long-lasting sound insulation performance. The key factor here is the tightness of the connection.

**Sound insulation performance of Finstral products**

The current sound insulation values for the Finstral window range are presented in our "Windows Glass Walls" catalogue at: [finstral.com/prospectuses](https://www.finstral.com/prospectuses)

# → Thermal transmittance

## Description

The product standard provides for several methods of determining thermal transmittance. All these methods are officially approved.

The most accurate procedure involves measurement and testing. Yet, the calculation methods and tables are organised in such a way as to make adequate provision for any tolerance ranges. This ensures reliable comparability.

## Classification

The thermal transmittance (U-value) expresses the energy loss in watts per m<sup>2</sup> area given a temperature difference of 1 K (Kelvin) between inside and outside.

The lower the U-value, the better the thermal insulation performance.

## Frame values $U_f$

Three methods are available for determining the frame values:

- Table EN ISO 10077-1
- Calculation EN ISO 10077-2 (by notified body)
- Measurement EN 12412-2 (by notified body)

The most common method for determining the  $U_f$  value is by calculation.

This is performed using special, certified calculation programs.

## Glass values $U_g$

Three methods are available for determining the glass values:

- Table EN ISO 10077-1
- Calculation EN 673 (by notified body)
- Measurement EN 674 (by notified body)

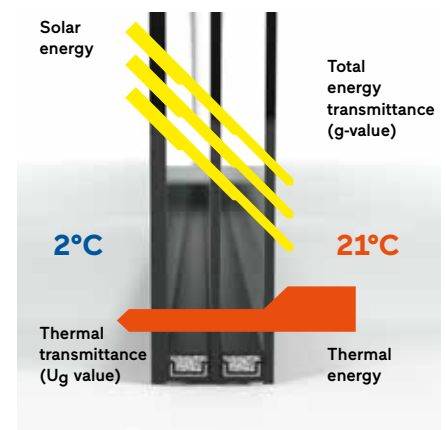
Here too, calculation is the most common method.

## Linear thermal transmittance of the edge bond/spacer ( $\Psi_g$ )

The type of glass edge bond has an impact on the overall thermal insulation value of the window unit. The glass edge bond has no implications for the thermal insulation value  $U_g$  of the glass. The  $\Psi_g$  values in function of window frame material and spacer material can be read from the tables:

- EN ISO 10077-1 Table G.1 (for aluminium or steel spacers)
- EN ISO 10077-1 Table G.2 (for thermally optimised spacers)

The value can also be determined by means of a detailed, type-specific calculation to EN ISO 10077-2 by a notified testing body.



Energy transmittance from exterior to interior (g-value) and thermal transmittance from interior to exterior ( $U_g$  value) exemplified by triple-glazed insulating glass unit

### $\Psi_g$ values (W/mK) of glass spacers used by Finstral

	Double-glazed unit	Triple-glazed unit
Thermally insulated glass spacer	0.031	0.029

### Thermal insulation value of whole unit $U_w$

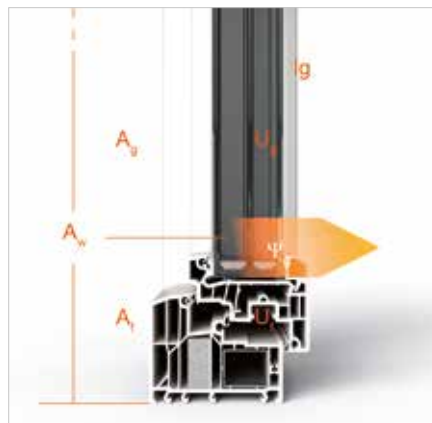
Three methods are available for determining the U-value of the whole unit. All three methods are approved.

	Input parameters to be determined
Table to EN ISO 10077-1	$U_g - U_f$
Calculation to EN ISO 10077-1	$U_g - U_f - \Psi_g$
Measurement to EN ISO 12567-1	None

### Determination using tabulated values: EN ISO 10077-1

Here, the value for the window unit  $U_w$  is read from the table in function of the frame insulation value  $U_f$  and glass value  $U_g$ . It is not necessary to factor in the size of the unit. A 30 % frame area fraction was applied to determine the table so as to ensure comparability with calculation and measurement. A high frame area fraction tends to negatively impact the values.

- $U_g$  Thermal transmittance of glazing
- $U_f$  Thermal transmittance of frame
- $\Psi_g$  Linear thermal transmittance of spacer
- $A_w$  Window area
- $A_g$  Smallest visible glazed area from outside or inside
- $A_f$  Largest visible frame area from outside or inside
- $l_g$  Total visible perimeter of glazing from outside or inside



Performance-determining features and parameters of a window

### Size dependency

Different sizes and design models result in slight variations in the thermal transmittance (U-value) of windows. Under the standard, the U-value for windows determined by calculation or measurement with a glazing thermal transmittance of  $U_g < 1.9 \text{ W/m}^2\text{K}$ , must always be given for the standard size  $1.23 \times 1.48 \text{ m}$ ; for windows and doors with the following standard sizes and designs as follows:

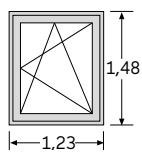
- Windows up to  $2.3 \text{ m}^2$ :  $1.23 \text{ m} \times 1.48 \text{ m}$
- Windows  $> 2.3 \text{ m}^2$ :  $1.48 \text{ m} \times 2.18 \text{ m}$
- Doors up to  $3.6 \text{ m}^2$ :  $1.23 \text{ m} \times 2.18 \text{ m}$
- Doors  $> 3.6 \text{ m}^2$ :  $2.00 \text{ m} \times 2.18 \text{ m}$

If the thermal transmittance  $U_w$  or  $U_g$  is determined using the table method, then the value read from the table can be applied to all sizes.

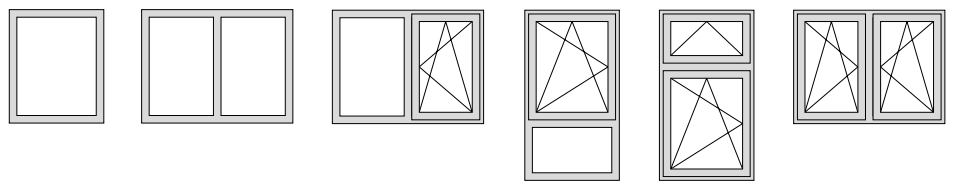
### Type families

The U-value for the window also depends on the window division as well as the inclusion of a fanlight, sublight or fixed light. The representative test specimen covers the designs pictured in its group:

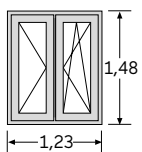
#### Single-sash tilt-and-turn window



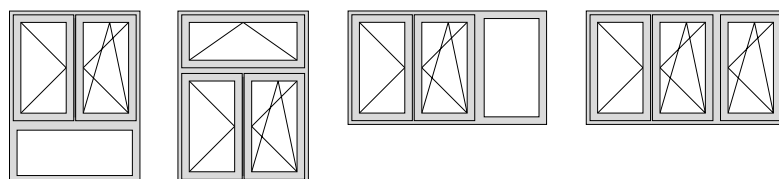
Representative  
test specimen



#### Double-sash window with flying mullion (mullion attached to sash)



Representative  
test specimen



## Classification

### Correction values for $U_w$ value to factor in glazing bars

Attached glazing bars	$\leq 4$ panels	+0.0 W/m <sup>2</sup> K
Attached glazing bars	$\geq 5$ panels	+0.1 W/m <sup>2</sup> K
Bars located between panes	$\leq 4$ panels	+0.1 W/m <sup>2</sup> K
Bars located between panes	$\geq 5$ panels	+0.2 W/m <sup>2</sup> K
Glass-dividing bars	$\leq 2$ panels	+0.0 W/m <sup>2</sup> K
Glass-dividing bars	$\leq 4$ panels	+0.1 W/m <sup>2</sup> K
Glass-dividing bars	$\geq 5$ panels	+0.2 W/m <sup>2</sup> K

### Determination by calculation to EN ISO 10077-1:2006

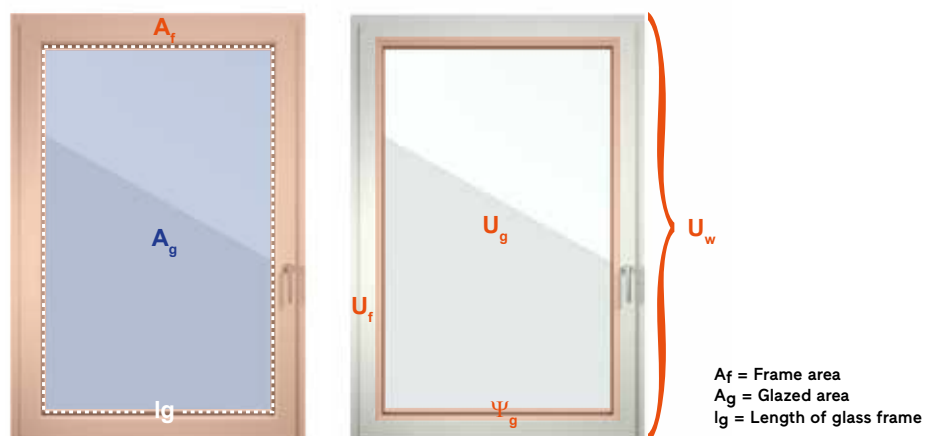
The following parameters are required to calculate the  $U_w$  value:

- $U_f$  value of frame
- $U_g$  value of glazing
- $\Psi_g$  value of spacer (e.g. aluminium, stainless steel, plastics ...)

It should be noted that the  $U_w$  value for the whole window may be calculated by the manufacturer itself for the purposes of the declaration of performance and CE marking. The input values alone must be either taken from the standard table or determined by a notified testing body.

### Calculation formula:

$$U_w = \frac{A_g * U_g + A_f * U_f + l_g * \Psi_g}{A_w}$$



**Calculation example 1 (FIN-Window Classic-line)  
with thermally optimised glass spacer**

Size 1.23 × 1.48 m	$A_W = 1.820 \text{ m}^2$
Clear glazed area	$A_g = 1.295 \text{ m}^2$
Frame area = $A_W - A_g$	$A_f = 0.525 \text{ m}^2$
Visible perimeter of glazing	$l_g = 4.580 \text{ m}$
Thermal transmittance:	
Frame	$U_f = 1.2 \text{ W/m}^2\text{K}$
Glass	$U_g = 1.1 \text{ W/m}^2\text{K}$
Thermally optimised spacer	$\Psi_g = 0.031 \text{ W/mK}$

**Formula**

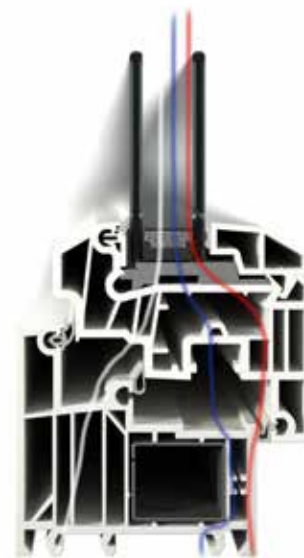
$$U_W = \frac{A_g * U_g + A_f * U_f + l_g * \Psi_g}{A_W}$$

$$U_W = \frac{1.295 * 1.2 + 0.525 * 1.1 + 4.580 * 0.031}{1.820} = 1.207 \text{ W/m}^2\text{K}$$

**rounded in accordance with EN ISO 10077-1 = 1.2 W/m<sup>2</sup>K**

$U_W$  values greater than or equal to 1.0 are rounded to one decimal place.

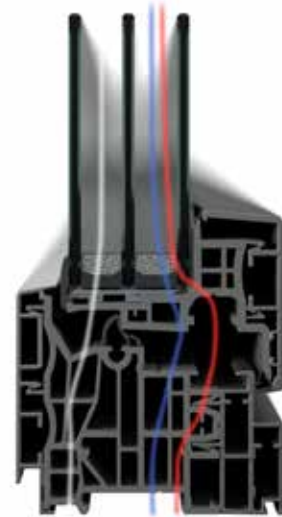
$U_W$  values less than 1.0 are rounded to two decimal places.



Isotherm pattern for FIN-Window  
with double insulation glazing

### Calculation example 2 (FIN-Project Nova-line) with thermally optimised glass spacer

Size 1.23 × 1.48 m	$A_W = 1.820 \text{ m}^2$
Clear glazed area	$A_g = 1.318 \text{ m}^2$
Frame area = $A_W - A_g$	$A_f = 0.502 \text{ m}^2$
Visible perimeter of glazing	$l_g = 4.820 \text{ m}$
Thermal transmittance:	
Frame	$U_f = 1.1 \text{ W/m}^2\text{K}$
Glass	$U_g = 0.6 \text{ W/m}^2\text{K}$
Thermally optimised spacer	$\Psi_g = 0.029 \text{ W/mK}$



Isotherm pattern for FIN-Project with triple insulation glazing

#### Formula

$$U_W = \frac{1.318 \cdot 0.5 + 0.502 \cdot 1.1 + 4.820 \cdot 0.029}{1.820} = 0.815 \text{ W/m}^2\text{K}$$

rounded in accordance with EN ISO 10077-1 = 0.82 W/m<sup>2</sup>K

#### Determination of $U_W$ value by measurement

Here, thermal transmittance is measured in accordance with EN ISO 12567-2 (heat box method).

#### Application notes

- Double glazing with argon filling achieves  $U_g$  values down to 1.1 W/m<sup>2</sup>K.
- Thermally insulated spacers tend to improve the window value by 0.1.
- Narrow frame face widths achieve better  $U_W$  values than wide profiles.

#### $U_W/U_D$ values for Finstral products

The current thermal insulation values for the Finstral window range are presented in our "Windows Glass Walls" catalogue at: [finstral.com/prospectuses](http://finstral.com/prospectuses)

# → Radiation properties

## Description

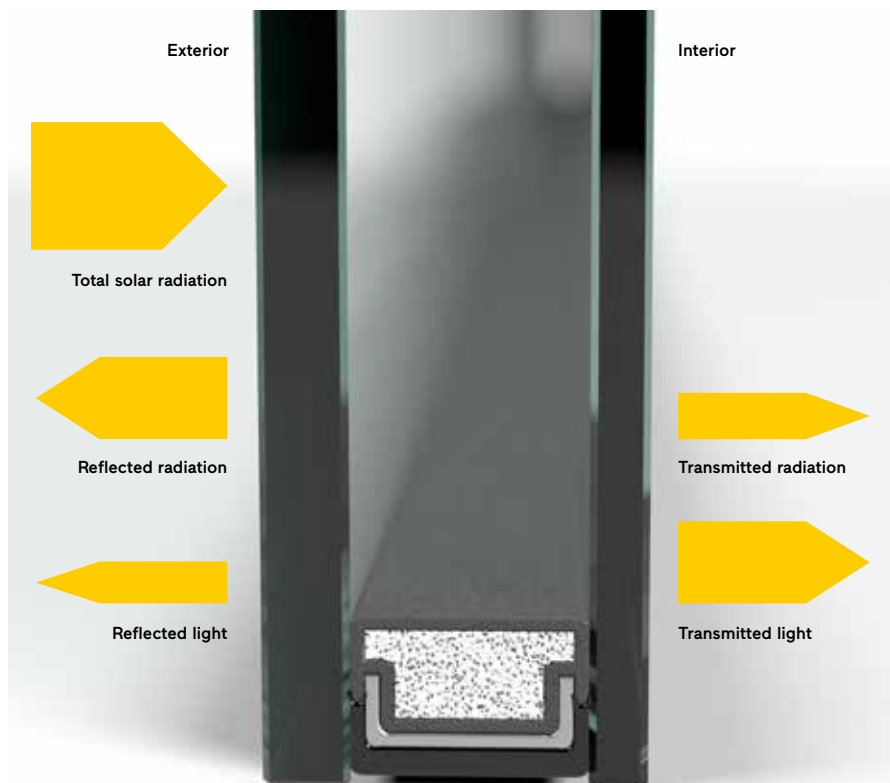
Radiation properties in the context of windows are considered in terms of the total solar energy transmittance (g-value) and light transmittance (LT) of translucent glazings. The frame is excluded from this analysis.

This means that the values for the glass can be directly applied for specifying the value under the window standard. The radiation properties are determined in accordance with EN 410 and specified in the declaration of performance.

## Total solar energy transmittance and light transmission

The total solar energy transmittance (g) indicates the proportion of energy that passes through the glass. The LT-value indicates the proportion of light that passes through the glass. The values are expressed as percentages.

### Structure of insulating glass units



### g-values and LT-values for Finstral glazing

Glazing type	g-value	Light transmittance LT
Plus-Valor 2	0.63	0.80
Max-Valor 3	0.60	0.77
Mediterran 2	0.48	0.74
Mediterran 3	0.44	0.67
Sun-Control 2	0.38	0.72
Sun-Control 3	0.36	0.66
Sun-Block 2	0.28	0.60
Sun-Block 3	0.26	0.54

Bodysafe (toughened) and Multiprotect (laminated) safety glass can be used for all glazing types. The g- and LT-values differ slightly from the values given in the table due to the modified glass structure. Finstral specifies the values in detail for each unit for the declaration of performance and CE marking. Specific values can be requested for any special glass designs. The g-value and LT-value cannot be determined for patterned glass on account of the glass structure.

#### Application notes

- A high g-value implies a high energy gain from outside. This is beneficial in the cool or cold season. In summer, a high g-value causes indoor spaces to heat up more quickly. Here, provision should therefore be made for flexible sunshading devices.
- Standard triple glazing has a g-value of around 0.50. With Finstral's triple-glazed insulating glass units, a total solar energy transmittance (g) of between 0.60 and 0.26 is achievable.
- The use of solar protection glass is recommended in areas with strong sunshine and high temperatures. Its low g-value limits the heating-up of the interior and reduces cooling demand.
- Solar protection glazing with a g-value down to around 0.35 can be designed as heat-absorbing glass. Lower g-values require mirror-like reflective glass as otherwise the heating-up of the glass may lead to glass breakage.

For Europe's temperate climate zones, glass with a very low  $U_g$  value and high g-value is advantageous. Finstral offers this kind of glass under the names Plus-Valor and Max-Valor.

For Europe's subtropical climate zones, low  $U_g$  values and somewhat lower g-values are beneficial. Finstral offers this kind of glass under the names Mediterran, Sun-Control and Sun-Block.

Thanks to their innovative design and interstitial Venetian blind, Finstral Twin coupled window models offer high added value in terms of thermal insulation, sound reduction, sunshading and heat protection.

# → Impact resistance

## Description

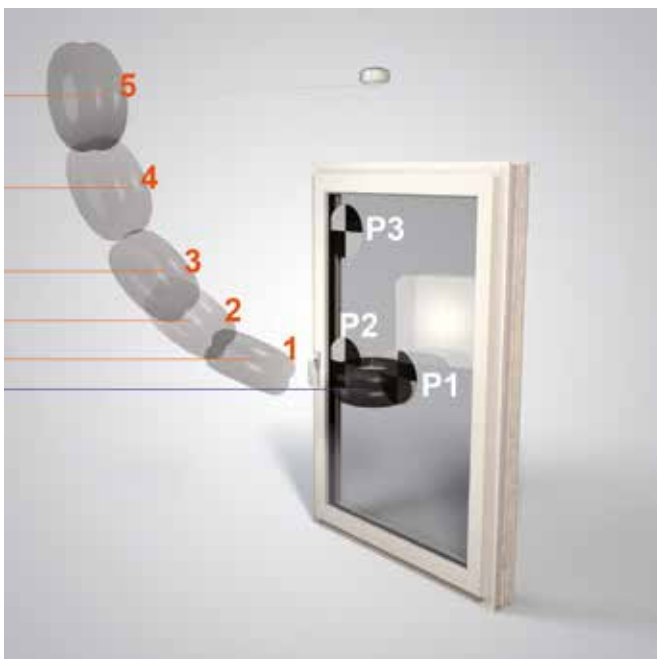
Windows and external pedestrian doorsets fitted with glass or other fragile materials are tested and classified for their impact resistance. The classification is unrelated to the ratings for fall-protection glazing. In the pendulum test to EN 12600, a soft, heavy impactor is dropped onto the unit from varying heights. Impact resistance is a non-mandated characteristic and does not need to be specified in the declaration of performance.

## Classification

### Pendulum test to EN 12600

Drop height (mm)	200	300	450	700	950
Classification	1	2	3	4	5
Comments	Low requirement	Medium requirement	High requirement	Very high requirement	Very high requirement

### Test set-up and impactor to EN 12600



Impact points:  
P1 Infill centre  
P2 Mid-point of longest edge  
P3 Infill corner

**EN 13049: Classification of Finstral systems**

<b>Finstral system</b>	<b>Classification</b>	<b>Comments</b>
FIN-Window	5	Very high requirement
FIN-Project	5	Very high requirement
FIN-Slide 90	1	Low requirement
FIN-Slide 38	5	Very high requirement

## → Clear height

### **Description**

The clear opening height for doors must be expressed in mm.

## → Ability to release

### **Description**

Doors in escape routes are subject to special provisions and must be certified/accepted by the door manufacturer and following installation. The declaration of performance for doors in escape routes must indicate their ability to release and include the assessment and verification of constancy of performance (AVCP system 1).

# Performance classifications for windows and doors

## → EN 14351-1

Performance characteristic	Test standard	Classification standard	Classification													
Resistance to wind load	EN 12211	EN 12210	Max. deflection	A (1/150)		B (1/200)		C (1/300)								
			Wind load	0	1	2	3	4	5							
Watertightness	EN 1027	EN 12208	1A	2A	3A	4A	5A	6A	7A	8A	9A	E xxx				
Air permeability	EN 1026	EN 12207	1	2	3	4										
Repeated opening and closing test	EN 1191	EN 12400	0	1	2	3										
Burglar resistance	EN 1628 EN 1629 EN 1630	EN 1627	RC 1 RC 2N	RC 2	RC 3											
Sound reduction $R_w$	EN ISO 10140-2	EN ISO 717-1	28	30	32	34	36	37	38	39	40	41	42	43	44	45
Thermal transmittance of whole unit $U_w$	EN ISO 10077-1		1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.8		
	EN ISO 10077-1	Notified body														
Thermal transmittance of glazing $U_g$	EN ISO 10077-1		1.4	1.3	1.2	1.1	1.0	0.9	0.8	0.7	0.6	0.5				
	EN 673	Notified body														
Radiation properties, g-value %	EN 410		30	35	40	45	50	55	60	(depending on requirement)						
	EN 410		55	60	65	70	75	80	(depending on requirement)							
Light transmittance LT %	EN 410		55	60	65	70	75	80	(depending on requirement)							
Impact resistance	EN 12600	EN 13049	1	2	3	4	5									

- = Low
- = Medium
- = Good/very good
- = Very good/excellent

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