



SICURTEC®
PROTECTIVE WINDOW

STATUS 11-2023

User manual

SICURTEC® machine safety windows with polycarbonate



DEUTSCH
ENGLISH
ESPAÑOL
FRANÇAIS
ITALIANO

[SICURTEC.COM](https://www.sicurtec.com)



User manual

Status:

27.11.2023 Version 1.4

Technical changes and omissions excepted. Reprint and publication, in full or in part, only with written permission by SICURTEC® Laminatglastechnik GmbH

Manufacturer's contact details:

If you have any questions or need more information, please contact:

SICURTEC® Laminatglastechnik GmbH

Freinbergerstrasse 2

A 5310 Mondsee

Tel.: +43 6232 21990

office@sicurtec.com

Return goods to factory address only:

SICURTEC® Laminatglastechnik GmbH

Betriebsgebiet Nord 3

A 3300 Ardagger Stift



Contents

1. Important information	1
2. General points and obligation to exercise caution	1
3. SICURTEC® model variants	1
4. Intended purpose and function of machine safety windows	2
5. Improper use and warnings	2
6. Residual risks	3
7. Quality guidelines for SICURTEC® machine safety windows	3
8. Commissioning & replacement	9
9. Recommendation for cleaning polycarbonate	10
10. Warranty for machine safety windows	10
11. Transport and storage	10
12. Type designation	11
13. Anomalies	11
14. CE certification	11
15. EC declaration of conformity	12
16. Troubleshooting - possible solutions	13



1. Important information

This user manual is intended for the use of machine safety windows and is a prerequisite for the fulfilment of warranty claims. Before installing and using the machine safety window, please read and adhere to the instructions in this user manual.

- ⊕ Material ageing: The door pane should be replaced after 3-5 years at the latest, or as soon as there are any signs of damage visible. Due to contact with cooling lubricant, the polycarbonate viewing window is subject to an ageing process (embrittlement) that reduces its strength.
- ⊕ Make sure you follow the installation and cleaning recommendations given in this manual.
- ⊕ Use the machine safety windows with a confirmed resistance class only on machines which require them according to the EN standards.
- ⊕ Installation and commissioning may only be performed by qualified technicians.
- ⊕ Install and remove only with suitable protective equipment (to avoid cuts, etc.)

2. General points and obligation to exercise caution

Machine safety windows are protective devices on tool machines that are designed to isolate the machine from its surroundings and catch any objects ejected from it. They prevent tools, workpieces and fragments from being ejected from the work area of the machine to protect persons from injury caused by flying parts.

The machine manufacturer or the machine user are obliged to exercise caution and take responsibility for machine safety windows, especially with regard to:

Determining the minimum required resistance class in accordance with the EN standards
Customer-specific safety window design in accordance with the required retention capacity
Correct installation, maintenance, cleaning, safety window seals, etc.
Maintaining the required replacement intervals

3. SICURTEC® model variants

3.1. SICURTEC_GUARD machine safety windows as a fully laminated unit

In this high-end variant, glass and polycarbonate are bonded over the entire surface using a glass-clear medium. Because there is no air gap, cooling lubricants cannot penetrate the pane.

As an option, these panes can also be bonded with adhesive into a V2A frame at the customer's request.

3.2. SICURTEC_AIR machine safety windows as an insulating glass unit

These machine safety windows are equipped with polycarbonate on the operator side and tempered glass or laminated glass, depending on the requirements, on the inside of the machine with an air gap in between. These two elements are encapsulated with a special seal. The glass on the inside retains the retention properties of the polycarbonate pane and prevents embrittlement by protected it against influences of the machine, such as cooling lubricants.

As an option, these panes can also be bonded with adhesive into a V2A frame at the customer's request.



3.3. SICURTEC_PURE machine safety windows as a single polycarbonate pane

3.4. SICURTEC_SHIELD machine safety windows as multiple pane composite

For lubricant-free machining centres we also produce single to quadruple pane polycarbonate composites without glass. As an option, these panes can also be bonded with adhesive into a V2A frame at the customer's request.

3.5. SICURTEC® machine safety windows with VISIPOINT® or ROTOCLEAR® spin windows

All three model variants can be equipped with spin windows to provide an unobstructed view into the machine room during the production process. Spin windows can be either bolted or bonded into the tempered /laminated glass pane. For further information on professional installation, please refer to the separate instructions for spin windows.

As an option, machine safety windows can be factory-fitted with spin windows.

4. Intended purpose and function of machine safety windows

Polycarbonate viewing windows (PC panes) with tempered glass/laminated glass panes are installed in machining centres as protective systems. For this application they fulfil various functions

- ⊕ Preventing access to hazardous areas (separating function)
- ⊕ Protection against fragments being thrown out (retaining function)

Material recommendations and necessary thicknesses depending on the required retention capacity - see DIN EN ISO 23125 (lathes), DIN EN 16090-1 (machining centres) and DIN EN 13218 (grinding machines) or VdW test classes 1-6.

PC panes (polycarbonate) are subject to an ageing process and are to be classified as wear parts.

The ageing of PC panes cannot be detected by visual inspection. The machine manufacturer is therefore required to specify a time limit for the replacement of PC panes with a safety-critical retaining function. Prolonged exposure of PC panes to cooling lubricants can lead to accelerated ageing and deterioration of the mechanical properties (embrittlement). From the operator side, cooling lubricant vapour, cleaning agents, grease and oil or other aggressive utilities can also cause ageing of the PC panes. This results in a reduced retaining capacity of the PC pane. If this is not taken into consideration, this can cause a critically low level of retention in the event of damage.

5. Improper use and warnings

- ⊕ Machine guards must not be subjected to additional loads or mechanical stress or electrical voltage when installed.
- ⊕ Machine guards may only be installed on machines or systems where the specifications relating to retention capacity and bulletproof class can be met. Non-compliance presents a danger to life in the event of damage.
- ⊕ The bulletproof class indicated on the pane labelling in accordance with the standards is deemed to be documented and/or has been specified by the customer.
- ⊕ Improper use can cause the glass pane to break - especially when installing machine safety windows. Scratching of the polycarbonate on the operator side should also be avoided at all costs.
- ⊕ Make sure the recommendations are observed when cleaning the polycarbonate
- ⊕ Do not use the machine safety window if it has been damaged.



6. Residual risks

- ⊕ Machine safety windows are fitted with an edge seal which can be damaged by improper bonding during installation. This can result in damage to the polycarbonate pane by cooling lubricants or other substances.
- ⊕ The polycarbonate pane must be inspected for damage before installation and continuously during operation.
- ⊕ Care must be taken to ensure that the machine safety window unit is installed the right way round with the polycarbonate on the operator side so that the label can be read from the outside.
- ⊕ Keep a safety distance of at least 50 cm from the machine safety window in case the polycarbonate becomes deformed due to fragments being ejected from the machine.

7. Quality guidelines for SICURTEC® machine safety windows

7.1. Introduction

These guidelines apply to the entire SICURTEC® special safety glass product range as well as SICURTEC® machine safety windows. SICURTEC® special safety glass is a multi-pane composite of soda-lime-silica glass with synthetic materials, in particular polycarbonate and polyurethane layers, each with specific material properties that may differ from other flat glass products, particularly in terms of transparency.

SICURTEC® special safety glass is subject to EN ISO 12543, EN ISO 1279 and EN ISO 14449 standards. Permissible deviations from the relevant product standards are specified in this document. For special constructions, the respective base standards of the glass used apply, e.g. EN 1096-1 for coated glass.

7.2. Scope of validity

This guideline is used to assess the quality characteristics of SICURTEC® special safety glass. The assessment is made in accordance with the test described below.

7.3. Test

In general, the transparency of the glass is decisive for the test. The flaws must not be specially noted. The glass is tested in accordance with the table in section 6 from a distance of at least 2 metres and at an angle corresponding to the general use of the surrounding space. The test is performed in diffuse daylight (such as overcast sky) without direct sunlight or artificial lighting. Glass used indoors (internal glazing) should be tested using the normal (diffuse) illumination provided inside the building, preferably at a viewing angle perpendicular to the surface of the pane. The flaws must not be specially noted. Flaws ≤ 0.5 mm are not taken into account. Existing flaws (rings, glass defects) must not be larger than 3 mm.

7.4. Permissible deviations

When assessing certain characteristics, the specific product properties need to be taken into consideration:

- ⊕ Combinations with coated glass EN 1096
- ⊕ Material-related properties (esp. polycarbonate)
- ⊕ Manufacturer and batch-related colour deviations
- ⊕ Colour differences in ornamental glass



For combinations with tempered glass, heat-strengthened soda lime silicate glass, ornamental glass or synthetic panes, ornamental glass or plastic sheets, the characteristics of these specific products also apply. However, the manufacturer reserves the right to make production-related deviations and changes to the state of the art.

7.4.1. SICURTEC®

Zone	The following are permissible:
Frame zone F	<p>F = Frame zone: the area of the pane that is covered when installed. (with the exception of mechanical edge damage, no limitations)</p> <p>External shallow edge damage or scallops that do not affect the strength of the glass and do not exceed the edge bond width. Internal scallops without loose shards filled by sealing compound, spots and surface residues as well as scratches, no limitations.</p>
Edge zone R	<p>The edge zone is 10% of the clear width and height dimensions.</p> <p>Inclusions, bubbles, spots, stains, etc.:</p> <ul style="list-style-type: none">☉ Pane area ≤ 1 m.: max. 4 occurrences of < 3 mm dia.☉ Pane area > 1 m.: max. 1 occurrence of < 3 mm dia. per metre length of edge <p>Residues (spots) in the space between the panes:</p> <ul style="list-style-type: none">☉ Pane area ≤ 1 m.: max. 4 occurrences of < 3 mm dia.☉ Pane area > 1 m.: max. 1 occurrence of < 3 mm dia. per metre length of edge <p>Residues (spots) in the space between the panes:</p> <ul style="list-style-type: none">☉ max. 1 occurrence ≤ 3 cm² <p>Scratches: sum of individual lengths:</p> <ul style="list-style-type: none">☉ max. 90 mm – individual lengths: max. 30 mm <p>Hairline scratches: not permitted in accumulations</p>



Zone	The following are permissible:
Main visible area H	<p>Inclusions, bubbles, spots, stains, etc.:</p> <ul style="list-style-type: none">☉ Pane area ≤ 1 m²: max. 2 occurrences of < 3 mm dia.☉ Pane area >1 / ≤ 2 m²: max. 3 occurrences of < 3 mm dia.☉ Pane area > 2 m²: max. 5 occurrences of < 3 mm dia. <p>Scratches: sum of individual lengths:</p> <ul style="list-style-type: none">☉ max. 60 mm – individual lengths: max. 20 mm <p>Hairline scratches: not permitted in accumulations</p>
R + H (Edge zone + main visible area)	<p>Max. number of permissible deviations as in zone R inclusions, bubbles, spots, etc. of 0.5 to < 1.5 mm are permitted without area limitation, except for accumulations. An accumulation is when four or more defects are spaced < 200 mm apart. This distance is reduced to 180 mm for three-pane laminated glass, to 150 mm for four-pane laminated glass and to 100 mm for five-pane or multi-pane laminated glass.</p>
General points	<p>Note:</p> <ul style="list-style-type: none">☉ Flaws ≤ 0.5 mm are not taken into account.☉ Existing flaws (rings) must not be larger than 3 mm.☉ The permissible deviations for zones R and H increase in frequency per additional intermediate layer by 50% of the above values.☉ The result is always rounded up.☉ Due to the manufacturing technology, waviness may occur (see P. 5 Tolerances).☉ Where polycarbonate is used, a slight orange peel effect may occur depending on exposure to sunlight or light and the viewing angle.☉ The pane thickness and the number of layers can slightly affect the way in which colours are rendered.☉ This effect can be considerably reduced by adding an extra pane of clear glass.

7.5. Tolerances

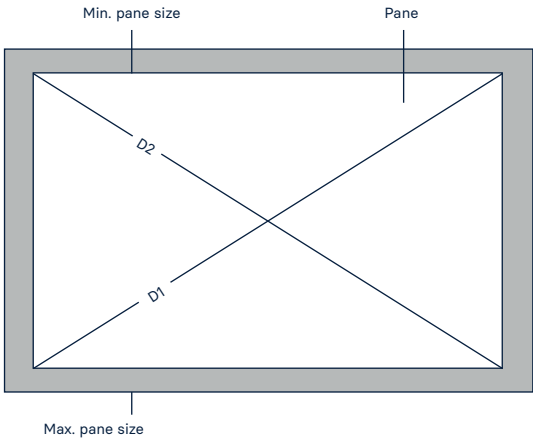
7.5.1. Dimension and edge offset

Nominal dimension

< 1000 mm	± 4.0 mm
≥ 1000 mm and < 2000 mm	± 5.0 mm
≥ 2000 mm	± 6.0 mm

The individual panes can shift in relation to each other during manufacturing.
The tolerance is within the deviation specified in the table above.

7.5.2. Squareness



A rectangular pane must be enclosed by a rectangle that has sides corresponding to the maximum and minimum permissible dimensions.


The **following applies:** $D1 - D2 = \text{max. } 2 \text{ mm}$

The squareness is checked by measuring the diagonals D1 and D2. The absolute difference must not exceed 2 mm.

7.5.3. General distortion


Straightness related to the glass edge length (general distortion)

Break-in-resistant products
in accordance with EN 356 + EN 1627 ff.:



Ruler
 $h1 = 3 \text{ mm/m ruler}$

Bulletproof and explosion resistant products
in accordance with EN 1063 or DIN EN 13541:



Ruler
 $h1 = 5 \text{ mm/m ruler}$



7.5.4. Element thickness

Element thickness	Mono	ISO
< 26 mm	+/- 2.0 mm	+/- 2.5 mm
> 26 < 40 mm	+/- 3.0 mm	+/- 3.5 mm
> 40 mm	+/- 4.0 mm	+/- 4.5 mm

7.6. Evaluation of the visible area of the insulating glass edge bond

In the visible area of the edge bond, outside the clear glass surface, production-related features may be visible on the glass and the insulating glass spacer frame. These features can become visible if the insulating glass edge bond is not designed to be covered on one or more sides. The permissible deviations from parallel of the spacer(s) to the straight glass edge or to other spacers (e.g. in triple thermal insulation glass) amount to a total of 4 mm up to an edge length of 2.5 metres, and a total of 6 mm for longer edge lengths. For double glazed insulating glass, the tolerance of the spacer is 4 mm up to an edge length of 3.5 metres, and 6 mm for longer edge lengths. If the edge bond of the insulating glass is not covered due to the design, typical features of the edge bond may become visible that are not covered by these guidelines and must be agreed in each case. Special frame constructions and implementations of the edge bond on insulating glass need to be matched to the glazing system.

7.7. General notes

The guideline represents an evaluation standard for the visual quality of glass in the construction industry. When assessing an installed glass product, it is assumed that, in addition to the visual quality, the characteristics of the glass product needed to fulfil its functions must also be taken into account.

Property values of glass products, such as sound insulation, thermal insulation and light transmission values, etc., which are specified for the corresponding function, relate to test panes in accordance with the applicable test standard. With other pane formats, combinations as well as a result of installation and external influences, the specified values and optical impressions can change.

7.7.1. Physical characteristics

A series of unavoidable physical characteristics that may be noticeable in the clear glass surface are excluded from the assessment of visual quality:

- ⊕ Interference phenomena
- ⊕ Insulating glass effect
- ⊕ Anisotropies
- ⊕ Condensation on the outer surfaces of the panes
- ⊕ Wettability of glass surfaces

7.7.1.1. Explanation of terms

7.7.1.1.1. Interference phenomena

Interference in the form of spectral colours can occur with insulating glass made of float glass. Optical interferences are superposition phenomena of two or more light waves when they meet at a point. They are evident as coloured bands that vary in intensity and which change when pressure is applied to the pane. This physical effect is reinforced by the parallel planes of the glass surfaces. Parallel planes ensure a distortion-free view. Interference phenomena occur randomly and cannot be influenced.



7.7.1.1.2. Insulating glass effect

Insulating glass has a volume of air/gas enclosed by the edge bond, the state of which is essentially determined by the barometric air pressure, the altitude of the manufacturing site above sea level, and the ambient air temperature at the time and place of manufacture.

When the insulating glass is installed at a different altitude, changes in temperature and fluctuations in barometric air pressure (high and low pressure) inevitably result in concave or convex curvatures of each pane, which in turn causes optical distortions. Multiple reflections can also occur to varying degrees on glass surfaces. These mirror images may be more noticeable if, for example, the background of the glazing is dark. This phenomenon is caused by a law of physics. Due to the thermal tempering process, chemical and mechanical changes can occur in the surface finish, such as spot formation and roller marks.

7.7.1.1.3. Anisotropies

Anisotropies are a physical effect in heat-treated glass that results from the internal stress distribution. Depending on the viewing angle, dark-coloured rings or bands may be perceived in polarized light and/or when viewed through polarizing lenses.

Polarized light is present in normal daylight. The strength of the polarization depends on the weather and the position of the sun. Double refraction is more noticeable at a shallow viewing angle or when the glass surfaces are at an angle to each other.

7.7.1.1.4. Condensation on the outer surfaces of the panes

Condensation can form on the outer glass surfaces when the glass surface is colder than the ambient air (e.g. steamed-up car windows). The formation of condensation on the outer surfaces of a glass pane is determined by the heat transfer U_g-value, the air humidity, the air flow and the inside and outside temperature. The formation of condensation on the room-side surface of the pane is promoted if air circulation is impeded, e.g. if the window is recessed, or by curtains, flower pots, flower boxes, venetian blinds as well as by unfavourable arrangement of radiators, inadequate ventilation or similar.

Insulating glass with high thermal insulation can temporarily form condensation on the weather-side of the glass surface if the relative humidity outside is high and the air temperature is higher than the temperature of the glass surface.

7.7.1.1.5. Wettability of glass surfaces

The wettability of the glass surfaces can vary due to imprints from rollers, fingers, labels, paper grains, vacuum cups, sealant residues, silicone components, smoothing agents, lubricants or environmental influences. The variations in wettability can become visible when glass surfaces are wet due to condensation, rain or cleaning water.

7.7.2. Visual properties of glass products

7.7.2.1. Inherent colour

All materials used in glass products have inherent colours due to the raw material, which can become more pronounced with increasing thickness. Coated glass is used for functional reasons. Coated glass also has an inherent colour.

The inherent colour can be detected when looking through the glass, and when looking at the surface of the glass. Variations in the colour are possible and unavoidable due to the iron oxide content of the glass, the coating process, the coating as well as changes in the glass thickness and the pane structure.



7.7.2.2. Colour differences and coatings

An objective evaluation of the colour difference in coatings requires the measurement and/or testing of the colour difference under exactly defined conditions (glass type, colour, light type). This guideline does not cover an evaluation of this kind. (More information is provided by the German window and facade association in the leaflet "Farbgleichheit transparenter Gläser im Bauwesen").

7.7.3. External surface damage

In the case of mechanical or chemical damage to an external surface that is detected after glazing, the cause must be clarified. Such defects can also be assessed in accordance with Section 3.

The following standards and guidelines, among others, also apply:

- ⊗ Technical guidelines of the glass industry
- ⊗ VOB/C ATV DIN 18 361 "Glazing work"
- ⊗ Product standards for the relevant glass products
- ⊗ Conditions of use for SICURTEC® glass
- ⊗ Leaflet on glass cleaning, published by the Austria glass association.
- ⊗ The elements are to be supported in such a way that the load is transferred evenly over the entire element.

7.8. Markings

SICURTEC® products and windows are permanently marked using sandblasted stamps. Multiple markings are possible. The work side, especially in the case of asymmetrical set-ups, is marked by a label.

8. Commissioning & replacement

It must be ensured that the circumferential clamping on the machine side complies with the requirements of the relevant standard (e.g. according to DIN EN ISO 23125) or the legal regulations. This value corresponds to the value of the test in the standard. If it falls below this value, there is a risk that the pane cannot completely guarantee the retention capacity. During installation, make sure that the label can be read from the operator side, so that when installed the tempered glass or laminated glass side is facing the machine. The machine safety window must be installed free of tension.

Replacement

Immediate replacement is strongly recommended in the following cases:

- ⊗ Plastic deformations (buckling) due to previous impact loading
- ⊗ Cracks
- ⊗ Damage to the edge seal
- ⊗ Damage or destruction to the tempered glass or laminated glass pane (facing the machine)
- ⊗ Cooling lubricant has entered the composite structure
- ⊗ Destroyed or damaged safety windows on the work side or operator side



9. Recommendation for cleaning polycarbonate

- ⊕ Polycarbonate has a non-porous surface to which dirt can hardly adhere. Dusty parts are wiped off with water, soft cloth or a sponge. Never wipe the surface dry.
- ⊕ For thorough cleaning, we recommend using a non-abrasive cleaning agent. Do not use razor blades or other sharp tools, abrasive or strongly alkaline cleaning agents, solvents, leaded petrol or carbon tetrachloride.
- ⊕ A microfiber cloth moistened only with water cleans effectively and largely streak-free. For heavier, especially greasy dirt, benzene-free pure petrol (petroleum ether, light petrol) can also be used to clean polycarbonate.
- ⊕ Paint splashes, grease, sealant residue, etc. can be removed before heat treatment by lightly rubbing with a soft cloth soaked in ethyl, isopropyl alcohol or petroleum ether. Rust stains can be removed with a 10% oxalic acid solution.
- ⊕ Mechanical cleaning systems, e.g. with rotating brushes, scrapers, etc., are not suitable for polycarbonate. Even if plenty of rinse water is fed to the brushes, the plate surface can be scratched.
- ⊕ Avoid using corrosive cleaning agents and sharp-edged equipment that could damage or scratch the surface.
- ⊕ Polycarbonate has a good electrical insulating capacity which is why it easily becomes electrostatic and attracts dust. Before handling polycarbonate panes, it is recommended to remove dirt and dust adhering to the surface using ionised air. Using normal compressed air or a cloth does not remove the particles, but normally simply relocates them.
- ⊕ Daily cleaning is recommended, especially for safety windows on machine tools.

10. Warranty for machine safety windows

The general terms and conditions as well as the product warranties of SICURTEC® Laminatglasstechnik GmbH apply in the current version and in the version at the time of signing the contract. The valid date is the date of manufacture, visible on the label in or on the pane.

In the event of a warranty claim, we will supply an equivalent replacement free of charge. Further claims are excluded. Machine safety windows that have a safety-critical restraining function against fragments thrown out of the machine must be visually inspected by the customer's personnel at regular intervals in order to ensure operational safety on machine tools.

We expressly point out that a machine safety window can only fulfil its retention function in the medium and long term if the polycarbonate is protected from external influences by pane of tempered glass or laminated glass and the polycarbonate pane on the operator side has not been subjected to chemical or mechanical stress.

11. Transport and storage

Some machine safety windows consist of a composite structure with an intermediate air layer. If several units are left in a horizontal position during transport, storage and intermediate storage, irreversible distortion can occur due to their own weight without any effect on the retention capacity.

We generally recommend that machine safety windows are stored and transported in an upright position at standard ambient temperature. Direct sunlight, moisture and outdoor storage must be avoided at all costs.

12. Type designation



We provide all machine safety windows with a silver-coloured sticker within the machine safety window unit, or directly on the polycarbonate. The information includes our order number and ID number for traceability, the bulletproof class and European standard, and as an option, the customer's drawing or article number as well as the production date.

13. Anomalies

Due to the manufacturing processes and material used for very thin insulating glass structures and depending on the ambient air pressure, the tempered/laminated glass and the polycarbonate pane may come into contact, resulting in the formation of unsightly bubbles. To prevent this, semi-transparent point-shaped intermediate spacers are factor-fitted in the centre of the pane. These are visible, but do not have any safety-relevant influence.

The decision criteria as to when additional spacers are necessary is shown in the table below:

Length or width	Polycarbonate thickness	Air gap	Intermediate spacer
< 700 mm	5, 6 and 8 mm	< 3 mm	no
> 700 mm	5, 6 and 8 mm	< 3 mm	yes
< 900 mm	10, 12 and 15 mm	< 3 mm	no
> 900 mm	10, 12 and 15 mm	< 3 mm	yes

For larger dimensions and other types of air gap, the use of additional transparent spacers is determined on a case-to-case basis.

Please note that the polycarbonate pane takes over the restraining function of machine safety windows, especially in the case of confirmed bulletproof classes.

This function can be weakened or destroyed as a result of contact with coolant, additional drill holes or other processing.

14. CE certification

Machine safety windows are implemented as a composite pane with tempered glass/laminated glass and polycarbonate to meet the requirements of the Machinery Directive 2006/42/EC and are marked with the CE symbol.



15. EC declaration of conformity

In accordance with Machinery Directive 2006/42/EC issued 17 May 2006, Annex II No .1 A

We herewith declare that the following identical safety components in their design and construction as well as in the version placed on the market by us comply with the principle health and safety requirements of EC Machinery Directive 2006/42/EC. Any changes made to the safety components without our prior consent render this declaration void.

Manufacturer:

SICURTEC® Laminatglasstechnik GmbH
Freinbergerstrasse 2
5310 Mondsee, Austria
Phone: +43 6232 21990
Fax: +43 6232 21999
Email: office@sicurtec.com
Website: www.sicurtec.com

Harmonised standards:

DIN EN ISO 23125:2015-04
DIN EN ISO 16090-1 + A2:2009
DIN EN ISO 16089:2016-06

Description of the safety component

Function: Separating and retaining protective system

Type: Machine safety windows as a composite of soda-lime glass and polycarbonate

SICURTEC® Laminatglasstechnik GmbH

Michael Ahlborn, MAS
Managing Director

Mondsee, 27.11.2023



16. Troubleshooting - possible solutions

Problem	Possible causes	Remedy
Liquid in air space between glass panes	Unsuitable cooling lubricant or damage to the edge seal	Replace immediately
Destruction of the tempered glass/ laminated glass pane during installation	No flat support or pane braced within the installation	Replace immediately
Polycarbonate pane becomes cloudy	Wrong cleaning agent has been used	Replace immediately
Bubbles forming inside the window unit	Panes are contacting each other within the unit	Cosmetic flaw, still usable