



**Processing procedure and guidelines for  
soda-lime-silica glass manufactured in accordance with  
the PN-EN 572 standard by:**

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**This procedures and guidelines apply to the following products:**

**Euroglas product name:**

**Eurofloat**

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## 1. General issues

### 1.1 Product description

Soda-lime-silica glass is also called float glass. It is manufactured in a continuous process called float or float-glass, in which the molten glass is continuously poured onto a liquid tin surface.

Soda-lime-silica glass shall be hereafter referred to as float glass.

### 1.2 Thickness and dimensions

Float glass is produced in standard formats such as:

Jumbo size (PLF)	Format 3,210* 6,000 /5,100 / 4,500 mm
Box size (DLF)	Format 3,210* 2,550 / 2,250 / 2,000 mm

in the following thickness values: 3, 4, 5, 6, 8, 10 and 12 mm.

Dimensions deviating from the above should be discussed with your sales representative.

## 2. Transport and packing

The packing and delivery of float glass described herein applies to deliveries within Europe during typical weather conditions. Separate rules apply to deliveries outside Europe, especially for sea transport.

### 2.1 Transport

As a rule, float glass is delivered by special trucks called inloaders. It is packed onto: "L" type racks - Single-sided, right or left-handed unloading depending on the order; "A" type racks - double-sided unloading

Shipping in containers or in railway cars on special "A" racks is also possible

Standard formats:

Jumbo size (PLF)	Format 3,210* 6,000 /5,100 / 4,500 mm
Box size (DLF)	Format 3,210* 2,550 / 2,250 / 2,000 mm

Dimensions deviating from the above should be discussed with your sales representative.

## **2.2 Arrangement direction of float glass panels**

Depending on the order, the PLF size is shipped in horizontal orientation only. DLF sizes can be shipped in either horizontal or vertical orientation.

## **2.3 Packing**

Flat glass packets are usually shipped without additional packaging. However, on the Customer's request, they can be packed in film and/or wooden boxes (like picture frames).

We recommend ordering packets with additional protection (film and/or boxes), especially in the case of international deliveries/maritime transport. The aim of such protection is to reduce the risk of the adverse effect of moisture on the glass, thus reducing the risk of corrosion.

## **2.4 Packet separation**

In order to make it possible to remove glass packets weighing 2.5 t or 5 t from a transport rack using a suitable frame, they are separated from each other by special spacers.

These spacers are made from recyclable materials and can be returned to an Euroglas plant.

## **2.5 Separation of glass panes within a packet**

A separator layer is placed between the individual panes of glass to separate them.

Other types of packaging, especially for deliveries outside the EU, must be agreed with our Sales Representative.

### **3. Delivery of glass**

The customer must ensure that the surface on which the "L" or "A" type rack is to be placed is flat and free of other items. For safety reasons, the unloaded rack must not wobble/sway and must not be allowed to tip as a result of which the packets are positioned at an angle of more than 87° from the horizontal plane.

#### **3.1 Inspection of delivered glass**

The customer must carry out a visual inspection of the delivered glass prior to unloading the individual packets from the rack. The purpose of this inspection is to detect any obvious defects that may have occurred during transport (such as cracks, moisture inside the packet, flooding during transport on the rack) or, for example, an incorrect number of panes in the packet, or the delivery of the wrong product, etc.).

Any defects detected upon delivery must always be noted on the consignment note (CMR) in the presence of the driver and signed by him.

If any defects of the delivered order are noted, the signed consignment note (CMR) must be sent to Euroglas in accordance with the General Terms of Sale.

Claims for damage occurring during and after processing shall not be accepted. The Customer should therefore ensure that the production process is suitable for processing float glass and that quality inspection personnel is properly trained to detect any possible quality problems as soon as possible. In the event of a complaint, samples of the defective glass will be required.

#### **3.2 Unloading of packets**

Unloading of packets must be carried out by appropriately trained personnel, in compliance with occupational health and safety regulations. Only suitable equipment that complies with the currently binding regulations should be used.

The supports on which the glass is placed must be free from possible contamination, e.g. broken glass or other sharp objects.

### 3.3 Storage of packets

Packets of glass must be stored at an angle between 87° and 83° to the ground; for safety reasons packets of glass must never be stored vertically or horizontally. The storage area must be equipped with at least two stable supports, which do not damage the edges of the glass.

The spacers provided can be used to maintain the spacing between the packets, and they should be positioned in the same locations in the packet as upon glass delivery.

Make sure that the packets in the storage area are not exposed to direct sunlight - this may lead to thermal cracks. The delivered glass should be stored in an enclosed building. Storage of glass in the open air is not permitted.

The storage space must be dry and the air humidity must not exceed 60%, while the air temperature should be stable enough to avoid reaching the dew point. We recommend a temperature above 18°C.

The use of chemicals in the vicinity of coated glass storage areas is not permitted. Our experience shows that e.g. sodium hydroxide, hydrochloric acid or hydrofluoric acid can cause degradation of the glass structure, even from a considerable distance.

Apart from the time of delivery, float glass must not be stored outdoors, and the storage area must be located away from gates and doors in order to prevent cold draughts.

The stored glass must be managed according to the FIFO principles.



### 3.4 Durability

If all our guidelines are followed, the shelf life of the product at the customer from the date of delivery by our forwarding agent shall be as follows:

Delivery to the following countries:

Benelux, Denmark, Germany, England, Finland, Norway, Austria, Poland, Sweden, and Switzerland

Open or unpacked packets: 6 months

Delivery to any other EU countries not listed herein:

Open or unpacked packets: 6 months

Delivery outside the EU and to countries requiring maritime transport:

**On the basis of individual agreements between the customer and Euroglas only.**



## **4. Handling**

### **4.1 General information**

Suction cups usually contain a softening agent which can leave marks on the glass surface. This can be prevented or significantly reduced by using suitable covers.

Any works involving glass must be carried out in compliance with the occupational health and safety regulations in force.

### **4.2 Manual picking of a pane from the packet**

The suction frame used must be positioned in such a way so that it may approach the packet centrally. Its height must be set in a way ensuring the change of the glass angle, as a result of which it may reach approximately 90° during transport.

The suction frame must initially be moved slightly away from the packet of glass.

Care must be taken not to pull the entire packet! The glass pane can then be moved slightly at the edges to allow the air to enter between the panes, thus detaching the glass pane to be lifted. After that the pane can be lifted.

Lifting the glass with the panes sticking together and then attempting to detach it from the packet later should be avoided. This can lead to cracks forming on the surface of the glass.

Glass grippers can also be used for handling glass. The area on the glass caught by the gripper cannot be included in subsequent optimisation and must therefore be removed.

### **4.3 Automatic picking of a pane from the packet**

In the case of automatic picking, it is necessary, especially in the case of the first delivery, to check the picking cycle, especially the first stage, i.e. the time required for separating the panes from the packet and the time for blowing air through the edge diffusers. Even if the glass is divided by a separator, the separation process may be different for different glass suppliers.

Even in the case of automatic picking, the rule of thumb is to first separate the glass pane from the next one and then to lift it. Dragging the glass horizontally/vertically should be avoided, as this will cause cracks to appear on its surface.

## **5. Cutting of glass**

### **5.1 General information**

Float glass without ground edges must not be touched with bare hands. Special gloves must always be worn when working with our glass and they must be clean and dry.

It is also necessary to take appropriate precautions in accordance with the relevant occupational safety regulations.

The cutting table must be cleaned of glass splinters and other impurities.

### **5.2 Cutting of glass - recommendations**

The cutting of float glass should take place on the fire (air) side.

Ultraviolet (UV) light can be used to identify the fire/tin side of float glass.

The cutting parameters should be selected after the first cut and they depend on the thickness of the glass and the cutting table used.

Cutting oil should also be used during the cutting process to ensure lubrication, bonding of fragments and better shearing results.

However, as little cutting oil as possible should be used. Nevertheless, the amount must be sufficient to prevent the cutting edge from drying out completely as this could lead to the glass breakage.

Glass splinters which get on the glass during shearing must be removed. Do not remove them with a brush or broom as this will cause scratches on the glass surface.

### 5.3 Overview of cutting parameters

The following cutting parameters are suggested:

Float glass thickness	Tool type	Type of oil for cutting glass	Head pressure	Cutting speed
3 mm	135° x 5.5Ø; 145° x 5,6Ø	Sogever 1100/ ACECUT 5503	135°-27-30N; 145°-30-33N	110m/min
4 mm	145° x 5,6Ø	Sogever 1100/ ACECUT 5503	35N	110m/min
5 mm	145° x 5,6Ø	Sogever 1100/ ACECUT 5503	40N	110m/min
6 mm	145° x 5,6Ø	Sogever 1100/ ACECUT 5503	45N	110m/min
8 mm	150° x 5.6Ø	ACECUT 2959	55N	90m/min
10 mm	155° x 5.6Ø	ACECUT 6336	60N	90m/min
12 mm	158° x 5.6Ø/ 155°/150°P	ACECUT 6336	65N	70m/min

The above cutting parameters are only suggestions and they must be adapted to each individual glass cutting system.

### 5.4 Cullet container

Euroglas runs a cullet collection/return programme. We can provide containers for the cullet, which can be returned to Euroglas on the occasion of a glass cargo delivery. Please remember that glass must be sorted by type.

Any contamination is unacceptable and the container should only contain the cullet.

## **6. Placement of cut glass**

If the glass is not automatically/directly transported to the next processing stage, it is recommended not to store multiple panes of glass from one optimisation and subsequently transport the "package", the panes should always be stored and transported individually. This will allow to avoid abrasion/scratches on the glass surface which may be caused by glass splinters or filings.

### **6.1 Ridge rack**

When placing glass on racks, special care must be taken to ensure that the individual spacers of the rack, usually made of steel, do not have sharp spots. The spacers must be inspected regularly for wear or damage and replaced as necessary. In order to avoid scratches, care must be taken to ensure that the glass surface comes into as little contact with the steel covering as possible during loading and unloading.

### **6.2 “A” and “L” type racks**

When placing the glass on an "A" or "L" type rack, care must always be taken to first lower the pane onto the bottom work surface and then carefully slide it towards the other panes of glass. The panes must not be moved relative to one another afterwards. If it is necessary to move them again, first separate the panes and only then move them separately. The panes must fit firmly on the racks and must not "wobble" on the rack. Adequate protection against tipping should be used and the clamping force should be higher than required.

### **6.3 Temporary storage**

Make sure that the packets in the storage area are not exposed to direct sunlight - this may lead to thermal cracks.

The storage space must be dry and the air humidity must not exceed 60%, while the air temperature should be stable enough to avoid reaching the dew point. We recommend a temperature above 18°C.

The use of chemicals in the vicinity of coated glass storage areas is not permitted. Our experience shows that e.g. hydrochloric or hydrofluoric acid can cause degradation of the glass coating, even from a considerable distance.

## **7. Edge processing**

### **7.1 Glass unit processing: dry method**

The edges of the templates can be processed with a belt grinder using a dry method. Ensure that the grinding dust is completely removed (vacuumed) from the glass surface. Residual dust and glass particles can cause scratches during further processing of the glass and can also settle on the brushes in the washer and cause abrasion on the surface.

### **7.2 Wet processing of glass units**

When using a water-powered belt grinder for edge processing, ensure that the entire surface of the glass being processed is wet. The surface of the glass must remain wet until the template has been subjected to the cleaning process. Under no circumstances should the surface be allowed to dry out, as this may result in surface stains which cannot be removed by the cleaning process. When using this edge treatment method, the pane should be placed in the washer immediately after processing (the equipment should be interconnected).

## 8. Glass cleaning after edge grinding

Processed glass must be subjected to a cleaning process immediately after edge processing; an ideal solution is a washer combined with an edge processing machine. It must be ensured that no residues of the previous process have dried on the glass surface before the cleaning process begins. In addition, the template, before coming into contact with the brushes in the washer, must be rinsed with sufficient water to remove any residual fine glass dust from the edge blunting process.

The washer and especially all brushes must be clean. We recommend drawing up a regular maintenance schedule so that the washer is cleaned on a regular basis.

Demineralised water should be used for cleaning. The water used for cleaning must meet the following requirements:

Conductivity < 30 microsiemens (mS) Recommended water temperature 30-45 °C No cleaning agents  
pH value 6.0 - 8.0

It is assumed upfront that the washer is equipped with an automatic glass thickness setting.

Please note! The glass should be in constant motion during cleaning, otherwise the brushes could damage the glass surface.

Moreover, it is important to check the length of brush fibre. In case of rare processing of larger dimensions, the fibre length from the bottom to the top of the brush can show significant differences. In such case it should be appropriately reduced to a uniform length.

The minimum bristle length recommended by the brush manufacturer should be checked and it must not be exceeded.

Soft brushes approved for use on float glass by the glass cleaning machine manufacturer must be used in the pre-cleaning and basic cleaning areas. (Recommendation: if coated glass is also washed in the machine, then brushes which are also suitable for coated glass should be used.

The process of drying the templates must be carried out using an air knife, the air used in it must be filtered (care must be taken of the condition and quality of the filters within the system). Any wet marks remaining on the surface of the template after the drying process are unacceptable.

## **9. Transport of washed and processed glass**

Special gloves must always be worn when handling float glass with sharp edges and they must be clean and dry. When working in contact with glass, appropriate personal protective equipment must always be worn in accordance with generally applicable occupational health and safety regulations.

As already mentioned in the case of preliminary cutting, small templates must not be stacked and removed together from the washer. Units with heavy weight, or large dimensions, should always be removed by two persons.

If frames with suction cups are used to transport the glass, clean and fitted suction cup covers should be used; this will minimise the possibility of suction cup marks.

When transporting larger sheets of glass, we recommend the use of a glass gripper or a gantry crane for glass transport.

The glass processor must ensure that suitable glass spacers are used. We recommend that a thorough quality inspection of the units is carried out after this processing stage.

### **Interoperational (intermediate) inspection**

Float glass defects assessment in compliance with the PN-EN ISO 572-2 standard.

## 10. Manufacturing of multiple-glazed units

### 10.1 General comments

When working in contact with glass, appropriate personal protective equipment must always be worn in accordance with generally applicable national occupational health and safety regulations.

### 10.2 Placement of the templates on the multiple-glazing units production line

#### Rack carts

The touching of the glass surface shall be limited to the minimum.

#### “A” and “L” type racks

When unloading from an "A" or "L" type rack, ensure that the glass pane is first slightly tilted away from the batch and only then removed from the rack. Avoid lifting/pulling the pane up against the next pane. Care must also be taken not to pull the panes from the centre, as this causes damage (scratching) to the glass surface.

### 10.3 Glass cleaning

The washer and especially all brushes must be clean. We recommend drawing up a regular maintenance schedule so that the washer is cleaned on a regular basis.

Demineralised water should be used for cleaning. The water used for cleaning must meet the following requirements:

Conductivity < 30 microsiemens (mS)  
Recommended water temperature 30-45 °C  
No cleaning agents  
pH value 6.0 - 8.0

It is assumed upfront that the washer is equipped with an automatic glass thickness setting.

**Please note!** The glass should be in constant motion during cleaning, otherwise the brushes could damage the glass surface.



Moreover, it is important to check the length of brush fibre. In case of rare processing of larger dimensions, the fibre length from the bottom to the top of the brush can show significant differences. In such case it should be appropriately reduced to a uniform length.

The minimum bristle length recommended by the brush manufacturer should be checked and it must not be exceeded.

Soft brushes approved for use on float glass by the glass cleaning machine manufacturer must be used in the pre-cleaning and basic cleaning areas. (Recommendation: if coated glass is also washed in the machine, then brushes which are also suitable for coated glass should be used.

The process of drying the templates must be carried out using an air knife, the air used in it must be filtered (care must be taken of the condition and quality of the filters within the system). Any wet marks remaining on the surface of the template after the drying process are unacceptable.

## 11. Product quality inspection

### 11.1 Recommendation

Customers process float glass for the first time are advised to inspect the glass after each stage of the process. This enables early detection and prevention of defects. Employees should be familiar with and properly trained in the area of this inspection.

### 11.2 Defects acceptance criteria for float glass according to PN-EN 572-2

Euroglas supplies various ranges of float glass across Europe and to many countries in the world. For this reason, our production processes strictly comply with the requirements of the EN 572-2 standard.

Float glass defects assessment is carried out in compliance with the provisions of the PN- ISO 572-2 standard.

#### Extract from the PN-EN 572-2 standard

Float glass can be inspected in stock dimensions or in cut sizes for assembly. The pane or template of glass to be inspected is viewed from a distance of at least 2 m.

**Table 5 – Permissible spot defects for PLF (Jumbo)**

Defects category	Average value per pane	Maximum quantity per pane
A	unlimited	unlimited
B	3	5
C	0,6	1
D	0,05	1, however the defects causing breakage are unacceptable

PLEASE NOTE: The word "average" shall be understood as the aggregate average of at least 20 tonnes of glass

**Table 6 – Permissible spot defects for DLF (commercial dimensions)**

<b>Defects category</b>	<b>Average value</b>	<b>Maximum quantity per pane</b>
A	unlimited	unlimited
B	3	2
C	0,6	1
D	0,05	1, however the defects causing breakage are unacceptable

PLEASE NOTE: The word "average" shall be understood as the aggregate average of at least 20 tonnes of glass

### **Linear/ extended defects**

The permissible number of defects averages 0.05 defects per 20 m<sup>2</sup> of glass, for a delivery weighing at least 20 tonnes

For inspection regulation, see PN-EN 572-2:2012

The evaluation criteria for the subsequent end product may vary from country to country. It is the responsibility of the processor to adequately meet the quality requirements in terms of guidelines and legislation.

#### **Example:**

In the case of glass for the German market, the guidelines issued by the German Federal Flat Glass Association on the visual assessment of glass quality for construction industry applications must be observed.

The latest version of these guidelines must always be used.

## 12. Apparent defects in the manufacture of multiple-glazed units

The following apparent defects are excluded from assessment and cannot be the basis of any claim:

- Interference phenomena
- Double-glazing effect
- Multiple reflection
- Condensation on external surfaces

### 12.1 Interference phenomena

Individual interference phenomena can occur in insulated glass. The phenomenon of light interference called Brewster's striation appears in multiple-glazed units when they are made of glass with a very small difference in thickness

between 400 and 700  $\mu\text{m}$ , i.e. the wavelength of the visible light band, and when both panes are at a slight angle to one another, i.e. when the difference in the parallelism of the panes is in the order of 400 to 700 nm.

Float glass used in multiple-glazed units is characterised by minimum variations in thickness, which is a great advantage. Interferences consist of more or less strong rings, striation or spots which become visible in the spectral colours.

Interference phenomena do not in any way affect the transparency or function of the multiple-glazed units; they are a physical circumstance and therefore are not a cause for complaint. They can even be made to disappear by turning or slightly changing the angle (change of angle = non-parallelism of the panes).

### 12.2 Double glazing effect

In any insulated glass, the gas is hermetically sealed in the space between the panes. The pressure inside the glass is thus determined by the altitude of the production plant, the atmospheric pressure and the air temperature during production.

If these conditions are different from those at the assembly site, a difference is created between the air pressure outside and the gas pressure in the space between the panes.

This can lead to temporary bulging or concaving of individual panes. As for the external image, the mirror images may appear more or less distorted.

This has no effect on the quality of the glass, its thermal and acoustic insulation, light transmission or good transparency.

To improve the optical quality of reflective solar control glass, the a slightly thicker outer pane can be chosen. The pressure difference will then be absorbed by the thinner glass, while the thicker glass will remain stable. However, care must be taken with smaller format glass or glass with unfavourable proportions. The permissible deflection stress is exceeded more quickly here than in the case of large format glass and breakage may occur. The double glazing effect results from the laws of physics and therefore cannot be the cause of complaint.

### **12.3 Multiple reflection**

Multiple mirror reflections of varying intensity can occur on the different surfaces of the insulated glass. In the case of coated glass (especially with a highly reflective coating), this effect may be intensified. Since we are dealing with the natural characteristics of glass in this case, multiple reflections cannot be the cause of a claim..

### **12.4 Condensation on external surfaces Interior side**

The dew point on the inner surface of the glass (in the room) depends on the emissivity, air humidity, room temperature and air circulation. Modern windows are more airtight than the old frame systems and thus prevent the loss of heat, but also the exchange of moisture. As a result, the humidity in the room increases and the inner pane becomes foggy after reaching a certain humidity degree. The increase in humidity can be avoided, for example by frequent ventilation of the room.

#### **Exterior side**

Due to the higher thermal insulation properties of modern thermal insulating glass, the outer pane warms up only slightly, since the amount of energy conducted from the inside to the outside is small. At low temperatures at night, the outer pane additionally cools down and with high air humidity it can fog up on the outside.

### **13. Problem solving**

If there are any problems, we are always available to offer help in order to solve them.  
In case of product defects, please send us samples to help us investigate the complaint.

Despite sending the samples, please leave the glass in question in its entirety for our inspection until the works related to the reported problem has been completed.

### **14. Legal Issues**

The information contained in these guidelines is not exhaustive. Euroglas has drafted the most important guidelines and recommendations to the best of its knowledge and belief as at the time of their preparation.

Euroglas shall not be responsible for any missing information regarding the above guidelines for the float glass product family.

Euroglas reserves the right to amend or supplement the contents of this manual at any time without notice.

This document does not regulate the issue of ordering and handling/processing glass in commercial dimensions (template).

### **15. Declaration of performance characteristics for glass**

The declaration of performance characteristics for glass can be downloaded from the following web page:

<https://www.euroglas.com/pl/dlaklienta/certyfikaty.html>

by entering the LE number (e.g., Float-u 4mm 00574.0C01CLA) under "Declarations of performance characteristics" tab.

The LE number is included on the packet and can be found on invoices, waybills and product labels.

## 16. Recommendations

### Stickers and labels

We recommend using labels with acrylic adhesive. They can usually be peeled off many times and leave the smallest marks on the glass.

### Float glass

With a standard thermal insulating multiple-glazed unit, the pane is generally installed with the uncoated side facing outwards. We recommend that you always mount the tin side of the glass in position 1.

### The cleaning process

Depending on the environmental conditions, biological contamination of the washer may occur. It is evidenced by discolouration of the rollers or cylinders. It can also be indicated by slippery deposit on the walls.

Such contamination can be prevented by using a suitable biocide. You can then rinse the washer with a suitable chemical agent and thus improve the surrounding conditions.

Before doing so, please check with the manufacturer (of both the washer and the water treatment plant) whether such an operation can be carried out.

Euroglas cannot be held responsible for any damage caused in this way.

### Identification of the tin side

Ultraviolet (UV) light can be used to identify the tin side of float glass. In addition, we recommend using the TinCheck test by Bohle.

### Cutting pressure (cutting force)

The cutting pressure should be checked directly on the cutting wheel, at regular intervals. To this end, a suitable pressure gauge (a manometer) should be used.

### Identification of multiple-glazed unit sets

The thickness of the glass can be identified after the installation of multiple-glazed units for example by means of a laser measuring device.



## 17. Identification of stored products

To avoid confusion when identifying float glass, it is advisable to leave the supplied label on the last pane of the packet.

packet designation - label

EU



Field number	Description and comment
1	Glass thickness [mm]
2	Width [mm]
3	Length [mm]
4	Product quality
5	Orientation
6	Item
7	Colour
8	Separol
9	Number of panes in a packet:
10	Packet no.:
11	Matrix Code
12	Year of CE-marking assignment
13	Stacker number
14	Change no.
15	CE marking
16	Standard number
17	Declaration of performance characteristics for glass
18	Plant name
	Product name

## 18. Chemical composition of glass

Soda-lime-silica glass (EN 572-1) - Extract from the standard

Chemical names	Symbol	Content in Eurofloat
Aluminium oxide	Al <sub>2</sub> O <sub>3</sub>	0.00- 3.00 %
Calcium oxide	CaO	5.00- 14.00 %
Magnesium oxide	MgO	0.00- 6.00 %
Sodium oxide	Na <sub>2</sub> O	10.00- 16.00 %
Silicon dioxide	SiO <sub>2</sub>	69.00- 74.00 %
Other		0.00- 5.00 %

## 19. Physical properties of glass

Soda-lime-silica glass (EN 572-1) - Extract from the standard

Physical properties	Symbol	Numerical value and unit	Standard
Modulus of elasticity	E	7 x 10 <sup>10</sup> Pa	PN-EN 572-1
Poisson's ratio	μ	0.2	PN-EN 572-1
Density	ρ	2,500 kg/m <sup>3</sup>	PN-EN 572-1
Thermal conductivity	λ	1 W/(m K)	PN-EN 572-1
Coefficient of linear expansion	α	9 x 10 <sup>-6</sup> / K	PN-EN 572-1
Refractive index	n	1.5	PN-EN 572-1
Emissivity	ε	0.837	PN-EN 572-1
Hardness (Mohs scale)		5-6	PN-EN 572-1
Hardness (Knoop)		6 Gpa <sup>a</sup>	PN-EN 572-1
Hardness (Vickers)		4.95 kN/mm <sup>2</sup>	PN-EN 572-1

## 20. Certification

Certificates, factory certificates and manufacturer's declarations can be obtained from our office or from our sales representatives.

## 21. Construction standards for glass

PN-EN 356: Glass in construction industry

Safety glazing -- Testing and classification of resistance to manual attack

PN-EN 410: Glass in construction industry

Determination of luminous and solar characteristics of glazing

PN-EN 572: Glass in construction industry

Parts 1/2/8/9 Basic soda lime silica glass products

PN-EN 673: Glass in construction industry

Determination of heat transfer coefficient (U value) -- Calculation method

PN-EN 674: Glass in construction industry

Determination of heat transfer coefficient (U value) -- Shielded hot plate method

PN-EN 1096: Glass in construction industry

Parts 1-4 Coated glass

PN-EN 1279: Glass in construction industry Parts 1-6 Insulating multiple-glazed units PN- EN 1863:

Glass in construction industry

Parts 1/2 Thermally strengthened soda lime silica glass

PN-EN 12150: Glass in construction industry

Parts 1/2 thermally tampered soda lime silica safety glass

PN -EN ISO 12543: Glass in construction industry

Parts 1-6: Laminated glass and laminated safety glass

PN-EN 12600: Glass in construction industry

Pendulum test - Impact test method and classification of flat glass

PN-EN 13363: Solar protection devices incorporated in glazing

Part 1/2 Calculation of the penetration rate of total solar energy and light

PN -EN 20140-3: Acoustics

Measurement of sound insulation in buildings and of the sound insulation of building components. The full text of the standards for glass in construction industry is available at <http://www.pkn.pl>