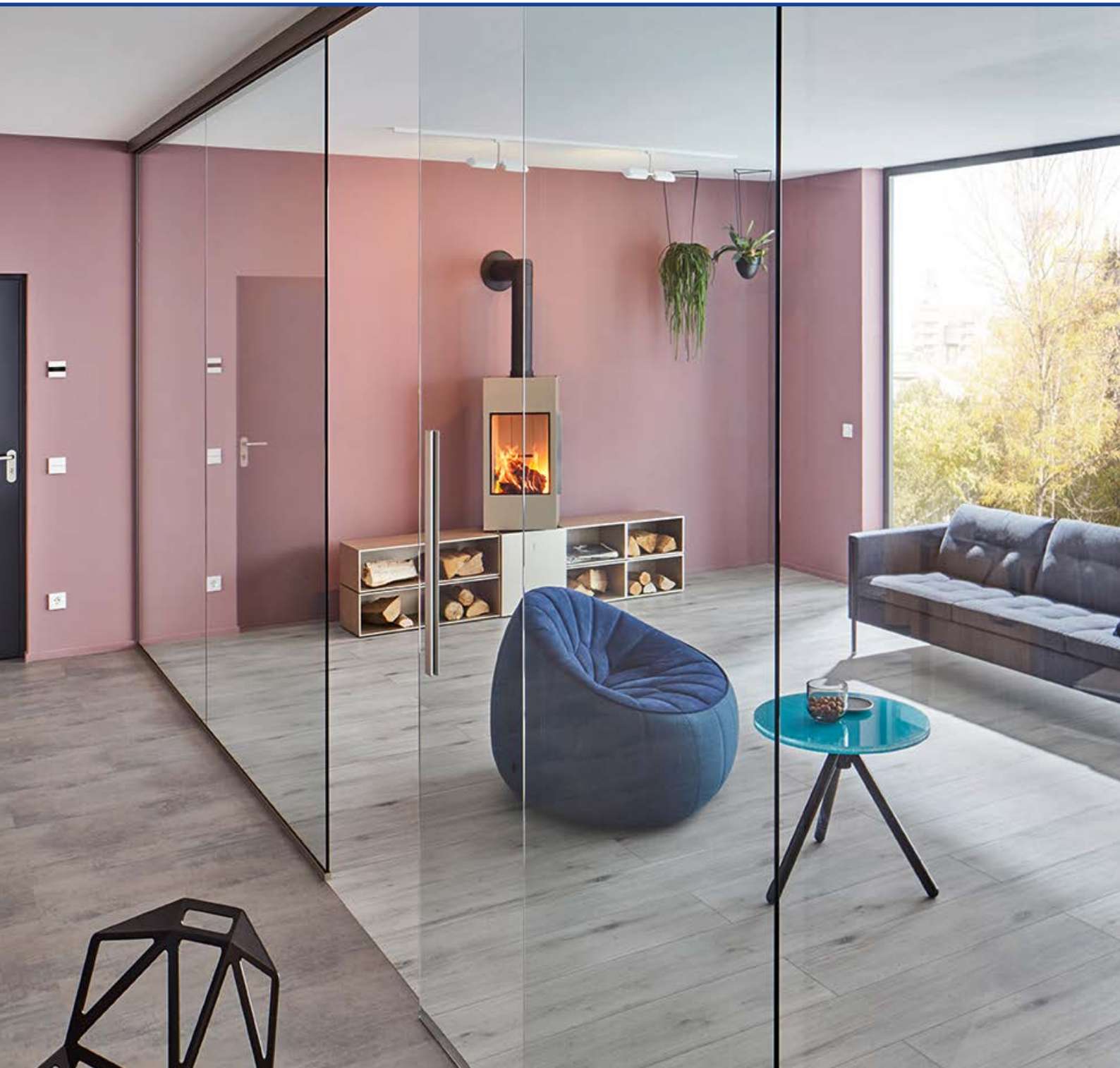
# A guide to the product properties and technical instructions.

Version: February 2022



## Table of contents


### 1. Generally applicable technical and glass-specific characteristics

1.1 General comments
1.2 Physical values and regularities
1.3 Special thermal, mechanical or chemical effects
1.4 Glass thickness determination
1.5 Thermally caused glass breakage

### 2. Quality and complaints procedure

### 3. Product specifications multiple pane insulating glass

3.1 Product-technical producible sizes
3.2 Tolerances
3.3 Coated glasses
3.4 Dual function glasses (Semco Therm/Star/Klima/Sun/Renova)
3.5 Recommendations for the glass design for defined pane absorption values
3.6 Characteristics for triple function glazing (Semco Energy/Klimastar/Sunstar)
3.7 Specific instructions for insulating glass units with glass thicknesses of 3 mm
3.8 Semco XXL insulating glasses
3.9 Insulating glasses with cleaning-assisting property (Semco Clean)
3.10 Muntin insulating glasses (Semco Stil)
3.11 Noise insulating glasses (Semco Phone)
3.12 Systems in spacing between panes (Semco Solar Flex)
3.13 Information about ISOScreen
3.14 Patterned glass combinations

### 4. Product specifications safety glasses

4.1 Product-technical producible sizes
4.2 Tolerances
4.3 (Heat-soaked) Tempered glasses (Semco Dur/Dur ESG-H according to EN 14179)
4.4 Coloured and screen-printed tempered glasses (Semco Color/Design)
4.5 Semi-tempered safety glasses (Semco Dur TVG)
4.6 Laminated safety glasses (Semco Safe) and laminated glasses
4.7 Alarm glasses (Semco Dur Alarm)
4.8 Attack-resistant glasses (Semco Safe VSG PxA, PxB, BRx)
4.9 Fire resistant glasses (e.g. Semco Pyrotec)
4.10 Specific information about Contraflam

## 5. Product specifications structural glasses

5.1 Fall prevention glasses (Semco Stop)
5.7 Walkable glasses (Semco Step)
5.3 Accessible and fall-through protection glasses
5.4 Point-fixed glasses (Semco Point)
5.5 Step glasses and roof glasses or horizontal glazing (Semco Roof)
5.6 All-glass systems (GGA) and all-glass doors (GGT) and all-glass showers (GGD)
5.7 Glued windows
5.8 (UV-)glued glass connections

## 6. Product specifications special glasses

6.1 Lacquered glasses (Semco Lac)
6.2 Wire-reinforced glasses
6.3 Satin-finished and sandblasted glasses
6.4 Crash glasses (Semco Crash)
6.5 Modelled panes
6.6 Curved insulating glasses
6.7 Lead and brass glasses
6.8 Antique glasses
6.9 Artistic glasses
6.10 One-way glasses („two-way mirror")
6.11 Insulating glasses with talk-through opening and drill hole and corner and edge cutout sections
6.12 Glasses provided by the customer

## 7. Special information on the storage, handling and maintenance

7.1 Storing the glass (on frames)
7.2 Glazing work
7.3 Cleaning recommendations for glasses
7.4 Fogs („milky" coating) on the glass external surface

## 8. Technical regulations, standards, guidelines and information sheets

## Glossary

# 1. Generally applicable technical and glass-specific characteristics

## 1.1 General comments

- Unless it has been explicitly agreed to the contrary, no static dimensioning, monitoring of glass thickness and suitability for protection against falls or any other functions will be performed for the glasses offered.
- The reference to the performance specifications and inspection of the practicality and suitability of the contractual glasses for the application intended in the construction project [e.g. usability of insulating glasses in accordance with DIN 18008 Parts 1-6)] must be carried out by the customer.
- The checking of whether a binding structural engineering verification is legally required and production of this verification must be carried out by the customer.
- Coated, coloured and wire-reinforced (not pre-tensioned) glasses must not be stored in the open - there is a high risk of thermal breakage. The danger of stress rupture for these glasses is further increased by partial shading.
- Lamination of non pre-tensioned glasses (e.g. float glass or patterned glass) with coloured films and adhesive pictures or painting with glass paints could lead to a thermally caused glass breakage. The danger of stress rupture for these glasses is further increased by partial shading.
- The wettability of glass surfaces can be different e.g. due to imprints from rollers, fingers, labels, paper residue, vacuum cups, sealant residues, silicone components, smoothening materials, lubricants or environmental influences. In the case of damp glass surfaces as a result of dew, rain or cleaning water, the differing wettability can become visible. This is no ground for a complaint see customer letters, available at **http://www.semcoglas.com/service/merkblaetter.html**).
- No conclusions about the optical impression of our insulating glass and safety glass products can be made from the technical values, e.g. Ug value, g value, light transmission or light reflectance. As a result, we fundamentally recommend a sample for alternative offers, that we assume to have taken place in the event of an order.
- The inherent colour of the glass is influenced in the form of a green/yellow tint with increasing pane thickness and number of laminated sheets used. **There is a duty to inform your customers.**
- In the case of other sources of supply for our basic glass, e.g. in the case of follow-up orders, there may be not insignificant differences in colour and differences between the nominal thickness and the actual thickness, in particular for thick glass. The same is true if different raw glass batches are used (e.g. due to scheduled partial deliveries, the number of glasses, the total amount of glass required or similar reasons).
- In the case of replacement or follow-on orders that take place after the initial delivery, minor differences in the colour in the glass or in the thickness and production tolerances may occur as a result of the quality of the raw glass, particularly for coloured and coated glasses (see Semco brochure, available at **http://www.semcoglas.com/service/merkblaetter.html**). This state of affairs is due to production factors and is no ground for complaint. The same is true if different raw glass batches are used (e.g. due to scheduled partial deliveries, the number of glasses, the total amount of glass required or similar reasons).
- When placing an order, the notification „Damp area glazing" (sauna among others) is absolutely necessary to achieve the guarantee preconditions.
- The technical guidelines of the German Institute of Glaziers (Glaserhandwerk) must be observed for the glazing. In addition, any necessary cleaning guidelines must be observed (see Section 7.3).
- We would like to point out that the inspection of the national statutory requirements for the property-related energy requirements should be carried out by you or by the building owner or planner.
- The declarations of performance for our products in accordance with the Construction Products Regulation (BauPVO) are available on the internet at **http://www.semcoglas.com/service/leistungserklaerungen-baupvo.html.** Please contact your Semco contact person for the properties of products that are not listed there (e.g. special structures).

## 1.2 Physical values and regularities

- The function values and the photometric and opto-physical data for our glass products correspond to the relevant and

valid DIN and EN test standards under the test measurements and test conditions that are required and described. Formats and combinations that differ from these conditions could lead to a change in the values of individual functions. Our deliveries are carried out exclusively in accordance with the DIN and EN standards and the guidelines of the glass industry.

- The light and radiation related information are mathematically or metrologically calculated values that could deviate by ±2 percentage points depending on the glass manufacturer and thickness or due to unavoidable production tolerances. The information presented here is presented conditionally in this respect.
- Alterations to the structure specified for the insulating glass unit, the layer position and the space between the panes, as well as the fitting of muntins could influence the functional values given.
- Fluctuations in the colour impression are possible and cannot be avoided due to the coating process, the coating itself, the inherent colour of the glass, as well as due to changes in the glass thicknesses and pane construction. Such types of raw material and production-related colour variations are no grounds for a complaint.

### 1.3 Special thermal, mechanical or chemical effects

- Customary in the trade and/or manufacturing or material related variations in design, dimensions, contents, thicknesses, weights or colour tones are not defects, provided that the requirements of Paragraph 444 of the German Civil Code (BGN) are not met. This also applies for interference phenomena, insulating glass effects, anisotropies, reflection distortions, multiple reflections, condensation on external surfaces, altered wettability of glass surfaces and nickel sulphide inclusions and breaks.
- Should stresses occur in the glass due to external thermal and/or mechanical influences that exceed the tensile strength of the glass, then it will cause the pane to break.
- We recommend the use of single-pane safety glass (ESG), heat-soaked single-pane safety glass (ESG-H according to EN 14179), annealed glass (TVG) or laminated safety glass (VSG) from double tempered glass (ESG) to avoid thermally-caused glass breakage. The pre-tensioned glasses have a considerably higher level of load-bearing capacity in relation to mechanical and thermal influences (thermal shock resistance) in comparison to normally cooled sheet glass due to the so-called thermal tempering process. The building regulations should be observed when using these products. Subsequent processing of the surfaces or edges can have a detrimental effect on the breakage properties of tempered glass (ESG) and is not regulated by standards.
- The minimum distance between panes of insulating glass (of non-tempered) and radiators must be a minimum of 30 cm. After detailed discussion, this minimum distance can be reduced to approximately 15 cm by the use of insulating glass in combination with tempered glass or heat soaked thermally toughened tempered glass (ESG or ESG-H according to EN 14179) as the inner window pane.
- The subsequent application of absorbing films and paints as well as the room-side installation of blinds, pleated blinds or similar that lead to heat accumulation can lead to thermally-caused cracks in the insulating glass unit in the event of sunlight on the non-tempered glasses. Therefore it should be ensured that there is a sufficient amount of circulating air between the window pane surface and the sunshade system (minimum of 10 cm advised).
- Coloured or coated (non-tempered) glasses in designs in which the glass panes could be pushed to be in front of each other (sliding doors etc.) are subject to an increased risk of glass breakage due to thermal stress. The danger of stress rupture for these glasses is increased further by partial shading. If sufficient rear ventilation cannot be guaranteed, then tempered glass (ESG) combinations should be used.
- By carrying out a heat soak test, it is ensured that spontaneous breakages as a result of nickel sulphide inclusions for tempered glass (ESG) are reduced to a technically not preventable residual risk.
- The surface of the glass must be protected effectively against flying sparks, welding beads, sprays, steam and similar during welding or grinding work to avoid damage to the surface.
- Chemical influences from the usage of corresponding construction materials, cleaning agents, paints etc. could lead to burns on the surface of the glass. Suitable protective measures corresponding to the conditions present should be taken, in many cases, simple covering of the glass surfaces is insufficient.

- In the event of a height difference between the production location and the installation location (or heights during transportation) of more than 600 m, we recommend the use of pressure balance capillary tubes (see information sheet MB-36-01, available at **http://www.semcoglas.com/service/merkblaetter.html**) and specialised glass assessments.
- Due to the manufacturing quality that is nowadays present, glass breakage can only be caused by external influences and damage to insulating glasses which is caused by one of reasons listed here or similar extraordinary stress are fundamentally no grounds for a complaint.
- To retain the properties of the glass over the entire period of use, correct cleaning that takes into account the type of glazing and the predominant environmental conditions carried out at sufficient intervals is required. For more information, see the „Merkblatt zur Glasreinigung" (information sheet for glass cleaning) from the following associations (available at **http://www.semcoglas.com/service/merkblaetter.html**):
  - Bundesinnungsverband des Glaserhandwerks, Hadamar
  - Bundesverband Flachglas e.V. (Federal Flat Glass Association), Troisdorf
  - Gütegemeinschaft Flachglas e.V., Troisdorf
  - Verband der Fenster- und Fassadenhersteller e.V., Frankfurt

## 1.4 Glass thickness determination

- The glass thickness pre-dimensioning that we carry out is a non-binding calculation and **not** a static or any other static engineering evidence in relation to the Construction Protocols Directive, that can only be produced by a legally Authorised Engineer. **It is the task of the customer to check whether a binding structural engineering verification is legally required and if necessary to produce this verification.** The glass thickness pre-dimensioning that we carry out is performed exclusively on the basis of the specifications that you provide on our customer question form available at **http://www.semcoglas.com/service/merkblaetter.html**) or the measurements that you provided in the order documents submitted. Additional factors that could have an influence on the glass thickness (e.g. intended purpose, contractual agreements, local conditions in the structure, production-technical capacities etc.) cannot be taken into account by us in the calculations.

  **Checking of compliance with the legal requirements must therefore be carried out by the customer.**
- The dimensions, aspect ratios and glass surfaces specified on our quotations and order confirmation refer exclusively to the production-technical capacities that arise from the operational requirements of insulating glass and safety glass manufacturing. There exists therefore no direct connection between the maximum dimensions and surfaces that can be manufactured in production-technical terms given, and the actual glass thickness and structures necessary for structural stability.
- The glass thickness and structures actually required must be investigated by the customer using reliable static dimensioning. They must correspond to the appropriate national and European Standards and technical codes of practice.
  This is in particular the MVVTB which have been introduced in all Federal German States as technical building regulations.
  The necessity of verification management (the verification of usability) is dealt with in Paragraph 55 of the Model Building Regulation (MBO). In accordance with the General Technical Regulations of the German Construction Contract Procedures (VOB/C ATV DIN 18361) (Glazing work), under Section 4.2.11 „The creation of static calculations, e.g. glass thickness measurement and the drawings and verifications necessary for this purpose" is listed as a „special service" that can be charged for.
- The basis for this is DIN 18008, the parts of which are listed below:
  - Part 1: Concepts and general foundations
  - Part 2: Linear stored glazing units
  - Part 3: Punctiform stored glazing units
  - Part 4: Additional requirements for accident-proof glazing

- Part 5: Additional requirements for walkable glazing
- Part 6: Additional requirements for maintenance measures for accessible glazing and accident-proof glazing
- Part 7: Designs (in preparation)

- We would also like to point out the information sheet BF-Merkblatt 019-2015 „Guidelines for glass dimensioning in accordance with DIN 18008" (available at **http://www.semcoglas.com/service/merkblaetter.html**) unless otherwise provided for in the following paragraphs.
- We would also like to point out the information sheet BF-Merkblatt 021-2017 „Suitability of linear supported glazings" (available at **http://www.semcoglas.com/service/merkblaetter.html**) unless otherwise provided for in the following paragraphs.

### 1.5 Thermally caused glass breakage

- Cast shadows and partial shading that occur (e.g. roof eaves), dark objects or furnishings located directly behind the glazing (e.g. a black leather sofa, a heavy curtain) or the overlapping of glass sliding panels can under certain circumstances lead to significant heating of the glass surface. The can cause the thermal strength of (non-tempered) glass to be exceeded.
- Lamination of glass with coloured films and adhesive pictures or painting with glass paints could lead to a thermally caused glass breakage for non-tempered glass. The same is true for the sudden cooling of hot glass surfaces (e.g. with a garden hose).
- The subsequent application of absorbing films and paints as well as the room-side installation of blinds, pleated blinds or similar that lead to heat accumulation can lead to thermally-caused cracks in the insulating glass unit in the event of sunlight (with non-tempered glasses). Therefore it should be ensured that there is a sufficient amount of circulating air between the window pane surface and the sunshade system (approximately 10 cm advised).
- We would also like to point out the VFF-Merkblatt V.02 information sheet - „Thermal stress on glasses in windows and facades." and the BF-information sheet 006-2016 „Subsequently added foil
- We recommend that customers and (end) users are informed of the issues given above.

## 2. Quality and complaints procedure

- In the corresponding regulatory area, the following are decisive for the determination of quality-related defects:
  - The SEMCO Group's visual guideline „The perfect view" (as of 2/2022), (available at http://www.semcoglas.com/service/)
  - DIN EN 1279-1:2018-10 „Glass in construction -Multi-pane insulating glass -Part 1: General, system description, exchange rules, tolerances and visual quality"

  For the processing of our glasses and their assessment in relation to defects, the relevant DIN-/EN Guidelines, Manufacturer's Guidelines (e.g. system descriptions) and Provisions that arise from the general construction authority approvals and test reports, as well as national quality and test regulations (RAL, BENOR, DS/DVV, P-Zeichen), each in their current valid version at the time of the tender preparation, shall also apply. Deviations from this are to be specially agreed upon between us and the customer before contractual acceptance.
- Customary in the trade and/or manufacturing or material related variations in design, dimensions, contents, thicknesses, weights or colour tones are not defects, provided that the requirements of Paragraph 444 of the German Civil Code (BGN) are not met. This also applies for interference phenomena, insulating glass effects, anisotropies, reflection distortions, multiple reflections, condensation on external surfaces, altered wettability of glass surfaces and nickel sulphide inclusions and breaks. For the assessment of other tolerances and permitted quality impairments, the regulations, guidelines and provisions listed above shall apply, unless otherwise explicitly agreed upon at the conclusion of the contract.

## 3. Product specifications multiple pane insulating glass

### 3.1 Product-technical producible sizes

| Float glass in large panes | | | | |
|---|---|---|---|---|
| Nominal float glass thickness (mm) | Max. Edge lengths (cm x cm) | Min. Dimensions* (cm x cm) | Max. Surface area ($m^2$) | Max. Aspect ratio |
| 3 | 100 x 200 | 20 x 30, 19 x 35* | 2.0 | 1:6 |
| 4 | 141 x 241 | | 3.4 | |
| 5 | 245 x 300 | | 6.0 | 1:10 |
| 6 | 250 x 400 | | 8.0 | |
| 8 | 280 x 500 | | 12.0 | |
| 10 | 321 x 600 | | 19.3 | |
| 12 | | | | |

* smaller formats as manual work and without guarantee (prices and details upon request)

Whichever dimension of single pane is smaller shall determine the maximum dimension of the insulating glass.

| Laminated safety glass (VSG) and laminated glass (VG) in large panes | | | | |
|---|---|---|---|---|
| Nominal laminated safety glass thickness - without film (mm) | Max. Edge lengths (cm x cm) | Min. Dimensions* (cm x cm) | Max. Surface area ($m^2$) | Max. Aspect ratio |
| VSG6 | 141 x 241 | 20 x 30, partly 19 x 35* | 3.4 | 1:6 |
| VSG8 | 250 x 360 | | 8.0 | |
| VSG10 | 280 x 500 | | 12.0 | 1:10 |
| VSG12 | 321 x 600 | | 19.3 | |
| VSG16 | | | | |

* smaller formats as manual work and without guarantee (prices and details upon request)

Whichever dimension of single pane is smaller shall determine the maximum dimension of the insulating glass.

### 3.2 Tolerances

- The tolerances of the functional values given for our glass products and the photometric and opto-physical data have been determined in accordance with the relevant and valid DIN and EN Standards and regulations for national quality marks (RAL, BENOR, DS/DVV, P-Zeichen) taking into account the test measurements and requirements that are required there. Formats and combinations that differ from these conditions could lead to a change in the values of individual functions. In the event of contradiction, the larger tolerance threshold shall apply.
- The light and radiation related information are mathematically or metrologically calculated values that could deviate by ±2 percentage points depending on the glass manufacturer and thickness or due to unavoidable production tolerances. The information stated in our brochures, catalogues and posters etc. are given with respect to these tolerances.
- The functional values given for these glass products were investigated using calculation software validated and certified by ift Rosenheim (Test report no. 41041462). Functional values for standard structures that are investigated in accordance with the relevant and currently valid test standards at accredited testing institutes serve as the basis for the data for the software. We shall not assume responsibility for the correctness of these values.

  Deviating formats and combinations could lead to a change in individual functional values.
- Tolerance for the Ug value + 0.1 W/m²K (in accordance with RAL quality criteria)
- Tolerance for the g value: ±2 percentage points (in accordance with RAL quality criteria)
- Size tolerances for float glass in accordance with DIN EN 572-8

- **Dimensional tolerance of multiple pane insulating glass units in accordance with DIN EN 1279-1:2018-10 (Table 2)**

| 2IG or 3IG | Tolerances for W and H | Offset |
|---|---|---|
| 2 panes ≤ 6 mm or W and H ≤ 2,000 mm | ±2 mm | ±2 mm |
| largest pane ≤ 12 mm or 2,000 < W or H ≤ 3,500 mm | ±3 mm | ±3 mm |
| largest pane ≤ 12 mm or 3,500 < W or H ≤ 5,000 mm | ±4 mm | ±4 mm |
| 1 pane > 12 mm or W or H > 5,000 mm | ±5 mm | ±5 mm |

- **Thickness tolerance in the edge section of insulating glass unit in accordance with DIN EN 1279-1:2018-10 (Table 3)**

| | Pane | Thickness tolerance[1] |
|---|---|---|
| 2IG | all panes are non-tensioned glass | ±1.0 mm |
| | at least one pane is tensioned glass | ±1.5 mm |
| 3IG | all panes are non-tensioned glass | ±1.4 mm |
| | at least one pane is tensioned glass | + 2.8 mm / -1.4 mm |

[1]: If for non-tensioned or pre-tensioned glass, one glass component has a nominal thickness of more than 12 mm or in the case of laminated glass a nominal thickness of more than 20 mm, then the manufacturer should be consulted.

## 3.3 Coated glasses

- The relevant European product standards apply. Requirements deviating from that are separate and should be agreed upon in writing. In this context, we would also like to point out any possible national provisions for the use of these products.
- Coated glass in combination with coloured patterned glass and tinted glasses is processed to make multi-pane insulating glass without any guarantee as a result of the high risk of glass breakage. If such a combination is explicitly desired, we recommend that the coloured pane is produced in a pre-tensioned version (ESG or ESG-H according to EN 14179).
- In the event of cleaning-assisting coats being used, our additional processing guidelines should be observed, with regard to the color permissibility of our internal data sheet (available at **http://www.semcoglas.com/service/merkblaetter.html**). With regards to glasses with cleaning-assisting properties, we would also like to point out the designs in Section 3.9.
- Glass edges with coated glass will have the coating removed at the edges. Residues from the coat removing process could lead to different reflections at the exposed laminated edge in construction projects compared to coated glass surfaces. This is caused by the production and is no ground for a complaint. We recommend that the protruding area is covered with a profile or angle and we can provide edge screen printing at an extra charge.

## 3.4 Dual function glasses (Semco Therm/Star/Klima/Sun/Renova)

- The relevant European product standards apply. Requirements deviating from that are separate and should be agreed upon in writing. In this context, we would also like to point out any possible national provisions for the use of these products.
- The function values and the photometric and opto-physical data correspond to the relevant and valid normative requirements and have been investigated under their test measurements and test conditions. For example, formats deviating from this, static-related adjustments to the glass thickness and possible insulating glass combinations could lead to a change of individual functional values.
- Ug values for insulating glass are investigated in accordance with DIN EN 673 for vertical installation. For physical reasons, the Ug value increases when the installation is slanted, depending on the angle of inclination.
- **In the case of sun shade, Semco Klima or Semco Sun combinations being installed, the coating is generally located in position 2, i.e. on the surface of the external pane facing the space between the panes. For purely**

**heat insulating glazing, the coating is generally located in position 3, i.e. on the surface of the internal pane facing the space between the panes.**

- For insulating glass made of float glass, interferences in the form of spectral colours may occur. Optical interferences are superpositions of two or more light waves meeting at one point. They appear in more or less strongly coloured zones that change when pressure is put on the pane. This physical effect is strengthened by the plane parallelism of the glass surfaces. This plane parallelism ensures a view free of distortions. Interference effects appear randomly and cannot be influenced.
- The insulating glass edge seal must be protected against influences such as direct sunshine, water and the influence of moisture and unplanned mechanical stresses (e.g. as a result of unsuitable transportation or storage conditions).
- Insulating glass has a volume of air/gas that is sealed in by the edge seal whose condition is largely defined by the barometric air pressure, the height of the production facility above sea level and the air temperature at the time and place of manufacture. When installing insulating glass at a different altitude, in the event of temperature changes and fluctuations in barometric air pressure (high and low pressure), it is unavoidable that concave or convex curvatures of the individual panes and therefore optical distortions occur.
- If the length of the shorter edge falls below the value of 500 mm, then the breakage risk of panes made from float glass increases as a result of the climatic influences.
- Multiple reflections of different strength may also appear on the surfaces of the glass. These mirror images may also be more visible if the background of the glazing is dark for example. This appearance is a physical regularity.
- Condensation (dew) can then form on the external glass surfaces if the surface of the glass is colder than the surrounding air (e.g. a steamed up bathroom window). Formation of condensation water on the external surfaces of a window pane is defined by the Ug value, the air humidity, the air flow and the internal and external temperature.

  For insulating glass with a high level of insulation, condensation can temporarily form on the glass surface facing the weather, if the external humidity (relative air humidity outside) is high and the air temperature is higher than the temperature of the window pane surface and thus the dew point is reached.
- Condensation formation on the glass surface facing the room is promoted by the prevention of air circulation, e.g. due to deep soffits, curtains, flowerpots, flower boxes, venetian blinds or due to an inconvenient arrangement of the radiators or insufficient ventilation.
- For insulating glass with plugged corners, it is possible that occasional grains of the drying agent filled into the spacers could be present in the space between the panes. This could in particular be more strongly noticeable with black spacers. We would like to point out that these are production-related side effects and that they are not a ground for a complaint.
- **In the further processing and for the prevention of damage to insulating glazing with the Semco Spacer BL thermo-plastic edge seal system in combination with the polysulphide sealing compound GD 116 (NA), the separate Semcoglas processing instructions shall apply**. The processing instructions are available at http://www.semcoglas.com/service/merkblaetter.html.

  Damages that arise from the fact that the processing instructions have not been observed shall not represent a defect.
- We recommend the use of the following space between the window panes, depending on the glass structure - symmetrical (i.e. $\Delta d < 2$ mm) or asymmetrical (i.e. $\Delta d \geq 2$ mm) - and the surface area of the glass:
  - Symmetrical glass structure and surface area ≤ 1.5 m²: all space between panes
  - Symmetrical glass structure and surface area > 1.5 ≤ 2.5 m²: minimum space between panes 10 mm
  - Symmetrical glass structure and surface area > 2.5 ≤ 4.0 m²: minimum space between panes 12 mm
  - Symmetrical glass structure and surface area > 4.0 ≤ 6.0 m²: minimum space between panes 14 mm
  - Symmetrical glass structure and surface area > 6.0 m²: minimum space between panes 16 mm
  - Symmetrical glass structure and surface area ≤ 1.5 m²: minimum space between panes 10 mm
  - Symmetrical glass structure and surface area > 1.5 ≤ 4.0 m²: minimum space between panes 14 mm

- Symmetrical glass structure and surface area > 4.0 m²: minimum space between panes 16 mm
- If Δd ≥ 10 mm: minimum space between panes 14 mm

- The deflection of the (free) insulating glass edge seal with a maximum stress may be a maximum of 1/200 of the length of the glass edges (DIN 18008-2).

### 3.5 Recommendations for the glass design for defined pane absorption values*

- If the front pane absorption with or without coating of < 50 % in front → float glass**
- If the front pane absorptions, with the application of colour films, coatings or dyed-through glasses is ≥ 50 % and ≤ 60 % → tempered glass (ESG)**
- With front pane absorptions > 60 % → heat-soaked tempered glass (ESG-H according to EN 14179)**
- Is the pane absorption for the middle pane of 3IG > 10 % → tempered glass (ESG)

* ascertained with core calculation

** for laminated safety glass (VSG) Version of individual glass panes

### 3.6 Characteristics for triple function glazing (Semco Energy/Klimastar/Sunstar)

- This insulating glass consists of three panes of glass that are connected to each other at the edge region so that they are air/gas tight by a primary and secondary sealing and a spacer, formed as standard by a thermally enhanced edge seal („warm edge"). Triple glazing therefore represents a complex system due to the physical phenomena, the raised quality requirements and the increased requirements in their application. They exhibit some product-specific characteristics that we would like to highlight in the following section.
- The insulating glass effect is strengthened due to a relatively large total space between the panes of 2x 12 mm or more. As a result of external temperature and air pressure changes, with large volumes of gas, there is a high „internal" pressure load in the spacing between the panes, which in turn leads to a more or less large curvature of the external glass panes either inwards or outwards, depending on the glass thickness and formats selected - caution: Optical distortions may occur. In the case of insufficient glass thickness calculation (see Point 1.4), this can lead to glass breakage.
- As a result of the increased insulating glass effect described above, there is an increased strain on the glass and the edge seal for unyielding ISO systems (= short edge lengths and thick glass), that could in the worst case lead to glass breakage or to leakages in the edge seal system. Large differences in altitude between the production and installation locations and south-facing installation locations with an increased temperature stress, particularly in summer will also intensify this effect. Increased heating of the insulating glass panes and therefore of the gas volume in the spacing between the panes when laminated safety glasses and coated and darkened glass panes are used should also be considered.
- Particular caution is recommended with edges of lengths less than 900 mm combined with large volumes between the panes such as 2x 14 mm, 2x 16 mm and especially of 2x 18 mm, as high levels of climate related glass stress will occur that cannot generally be statically absorbed with float glass of standard glass thicknesses of 3 x 4 mm (see DIN 18008-2). **Spaces between the panes with widths of greater than 2x 12 mm and edges of lengths less than 700 mm with panes made from float glass increase the risk of breakage as a result of climatic influences.**
- For asymmetric triple structures and/or long, small pane formats (so-called „hand towel formats") with edges of length less than 700 mm, pre-tensioning of the external thinner pane of tempered glass (ESG) is recommended.
- To ensure the long-term functioning of triple glazing units and the insulating glass edge seal for units with large spaces between the panes, a special execution for the glass pane bedding conditions is advisable (especially blocking, over the entire width of the insulating glass unit). Caution: A larger edge offset is present under certain circumstances (see point 3.2).
- The thermal capacity of float glass panes that have been provided with a heat insulation layer and installed in triple function glazing is the same as the thermal capacity of uncoated float glass panes.
- As a result of the mode of action of the coatings, there can however be a considerably higher amount of heating in the areas between the panes. Glass breakage is therefore possible in the event of high temperature differences within the

pane. The danger of stress rupture for these glasses is increased further by partial shading. The use of tempered glass (ESG) will reduce this probability of breakage considerably.

- **Pre-tensioning of the middle pane is recommended to reduce the risk of glass breakage if the pane is to be made of patterned glass or coated glass.** That means that patterned or coated glass that has not been pre-tensioned should only be installed in the unit as the external glass panes.
- Due to the improved heat insulation of triple glazing, it should be expected that condensation forms on the external glass surface of triple glazing more frequently than it forms on the standard double insulating glazing. **The end customer should be informed about this situation.**
- Triple glazing is included in the current version of DIN EN 1279-1:2018-10 „Glass in construction - multi-pane insulating glass - Part 1: General, system description, exchange rules, tolerances and visual quality". With each additional glass component, the number of permissible defects increases by 25%. In addition, the thickness tolerances when only float glasses are used are changed from ± 1 mm to ±1.4 mm.
- Due to the two coated glass surfaces, there can be a shielding of radio frequencies and therefore an adverse effect on the quality of the mobile phone network with triple glazing. The consequences of this depend on the overall building construction.
- The inherent colours of triple glazing can be more clearly visible than those of double glazing.
- We would also like to point out the information sheet BF-Merkblatt 003-2019 „Guidelines for the use of triple insulating glass" (available at **http://www.semcoglas.com/service/merkblaetter.html**).

### 3.7 Specific instructions for insulating glass units with glass thicknesses of 3 mm

- maximum production sizes: 100 to 200 cm
- Increased risk of breakage due to increased stress on the edges, lower edge loading capacity and reduced thermal capacity (for non-tensioned units)
- Disruptive optical distortions as a result of increased insulating glass effect and larger waviness of the float glass pane surface
- Increased challenge in the handling of the panes and increased requirements for clean and correct mounting and blocking of the panes to avoid glass breakage

### 3.8 Semco XXL insulating glasses

- Semco XXL glass is an insulating glass unit (2IG or 3IG), in which one edge exceeds the dimension of 500 cm or both edges exceed the dimension of 270 cm. These XXL glass requires an increased effort in production, during transport, and in assembly preparation and execution. On request, we would be pleased to give you the Semco internal processing instructions for XXL-glass (available at http://www.semcoglas.com/service/merkblaetter.html)".

### 3.9 Insulating glazing with cleaning-assisting property (Semco Clean)

- The functionality is based on the photocatalytic and hydrophilic effect of the coating. The coating of the glass triggers a chemical reaction in conjunction with UV light. Organic dirt is decomposed into individual particles. When it rains, the dirt is washed out and washed away by the hydrophilic effect. The cleaning effort is reduced, but the climate-related values of the glazing – e.g. light transmission and g-value – are still ensured. Glass with cleaning-supporting properties is marked with the addition „Clean" in the respective product description.
- The following must be observed when processing cleaning-supported glass products such as Semco Clean (Classico), SGG Bioclean, Pilkington Activ: Silicone of any kind and quantity (e.g. also contained in glass cleaners) irreversibly destroys the hydrophilic functioning and must not come into contact either directly or indirectly with the glass surface. Oil-containing sealing profiles or sealants, such as silicone, paraffin wax or mastic on linseed oil can also be of concern. If necessary, compatible silicones or silicone-containing seals can be requested.
- The cleaning-promoting properties become fully effective from an angle of inclination of at least 10 °.
- The consumer must be informed of the cleaning and care instructions (see section 7.3, available at http://www.semco-glas.com/service/merkblaetter.html) . We can provide them on request.

## 3.10 Muntin insulating glazing (Semco Stil)

- Built-in elements and muntins in the spacing between the panes could lead to a change in the technical values given (e.g. the heat and sound insulation). There is no test report present for functional glass with internal muntins.
- Orders of insulating glass units with internal rungs without rattle protection may cause rattling noises under unfavorable environmental conditions, external vibrations or mechanical influences (eg due to glass dimensions). These generally do not constitute a reason for complaint. The end user is obliged to give notice. Therefore, we recommend the use of a rattle guard (only from 14 mm spacer width).
- Without explicit reference in the order, we deliver sprouts insulating glass with rattle protection in the following Semco branches: Aschaffenburg, Bad Sülze, Eberswalde, Sennfeld, Vechta, Wassenberg, Zerbst
- In principle, the following Semco branches do not produce rattle protection: Bramsche, Gießen, Kropp, Nordhorn, Westerstede
- There is no warranty for subsequent detachment, slipping or discoloration of the felt tiles or transparent spacer plates and nubs.
- Felt pads or transparent spacers used to reduce rattling noises on the rungs hinder the deflection of the disc in the event of air fluctuations and increase the risk of breakage when using rungs in unfavorable spacer widths. If one or no rattle protection is to be used, this must be individually coordinated with the respective Semco branch. There is no guarantee of a break due to unfavorable spacer widths.If production takes place without anti-rattle protection at the explicit request of the customer, then any possible rattling noises do not represent a ground for a complaint.
- The use of Viennese muntins with spacing between the panes of less than 14 mm leads to an increase risk of breakage. We shall not assume any guarantee for this and we recommend spaces between the panes of more than 15 mm.
- The effects of temperature-related length changes for muntins in the spacing between the panes (e.g. the muntins being fitted to the surface of the pane) cannot fundamentally be avoided.
- We recommend that the layout of muntins for 3IG is limited to one area between the panes (generally the exterior). If muntins are fitted at the customer's request in both areas between the panes, then we shall accept no guarantee for any glass breakages that occur as a result due to the strongly increased risk of glass breakage.
- We shall assume no guarantee for the congruency of the muntins if muntins are located in both spaces between the panes. A possible misalignment of the muntins cannot be excluded for production reasons and is not a ground for complaint.
- Depending on the installation location, colour deviations (yellowing) may appear over time on the muntin knobs.
- Knobs on lacquered muntins may become discoloured.
- (Fixed) correction values for muntins in accordance with 14351-1 are:

  Single muntin grid in the spacing between the panes: Delta Uw-value W/m²K + 0.1

  Multiple muntin grids in the spacing between the panes: Delta Uw-value W/m²K + 0.2

  Note: „Warm" muntins possibly lead to lower impacts in the Uw-value.
- We would like to point out the information sheet BF-Merkblatt 016-2013 „Assessment of muntins in the spacing between panes" (available at **http://www.semcoglas.com/service/merkblaetter.html**).

## 3.11 Noise insulating glasses (Semco Phone)

- You will always receive the evaluated noise insulation measure $R_{w,}$ tested in the test laboratory according to the standard provisions for individual and insulating glasses. Values that have been assessed and based on experience are specially identified. All of the $R_w$ values received from us for the glasses may differ from the values measured in the overall situation (glass, frames, construction joints, etc.) in the installation situation.
- Influences on the noise insulation behaviour of our glasses result from:

  - Pane size
  - Pane weight
  - Stiffness of the individual panes
  - Alignment of the individual panes (symmetry/asymmetry of the pane structure)
  - Angle dependence of the incident noise (at the property)
  - Resonance behaviour of the individual panes or the individual insulating glass panes
  - The spacing between panes for insulating glasses
  - Gas filling for insulating glasses
- Negligible influences on sound insulation behaviour include:
  - The coating on the glasses and the position of the coating
  - Type of separator
  - Sealing material used
- So-called spectrum-weighting values C and $C_{tr}$ for the building acoustic range from 100 to 3150 Hz exist to take into account the different frequency spectrums of residential and traffic noise. The amount of noise insulation measured will be adjusted appropriately.
- We recommend arranging the laminated safety glass pane on the room side if possible.
- For additional information, we would like to point out the information sheet BF-Merkblatt 017-2014 „Noise insulation glass" (available at **http://www.semcoglas.com/service/merkblaetter.html**).

### 3.12 Systems in spacing between panes (Semco Solar Flex)

- The Semco Solar Flex (based on Screenline) product may only be transported in a horizontal position, with the blind sideways, or in a vertical position, with the blind lying flat.
- The Semco Solar Flex product may only be blocked in an extended position.
- It is absolutely essential to check the straightness of the sideward spacer in the blind.
- To ensure the correct operation of the Semco Solar Flex products, it is essential to guarantee an internal temperature of a minimum of 15 °C.
- **If the customer's own house technology is to be installed to control the Semco Solar Flex system, then this must be coordinated in advance. Confirmation of this installation option will be given in writing.** We would like to point out that no guarantee for the products will be assumed if the blinds are commissioned with accessories (power supply and control system) that have not been approved.
- We would like to ask you to return the original test protocols for the panes delivered in this order within 4 weeks, otherwise we shall assume that the Semco Solar Flex - panes are functionally free from defects. Later complaints may not be recognised if these protocols are not present.
- We would also like to point out that the abrasion of slat material on the bar of the spacers is not a ground for a complaint.
- A dimensioning of the glass thickness can only take placed after we have knowledge of the structural circumstances. This can lead to corrections of the glass thickness and price. The minimum glass thickness according to the manufacturer will be taken as the basis for the quotation.
- We would also like to point towards the information sheets available at **http://www.semcoglas.com/service/merkblaetter.html** :
  - BF-Merkblatt 005-2009 „Verarbeitungsrichtlinien – Sonnenschutzsysteme im Scheibenzwischenraum" (Processing guidelines - sun shade systems in the spacing between the panes)
  - BF-Merkblatt 006-2010 „Richtlinie zur Beurteilung der visuellen Qualität Sonnenschutzsysteme im Mehrschei-

ben-Isolierglas" (Guidelines for the assessment of the visual quality of sun shade systems in multi-pane insulating glass)

- BF-Merkblatt 008-2010 „Einbauempfehlungen für integrierte Systeme im Mehrscheiben-Isolierglas" (Installation recommendations for integrated systems in multi-pane insulating glass)
- BF-Merkblatt 011-2012 „Planungshilfe: Integrierte, bewegliche Systeme im Mehrscheiben-Isolierglas für Architekten, Planer und Verarbeiter" (Planning aids: integrated movable systems in multi-pane insulating glass for architects, planners and processors)
- BF-Merkblatt 018-2014 „Hinweise für die Ansteuerung von integrierten Systemen im Scheibenzwischenraum" (Instructions for the control of integrated systems in the spacing between the panes)

### 3.13 Information about ISOScreen

- For small panes (widths less than 700 mm), skewed running of the blinds will occur due to the low weight of the blind itself and the drawstrings that lie near each other. The deviation from perpendicularity can be up to 50 mm. This has no influence on the functionality of the system and is no ground for a complaint.
- Please observe that ISOscreen must be transported with the slats package raised and standing upside down. Systems with the exclusive function to only turn and rotate must be transported in an upright standing position and may not be put upside down, laid down or knocked over. Any damage arising from non-compliance with these measures is not covered by the guarantee.
- The cable outlet of the motor is primarily located in the upper right hand side, when seen from the inside. We recommend laying an approximately 35 cm long cable loop in the glass rebate.
- The blind should be moved downwards until it is halfway down the height of the glass before blocking. Turn and rotate the slats and then leave open horizontally to be able to inspect the unlimited rotatability and the correct horizontal alignment. During blocking, it is essential to ensure the parallel position of the curtain relative to the sideward spacer (left + right the same distance). Move the blind downwards and leave open horizontally until the final commissioning.
- Labels must be removed a maximum of 4 weeks after installation.

### 3.14 Patterned glass combinations

- Nearly all ordinary commercial patterned glasses can be processed into insulating glass. We will pass on the tolerances of the corresponding manufacturer's factory. We will not recognise any complaints about the quality of the structure or colour differences of these glasses that lie within the tolerances permitted in accordance with DIN EN 572, Part 5.
- For patterned glass combinations, the standard depth of the edge seal of around 11 mm can in places by exceeded by up to 3 mm.
- Patterned glasses are more susceptible to breakage in comparison to float glass of the same thickness as a result of their special properties (lower flexural strength).
- If Edelit or Master-Carre patterned glass is used on both sides, then distortions of up to 12 mm in the structure may result. This is no ground for a complaint.
- Glass such as Altdeutsch K and Echtantik may exhibit open bubbles, streaks and scratches. There could also be differences between the glass panes in terms of structure. These manufacturing-related properties do not form a ground for a complaint.
- If a float glass pane is to be replaced by patterned glass with an asymmetric pane structure, then this pane must be of a thickness at least equal to that of the float glass pane being replaced. The static requirements must be observed.
- The combination of wire mesh and glass will lead to an increased risk of breakage. For this reason, we shall exclude any guarantee claims in the processing of wired glass and wired patterned glass to make multiple pane insulating glass.
- Coloured float glass and patterned glass as well as patterned glass with wire inserts may heat up unevenly in sunlight, in particular in the event of cast shadows being formed. There is therefore an increased risk of stress rupture when used in insulating glass. This is caused by the production and is no ground for a complaint in the event of breakage. Therefore

do not store outdoors. We recommend that both of the glasses mentioned first are carried out in a pre-tensioned version to reduce the risk of breakage in these cases. **There is a duty to inform the end consumer.**

## 4. Product specifications safety glasses

### 4.1 Product-technical producible sizes

- The minimum and maximum dimensions for heat-soaked tempered glass (ESG-H) and annealed glass (TVG) may be requested from the corresponding manufacturer's plant.

### 4.2 Tolerances

- **Deviation limits and perpendicularity of tempered glass and annealed glass**.

  If the nominal dimensions for width W and length H have been specified, the finished panes must not be greater than the nominal dimensions plus the limit deviation *t* and must not be smaller than the nominal dimensions minus the limit deviation t.

  **Limit deviations *t* of the width W and length H in accordance with EN 12150, Part 1, and EN 1863, Part 1 (Table 2)**

| Nominal size of the pane W or H (mm) | Limit deviation *t* | |
|---|---|---|
| | Nominal thickness of glass, d ≤ 8 mm | Nominal thickness of glass, d > 8 mm |
| ≤ 2,000 | ±2.0 mm | ±3.0 mm |
| 2000 < W or H ≤ 3,000 | ±3.0 mm | ±4.0 mm |
| > 3,000 | ±4.0 mm | ±5.0 mm |

  The perpendicularity of rectangular panes of glass is specified by the difference between their diagonals. The difference between the two diagonal lengths of the pane of glass must not be larger than the variance threshold *v*.

  **Variance threshold *v* of the difference between the diagonals in accordance with EN 12150, Part 1, and EN 1863, Part 1 (Table 3)**

| Limit deviation *v* | | |
|---|---|---|
| Nominal size of the pane W or H (mm) | Nominal thickness of glass, d ≤ 8 mm | Nominal thickness of glass, d > 8 mm |
| ≤ 2,000 | ≤ 4.0 mm | ≤ 6.0 mm |
| 2000 < W or H ≤ 3,000 | ≤ 6.0 mm | ≤ 8.0 mm |
| > 3,000 | ≤ 8.0 mm | ≤ 10.0 mm |

- **Distortions of tempered glass (ESG) and annealed glass (TVG)**

  The maximum permitted threshold values apply in normative terms only for thermally tempered glass without boreholes and/or opening and/or extracts. We manufacture thermally tempered glasses with boreholes, openings and extracts following the normative specifications.

  **General and distortion of roller waves in accordance with EN 12150, Part 1, and EN 1863, Part 1 (Table 4)**

| Type of glass | Highest value of distortion permitted | |
|---|---|---|
| | General distortion mm/m | Roller Wave mm |
| Uncoated float glass in accordance with EN 572-1 and EN 572-2 | 3.0 mm | 0.3 mm |
| Other[a] | 4.0 mm | 0.5 mm |

  Comment: A suitable feeler gauge depending on the wavelength of the roller waves must be used.

  [a] excluding enamelled glass. The tolerance thresholds of the manufacturer shall apply which can upon request be requested and

passed on.

- **Deviation limits, perpendicularity and offsets of laminated safety glass (VSG) and laminated glass (VG)**

  The glass panes must not be either larger than the nominal dimensions for the width L and length H (see the diagram below), either extended by the upper deviation limit *t1* or smaller than the nominal dimensions minus the lower deviation limit *t2*. Every offset must be contained within these deviation limits. If a part of the laminated glass is pre-tensioned or thermally toughened glass, then an additional variance of 3 mm must be taken into account.

  **Tolerances t1 and *t2* of the nominal dimensions (laminated safety glass (VSG) and laminated glass (VG) final dimensions) in accordance with EN ISO 12543, Part 5 (Table 3)**

| Nominal dimension L or H (mm) | Nominal thickness of Laminated glass ≤ 8 mm | Nominal thickness of laminated glass > 8 mm | |
|---|---|---|---|
| | | Every glass pane nominal thickness < 10 mm | At least one glass pane nominal thickness ≥ 10 mm |
| ≤ 2,000 | +3.0/-2.0 | +3.5/-2.0 | +5.0/-3.5 |
| ≤ 3,000 | +4.5/-2.5 | +5.0/-3.0 | +6.0/-4.0 |
| > 3,000 | +5.0/-3.0 | +6.0/-4.0 | +7.0/-5.0 |

  The perpendicularity of rectangular panes of glass is specified by the difference between their diagonals. The difference between the two diagonal lengths of the pane of glass must not be larger than the variance threshold *v*.

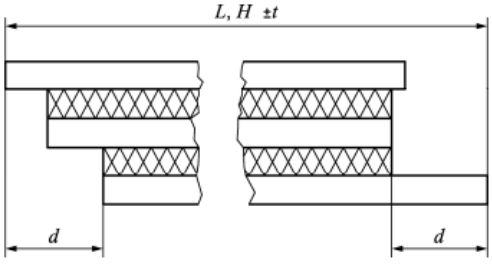
  **Limit deviation *v* of the difference between the diagonals in accordance with EN ISO 12543, Part 5 (Table 4)**

| Nominal dimension L or H (mm) | Nominal thickness of Laminated glass ≤ 8 mm | Nominal thickness of laminated glass > 8 mm | |
|---|---|---|---|
| | | Every glass pane nominal thickness < 10 mm | At least one glass pane nominal thickness ≥ 10 mm |
| ≤ 2,000 | 6.0 | 7.0 | 9 |
| ≤ 3,000 | 8.0 | 9.0 | 11 |
| > 3,000 | 10.0 | 11.0 | 13 |

- **Maximum dimension for the offset *d* (laminated safety glass (VSG) and laminated glass (VG) final dimensions) in accordance with EN ISO 12543, Part 5 (Table 5)**

  The maximum dimension for the offset *d* (see diagram below) must comply with the following table. Width L and length H must be considered separately.

| Nominal dimension L or H (mm) | Maximum permitted Offset *d* (mm) |
|---|---|
| ≤ 1,000 | ±2.0 |
| 1,000 < L, H ≤ 2,000 | ±3.0 |
| 2,000 < L, H ≤ 4,000 | ±4.0 |
| L, H > 4,000 | ±6.0 |




## 4.3 (Heat-soaked) Tempered glasses (Semco Dur/Dur ESG-H according to EN 14179)

- The relevant European product standards (see point 4.2 for tolerance specifications) apply. Requirements deviating from that are separate and should be agreed upon in writing. In this context, we would also like to point out any possible national provisions for the use of these products.
- (Heat-soaked) tempered glass ESG(-H) is subject to labelling in accordance with the normative provisions. We supply

(heat-soaked) tempered glass ESG(-H) without a hallmark only at the explicit request (written agreement necessary). We shall assume no liability for complaints arising as a result and any other claims.

**We would like to point out that the product in cases without labelling must not be used as a construction product as laid down in the definition of the Construction Products Ordinance, because it exhibits no conformity with the currently valid building regulations.** It plays no role whether this is a public or a private judicial area.

- In the case that tempered glass (ESG) is used, there is the risk that a spontaneous breakage occurs due to possible, unavoidable and indistinguishable nickel-sulphide inclusions in the glass. With a heat-soak test (→ ESG-H according to EN 14179) that is ordered separately, we can ensure that spontaneous breakages can be ruled out apart from a residual risk that cannot technically be avoided. **Please inform us if you are interested in a quotation for the implementation of a HS test.**

- Anisotropies are an unavoidable physical effect in glasses that have been heat-treated and they result from the internal tension distribution. A perception of dark-coloured rings or stripes from polarised light depending on the viewing angle and/or when observing through polarising lenses is possible (so-called iridescence). Anisotropies therefore do not constitute a defect. Polarised light is not present in normal daylight. The extent of polarisation is dependent on the weather and the position of the sun. The birefringence becomes more noticeable when viewed from a flat viewing angle or also when glass panes are facing each other in a corner.

  Increased birefringence may be caused (for example in the vicinity of water surfaces) by arranging several pre-tensioned glass panes in multiple pane insulating glass units and/or laminated safety glass made from pre-tensioned glass. That is not within our area of responsibility. If necessary, a test facade with the natural conditions at the location should be constructed.

- Due to the thermal tempering process, there could be technically unavoidable chemical and mechanical alterations of the quality of the surface with heat-soaked tempered glass (ESG-H according to EN 14179). As a result, dot formations and imprints may appear, which do not therefore constitute a defect.

- Full or partial adhesive films on tempered glass (ESG) panes could lead to a change in the breakage behaviour (e.g. formation of slabs instead of a fine fracture pattern) and hence lead to an alteration in the specific safety glass characteristics.

### 4.4 Coloured and screen-printed tempered glasses (Semco Color/Design)

- The relevant European product standards (see point 4.2 for tolerance specifications) apply. Requirements deviating from that are separate and should be agreed upon in writing. In this context, we would also like to point out any possible national provisions for the use of these products.

- **Provisions that affect the labelling or hallmarking are treated as follows:**

  - Semco Color/Design, when realised as facade glazing - must be realised here as Semco Color ESG-H according to EN 14179- may only be delivered with a hallmarking that is visible after installation.

  - Semco Color/Design, when used as an interior glass, e.g. as a parapet, step etc. (as laminated safety glass) may only delivered with the hallmarking.

  - Semco Color/Design as a monolithic full glass door (GGT) or full glass system (GGA) or interior partition wall should as a recommendation undergo a heat-soak test beforehand. In this context, it is emphasised that there is an increased probability of breakage of spontaneous breakage as a result of an NiS-inclusion. Delivery of the glass always occurs with a hallmark.

  - Semco Color/Design, when used as an interior glass, e.g. as a kitchen back wall, kitchen work space, etc. can be implemented without a hallmark. We shall however point out that strictly speaking, for kitchen and WC back walls, because they are in the proper sense of the word construction products permanently fixed to the building structure, that a hallmarking must take place.

- Ceramic enamel colours are opaque but are not completely light impermeable. Therefore, coloured glasses are not suitable for use in backlit and vision areas. Cooperation with the supplier is necessary before the order is placed here. You will

find a listing of the colour tones (some blue, light and metallic colours) in the product overview that, as a result of their consistency, should not be installed in front of regular, dark, opaque and non-reflective backgrounds. We will provide these colours only in individual cases and the area where they are to be used should be coordinated in advance.

- For coloured glasses, a so-called „starry sky effect", i.e. technically unavoidable extremely small imperfections (points of light or pinholes) may result due to the enamelling process, and for follow-on deliveries, nuances of colour differences may occur, caused by the inherent colour of the base glass used and the ceramic enamel colours, among other things. Therefore, the complete volume of the property should be announced so that both the glass and also the colours can be stockpiled from one production batch.
- In the case of the use of coloured functional glasses (e.g. sunshade coated facade glazing), it must be ensured that the coloured side of the glass is not exposed to any application of dampness, even if it is only due to condensation. Otherwise, the previously described „starry sky" effect can lead to damages to the moisture-sensitive functional layer.
- It cannot be excluded that there are slight colour differences between the colour patterns given (e.g. RAL, RAL-Design, NCS) and the glasses delivered.
- The above named circumstance is due to production technical reasons and is not a ground for a complaint. We recommend carrying out a sample (of the component size) for each of the planned uses of white glass and/or traditional float glass before placing the order. Local conditions (e.g. artificial light, daylight) can lead to a different perception of colours.
- For coloured (Semco Color) and screen-printed (Semco Design) panes, samplings should be carried out separately from one another, as this could otherwise lead to colour differences.
- The use of Semco Color and Semco Design as a film in laminated safety glass (VSG) structures must be checked for its feasibility in each corresponding application.
- In the case of enameling on pyrolytic layers, no guarantee can be given with regard to possible oxidation of the layer or cloud formation.
- Blackening of the protrusion is only possible manually. Air pockets and uneven application are due to production and are no reason for a complaint. We recommend the use of edge screen printing.
- In order to guarantee opaqueness with many colour tones, the rear side, with the exception of Nordhorn Glastechnik, where it is only done on request, is generally also coated with a multiple-component stop-out varnish or with a ceramic paint. If this is not desired (e.g. for the side walls of furniture or for glass shelves), then it is essential to state this in the order.
- We would like to state explicitly that the correct and long-term attachment (adhesion) of coloured or screen-painted tempered glass as a wall covering is generally the responsibility of the customer. As a result of versatile background properties (plasterboard, steel substructures etc.) we will fundamentally give no recommendations for adhesives or fastening elements. This should be inspected in advance by the customer or by the developer (e.g. by performing adhesion tests) or should be confirmed by the corresponding adhesive manufacturer.
- The „Richtlinie zur Beurteilung der visuellen Qualität von emaillierten und siebbedruckten Gläsern" (Guidelines for the assessment of the visual quality of enamelled and screen-printed glasses) (available at **http://www.semcoglas.com/service/merkblaetter.html**) shall apply. You will receive production dimensions upon request.
- The calculation will be performed on the basis of your enquiry. The quotation price shall be a guideline price if there are no concrete delivery dimensions and delivery amounts, and a significant change in the assumptions made in the calculation can lead to a re-calculation. The pricing terms shall remain valid for up to 4 weeks, while up to three repeat orders will be accepted, if these orders can be manufactured within one campaign. Outside of these campaigns, the calculation will be performed at cost.
- For roller application (Semco Color), the grooved structure on the rear side is characteristic and is hardly visible for opaque colours but is more clearly visible from the glass side with translucent or metallic paints. Therefore, the direction of rolling is basically manufactured to the height. If the width specification exceeds the maximum roller width, the direction of rolling will be rotated by 90° without any special statement from the customer. Glass panes in which at least one edge is underneath the minimum dimensions will, for technical reasons, be coated diagonally to the direction of rolling.

- Screen printing can be performed both with ceramic paints and 2-K paints. The instructions given above also apply for ceramic paints. The application of paint is however generally thinner than is the case with Semco Color, which results in a more transparent appearance. This means that media that are attached directly to the colour side will appear more visible.

  Particular attention should be paid to the metallic paints (e.g. RAL 9006) as they contain metal particles that cannot be completely combined with the surface of the glass. In the event of severe stress being placed on the screen-painted surfaces, this can therefore cause detachments to appear.

  2-K paints are subject to particular conditions and therefore the possible conditions of use must be agreed with the manufacturer. Depending on the paint, light stripes are typical for the manufacturing process both in the direction and crosswise to the direction of printing, as well as occasionally occurring „slight foggy areas" and web features. With the printing of decors, this always begins as seen from one edge or corner of the glass. Should the application of a motif be time-consuming, then extra costs will result. We will indicate this in your order.

  If Semco Design is to be used in a vision area, then this should already have been disclosed in the offer phase.

- Separate screen costs will always be invoiced in full. These screens will then be disposed of after a minimum of three months. You will not be informed of this in advance.

### 4.5 Annealed safety glasses (Semco Dur TVG)

- The relevant European product standards (see point 4.2 for tolerance specifications) apply. Requirements deviating from that are separate and should be agreed upon in writing. In this context, we would also like to point out any possible national provisions for the use of these products.

- Annealed glass (TVG) is subject to labelling in accordance with the normative provisions. We supply annealed glass (TVG) without a hallmark only upon explicit request (written agreement necessary). We shall assume no liability for complaints arising as a result and any other claims.

  **We would like to point out that the product in cases without labelling must not be used as a construction product as laid down in the definition of the Construction Products Ordinance, because it exhibits no conformity with the currently valid building regulations**. It plays no role whether this is a public or a private judicial area.

- In the case that annealed glass (TVG) is used, there is in rare circumstances the risk that damage occurs due to unavoidable and indistinguishable nickel-sulphide inclusions in the glass that, in the event of it overlapping with external influences, can lead to glass breakage.

- Anisotropies are an unavoidable physical effect in glasses that have been heat-treated and they result from the internal tension distribution. A perception of dark-coloured rings or stripes from polarised light depending on the viewing angle and/or when observing through polarising lenses is possible (so-called iridescence). Anisotropies therefore do not constitute a defect. Polarised light is not present in normal daylight. The extent of polarisation is dependent on the weather and the position of the sun. The birefringence becomes more noticeable when viewed from a flat viewing angle or also when glass panes are facing each other in a corner.

  Increased birefringence may be caused (for example in the vicinity of water surfaces) by arranging several pre-tensioned glass panes in multiple pane insulating glass units and/or laminated safety glass made from pre-tensioned glass. That is not within our area of responsibility.

  If necessary, a test facade with the natural conditions at the location should be constructed.

- Due to the thermal tempering process, there could be technically unavoidable chemical and mechanical alterations of the quality of the surface with annealed glass (TVG). As a result, dot formations and imprints may appear, which do not therefore constitute a defect.

- If you need heat-strengthened glass (Semco DUR TVG) that goes beyond the requirements of EN 1863, for the use of the glass, it is mandatory to obtain consent on site in individual cases (ZiE). Alternatively, to check whether the requirements are not covered by a system approval (e.g. for a canopy).

## 4.6 Laminated safety glasses (Semco Safe) and laminated glasses

- The relevant European product standards (see point 4.2 for tolerance specifications) apply. Requirements deviating from that are separate and should be agreed upon in writing. In this context, we would also like to point out any possible national provisions for the use of these products.
- **It should be ensured that the edges of the glass and the films are in contact only with adjacent materials that are compatible with the laminated film used for the long-term.** We shall assume no liability if damage to the glass panes and/or the laminated films occurs as a result of incompatibilities with sealing components or with other contact materials that have been used but have not been agreed upon.
- With laminated safety glass panes (VSG) in the outdoors (and also in internal areas with a high air humidity such as a swimming pool), any execution of unprotected, non-framed edges can under certain circumstances lead to optical impairments (delamination, clouding or air bubbles among others) as a result of the delayed penetration of moisture and also (high partially salt-containing) air humidity, sometimes combined with a high temperature via the edge of the glass into the PVB interleaf lamination.
- This phenomenon, so long as it is limited to the area of the glass edges will not lead to any safety-relevant consequences, i.e. that endanger the structural safety for laminated safety glass panes (VSG) that are linearly supported, point-fixed or clamped. **In general however, we advise against the use of freely exposed and unprotected laminated safety glass edges in vertical and horizontal laminated safety glasses applications.**
- Delamination phenomena as a result of the causes given above are not therefore a ground for a complaint.
- For the use of laminated safety glass of tempered glass (ESG) and annealed glass (TVG) in combination with colour films, it cannot be prevented that spontaneous breakages may occur due to possible nickel-sulphide inclusions. To reduce this risk of spontaneous breakage, we recommend the commissioning of a heat-soak test (see our information about annealed safety glasses, Section 4.5).
- For laminated safety glass (VSG) structures, the overhang of a pane past the laminated area (e.g. for drainage areas) may be a maximum of 30 mm (DIN 18008, Part 2).
- For asymmetric laminated safety glass (VSG) structures, the thicknesses of the individual glass panes must not differ from each other by a factor of more than 1.7 (DIN 18008, Part 4).
- The normative provisions in accordance with DIN EN ISO 12543-5:2011 shall apply for the edge design.
- Film protrusions and infeed cannot be avoided for production reasons. These do not represent a ground for a complaint. If in an individual case, glass panes without a film protrusions are absolutely essential, then please get in contact with us to see whether such a production is possible at a surcharge. Panes without film infeeds are only possible in combination with polished edges and require in general a surcharge to the price of the glass. Price surcharges upon request.
- Laminated safety glass of float glass, heat-soaked tempered glass (ESG(-H)) or annealed glass (TVG) requires the use of several layers of film. There can therefore occur for production technical reasons an offset of the edges and the drill hole of up to 2 mm depending on the length of the edges in accordance with DIN EN ISO 12543-5:2011, Section 4.2.4. Complaints regarding this are excluded.
- Laminated safety glass (VSG) units for horizontal glazings with a span width of more than 1.20 m must be bedded at four sides (DIN 18008, Part 2).
- The inherent colour of the glass is influenced in the form of a green/yellow tint with increasing pane thickness and number of laminated sheets used. **There is a duty to inform your customers.**
- Regarding the sequence of films (white film/clear film for laminated safety glass structures with several layers of film), it must always show the same view outwards - the direction of installation must be specified by the customer.
- In the standard production process of laminated safety glass (VSG) from 2x tempered glass (ESG) (4, 5 mm), a cloud and strip formation can occur physically if a matte film was used, which does not constitute a reason for complaint. Such phenomena can be avoided by employing an alternative, more elaborate production process. This is, however, to be agreed beforehand.

- We would also like to point out the information sheet BF-Merkblatt 013-2013 „Laminated safety glass (VSG) for application in the building industry" (available at **http://www.semcoglas.com/service/merkblaetter.html**).

### 4.7 Alarm glasses (Semco Dur Alarm)

- For insulating glass constructions made of ESG or TVG, please refer to sections 4.3, 4.4, and 4.5. In addition, the product-specific instructions for insulating glass (see section 3) apply.
- According to the VdS certificate G100038 for Semco Dur alarm, the alarm wire can be located both in the upper area and in the lower area of the window when the alarm glass is installed. In particular, care must be taken that the fitting of the wire, as viewed from the outside inwards, is always to be arranged at position 2 in the insulating glass, i.e. towards the attack side. Position 4 is also possible with triple-insulating glass.
- As a general rule please use our specific order form – in particular for custom-made panes – to select the alarm wire version and the outlining of your installation (available at http://www.semcoglas.com/service/merkblaetter.html) „.
- During transport and storage, care must be taken that the cables and the cable connection are not subjected to mechanical stress. When installing the Semco Dur alarm, make sure that the cable is laid with no tension. Before and after installation, check the electrical resistance indicated on the pane label.
- The Semco Dur Alarm is to be glazed according to the current state of glazing technology (see section 7.2) as well as laying technology (VDE 0833-3, VdS 2227, DIN EN 50131-1).

### 4.8 Attack-resistant glasses (Semco Safe VSG PxA, PxB, BRx)

- We would like to point out Section 4.6 for product-specific information about laminated safety glass (VSG). For insulating glass structures made from tempered glass (ESG) or annealed glass (TVG), we would also like to point out Sections 4.3, 4.4 and 4.5. In addition, the product-specific instructions for insulating glass apply (see Section 3).
- It should fundamentally be observed from which side the attack may take place, i.e. which direction of installation is required. This is generally to be specified by the customer, as it is always a tested complete system - glass and frame - for the achievement of a defined window resistance category (RC, previously WK), and hence must also be documented in the relevant system description of the customer as part of their CE labelling.
- Within the framework for the CE labelling for windows and doors in accordance with DIN EN 14351, it is up to the manufacturer of such systems to ensure the correct information about the corresponding resistance class against break-ins in accordance with DIN EN 1627, corresponding to the system description that goes along with it.

### 4.9 Fire resistant glasses (e.g. Semco Pyrotec)

- We would like to point out Section 4.6 for product-specific information about laminated safety glass (VSG) and laminated glass (VG). For insulating glass structures made from tempered glass (ESG) or annealed glass (TVG), we would also like to point out Sections 4.3, 4.4 and 4.5. In addition, the product-specific instructions for insulating glass apply (see Section 3).
- The fire-protection glasses that you have enquired about or ordered may only be installed as a component **in previously tested and approved systems** (glazing + frame profile + glazing components (AoC-Level 1). You should obtain information about the technical details from the supplier or the manufacturer of the fire-resistant glass being handled. If necessary, official authorities and/or the Fire Brigade should be involved in approval of the fire prevention design and concept.
- Regarding the processing of the fire-resistant glasses from the Pyroguard family that are permitted exclusively in the Netherlands that are used in our insulating glass products, we would like to point out the relevant guidelines (available at **http://www.semcoglas.com/service/merkblaetter.html**).

### 4.10 Specific information about Contraflam (as a commercial product)

- Contraflam glasses must not be exposed to temperatures lower than -10°C or higher than +40°C during transportation or storage. It will be ensured that the transportation by the forwarding agent is guaranteed to be within this temperature range. Under certain circumstances, it is possible that there may be a delay in delivery in the event of extreme weather conditions.

- After the goods have been delivered, the customer is responsible for compliance with the temperature range given above.
- During installation of the glass, the applicable glazing regulations and the labelling of the blocking edge must be observed. Any glass damage that occurs due to non-compliance shall not be covered by the warranty.
- We would like to explicitly point out that our storage conditions, cleaning regulations, glazing regulations and tolerances for the individual products as well as the current glazing guidelines of Saint-Gobain Glass Deutschland shall apply for all orders.
- As a result of the production process for Contraflam products, some fire-resistant panes may contain occasional micro-bubbles in the surface or in the edge area of the product at delivery. These micro-bubbles neither impair the fire-resistant properties nor do they represent a ground for a complaint or a defect. Micro-bubbles of up to 3 mm diameter will be removed completely in the siliceous fire-resistant layer of the Contraflam products. Depending on the actual size of the corresponding bubble and the environmental temperature, this reabsorption will take from a number of days up to several weeks. The reabsorption will take place completely, without leaving behind any optical defects.

## 5. Product specifications structural glasses

### 5.1 Fall prevention glasses (Semco Stop)

- We would like to point out Section 4.6 for product-specific information about laminated safety glass (VSG). For insulating glass structures from tempered glass (ESG) or annealed glass (TVG), we would also like to point on Sections 4.3, 4.4 and 4.5. In addition, the product-specific instructions for insulating glass apply (see Section 3).
- Fall prevention glasses are regulated as a design (as it is composed of several products) in DIN 18008, Part 4. Constructions whose shock resistance has been proven by tests are located in Appendix B, Table B.1. Any kind of construction or glass structure that goes beyond that represent an unregulated type of design. In these cases, a general building authority test certificate (AbP) is necessary, or an approval on an individual basis granted by the relevant building supervisory board of the Federal State.
- Any official permits necessary and any experimental and computational evidence are to be provided by the customer.
- If the insulating glass structure meets with the general building authority test certificate (AbP) P-2015-3075, P-2015-3076 or P-2015-3077 for fall prevention glazing units of the categories A, C2 and C3 in accordance with DIN 18008, Part 4, then the evidence of the load carrying capacity under an impact load (using a pendulum impact test) is produced for the glazing.
- We would like to point out that with regards to the respective application, evidence for the load carrying capacity under an impact load (compare the next point of symmetry) must also be provided for the bedding construction and mathematical evidence for the load carrying capacity of the glazing under static effects is to be provided by the customer or by the builder (DIN 18008, Part 4, Section 6). If there should be any changes in the requirements for glass thickness or glass structures of existing enquiries or orders arising as a result, then we will recalculate our quotations or our order confirmation and will present you with an adjusted quotation, as long as the glasses are not already being manufactured, or have been not already been manufactured.
- With regards to our general building authority test certificates (AbP) P-2015-3075, P-2015-3076 or P-2015-3077 for fall prevention glazing units in accordance with DIN 18008, Part 4 (available at **http://www.semcoglas.com/service/merkblaetter.html**), then the evidence of the load carrying capacity under an impact load shall be deemed to be fulfilled for the following bedding constructions:

  a) General Building Inspection Approval no.: Z- 14.4-446 Klemmverbindung für das Fassadensystem RAICO THERM + S- I; 29/10/2008 (Clamping connection for the RAICO THERM + S- I facade system)

  b) General Building Inspection Approval no.: Z- 14.4-454 Klemmverbindung für das Fassadensystem RAICO THERM + A- I; 30/09/2010 (Clamping connection for the RAICO THERM + A- I facade system)

  c) General Building Inspection Approval no.: Z- 14.4-455 Klemmverbindung für das Fassadensystem RAICO THERM + H- I; 12/08/2009 (Clamping connection for the RAICO THERM + H- I facade system)

  d) General Building Inspection Approval no.: Z- 14.4-504, Befestigungssystem für Fassadensysteme RAICO THERM + A- V; 21/09/2010 (Mounting system for the RAICO THERM + A- V facade systems)

e) General Building Inspection Approval no.: Z- 14.4-516, Befestigungssystem für Fassadensysteme RAICO THERM + A- V; 01/06/2007 (Mounting system for the RAICO THERM + A- V facade systems)

f) General Building Inspection Approval no.: Z- 14.4-452 Klemmverbindung für SCHÜCO- Fassadensysteme mit Pfosten- Riegel-profilen aus Aluminium; 27/04/2009 (Clamping connection for SCHÜCO-facade systems with post-transom profiles made of aluminium)

g) General Building Inspection Approval no.: 14.4-471 Klemmverbindungen für die Fassadensysteme FW 50 + AOS und AOT FW 60 + AOS und AOT; 20/05/2010 (Clamping connections for the FW 50 + AOS and AOT FW 60 + AOS and AOT facade systems)

h) General Building Inspection Approval no.: 14.4-478 Klemmverbindungen für die Fassadensysteme WICTEC 50 und 60; 20/05/2010 (Clamping connections for the WICTEC 50 and 60 facade systems)

i) Test report for the assessment of the load carrying capacity of pressure strip fastening in accordance with the Technical Regulations for the use of Fall-Prevention Glasses (TRAV) of the IFT Rosenheim; Test report no.: 502 28648 and 501 29755/1; Fassadensystem WICTEC 60 und 50 (WICTEC 50 and 60 facade systems)

j) General Building Inspection Approval no.: 14.4-463 Klemmverbindungen für die Fassadensysteme VF 50 und VF 60; 09/06/2010 (Clamping connections for the VF 50 and VF 60 facade systems)

k) Gutachterliche Stellungnahme HUECK HARTMANN Aluminium Systeme, Übertragbarkeiten der Pendelschlagversuche zur absturzsichernden Wirkung des Fenstersystems Serie 1.0 IF auf die Serien 72E, Lambda 57S, 77L, und A72 der Prof. Sedlacek & Partner Technologien im Bauwesen GmbH, Dokument H-74-06-02, Datum 21.Dezember 2007 (Expert's opinion from HUECK HARTMANN Aluminium Systeme, Transferability of the pendulum impact test for the fall-prevention effect of the Series 1.0 IF of the Series 72E, Lambda 57S, 77L, and A72 window systems from Prof. Sedlacek & Partner Technologien im Bauwesen GmbH, Document H-74-06-02, Date 21st December 2007)

l) General Building Inspection Approval no.: 14.4-501 Klemmverbindungen für die Fassadensysteme Gutmann F 50 und F 60; 01/06/2006 (Clamping connections for the Gutmann F 50 and F 60 facade systems)

m) General Building Inspection Approval no.: 14.4-502 Klemmverbindungen für die Fassadensysteme Gutmann Lara GF; 26/09/2006 (Clamping connections for the Gutmann Lara GF facade systems)

- **The use of bedding constructions that deviate from this requires a separate verification (approval on an individual basis) that has to be obtained by the customer or the builder.** Please observe the following information here:

  All notable plastic profile manufacturers such as Veka, Salamander, Inoutic, Profine/Kömmerling, Gealan, Aluplast, etc. have corresponding verifications for their profiles available and will present these to their customers or to the processors on request. Therefore, please refer any of these types of questions that customers have asked you or that come up in your consultation sessions to the profile manufacturer.

- In certain installation positions, edge protection must be attached and verified (DIN 18008, Part 4, Section 5).

- **We would like to point out that an in-house production control (WPK) should be established and a declaration of conformity (Ü-Zeichen) should be presented by the processor for this type of construction.**

## 5.2 Walkable glasses (Semco Step)

- We would like to point out Section 4.6 for product-specific information about laminated safety glass (VSG). For structures made from tempered glass (ESG) or annealed glass (TVG), we would also like to point out Sections 4.3, 4.4 and 4.5.

- For walkable glass panes, alongside providing static verifications, load carrying and residual carrying tests on the original components generally also have to be carried out by the customer or by the builder. The specified traffic load (accessible to people) is 5 kN/m², alterations in the traffic loads are possible in individual cases, depending on the type of use. Therefore, the relevant building authorities should be contacted in the pre-planning phase, to clarify the building regulations and the inspections that have to be carried out and verifications needed as part of an approval on an individual basis.

- All-round linear bedded orderly accessible glazing with a verified residual carrying capacity and a mathematical load capacity of less than 5.0 kN/m² can be found in DIN 18008, Part 5, Appendix B. The minimum layer depth must be 35 mm here. In addition, this part of the standard contains additional recommendations for the application and the glazing that must be observed.

- To prevent the risk of slipping, the glass surfaces should be executed with an anti-slip screen printing (alternatively with a non-slip surface) in accordance with the German Workplace Ordinance (ArbStättV) and the German Accident Prevention Regulations (UVV). The glass surface of the (upper) protective pane is susceptible to scratches, despite its execution as safety glass.

### 5.3 Accessible and fall-through protection glasses

- We would like to point out Section 4.6 for product-specific information about laminated safety glass (VSG). For insulating glass structures made from tempered glass (ESG) or annealed glass (TVG), we would also like to point out Sections 4.3, 4.4 and 4.5. In addition, the product-specific instructions for insulating glass apply (see Section 3).
- Roof glazing that for example may be accessed for a short time for cleaning purposes must be realised in accordance with the requirements of the German Institution for Statutory Accident Insurance and Prevention (Hauptverband der gewerblichen Berufsgenossenschaften). We would like to point out the following brochure: „Grundsätze für die Prüfung und Zertifizierung der bedingten Betretbarkeit oder Durchsturzsicherheit von Bauteilen bei Bau- und Instandhaltungsarbeiten." (Principles for the inspection and certification of limited accessibility or fall-through safety of components during construction and maintenance work), Prüfgrundsätze-GS-BAU-18, Ausgabe Februar 2001 (in the future DIN 18008, Part 6, still in preparation) February 2001 edition.
- Furthermore, load distribution using running boards should be carried out. They should be laid on the glass with clean intermediate layers to avoid scratching the glass panes.
- The glass thickness specified by us is only a non-binding pre-dimensioning and applies to glazing that is bedded on all sides (also see Section 1.4 for more information).

### 5.4 Point-fixed glasses (Semco Point)

- We would like to point out Section 4.6 for product-specific information about laminated safety glass (VSG). For structures made from tempered glass (ESG) or annealed glass (TVG), we would also like to point out Sections 4.3, 4.4 and 4.5.
- DIN 18008, Part 3, or a valid corresponding general building authority approval (AbZ) must be observed for the use of point-fixed glazing.

### 5.5 Step glasses and roof glasses or horizontal glazing (Semco Roof)

- We would like to point out Section 4.6 for product-specific information about laminated safety glass (VSG). For insulating glass structures made from tempered glass (ESG) or annealed glass (TVG), we would also like to point out Sections 4.3, 4.4 and 4.5. In addition, the product-specific instructions for insulating glass apply (see Section 3).
- For roof glazing, we recommend that the width of the spacing between the panes does not exceed 12 mm. A larger volume of gas arising from a wider space between the panes will lead to increased pumping movements and therefore to an increased thermal load which will be increased further in the case of an inclined installation position. The edge seal will be stressed considerably and can be damaged as a result.
- As a result of the higher thermal stresses for roof glazing, (e.g. cast shadows, a lack of ventilation), thermally caused glass breakages (in the case of non-tensioned individual glass panes) occur frequently. We therefore recommend the use of tempered glass (ESG) to reduce the risk of glass breakage. Such thermal glass breakages are not part of our responsibility and shall therefore be excluded from the warranty.
- Laminated safety glass (VSG) units with a span width of more than 1.20 m must be bedded at all sides (DIN 18008, Part 2).
- For roof glazing with a protrusion of more than 70 mm, we recommend that the external pane is realised in tempered glass (ESG). Otherwise, there is an increased danger of breakage here.
- For horizontal glazing, the nominal thickness of the intermediate laminate for laminated safety glass must be a minimum of 0.76 mm (span of greater than 0.8 m) in accordance with the normative provisions. For all-round bedding and a maximum span of smaller than 0.8 m, the nominal thickness of the intermediate laminate may be 0.38 mm.
- For laminated safety glass (VSG) structures, the overhang of a pane past the laminated area (e.g. for drainage areas) may be a maximum of 30 mm (DIN 18008, Part 2).

- For asymmetric laminated safety glass (VSG) structures, the thicknesses of the individual glass panes must not differ from each other by a factor of more than 1.7 (DIN 18008, Part 4).
- In accordance with the normative provisions, for overhead glazing with laminated safety glass (VSG) made of 2x float glass, drill holes and/or openings are not permitted. We recommend the use of laminated safety glass (VSG) made from 2x annealed glass (TVG).
- The insulating glass edge seals must be covered. If a cover is not provided, then a version with a UV-resistant edge seal must be commissioned.
- The edges of the coated pane cannot be polished. The only edge finishing possible after the insulating glass has been assembled is hand lining.
- Glass edges with coated glass will have the coating removed at the edges. Residues from the coat removing process could lead to different reflections at the exposed laminated edge in construction projects compared to coated glass surfaces. This also applies to masked, uncoated edge sections during the coating process. This is caused by the production and is no ground for a complaint. We recommend that the protruding area is covered with a profile or angle and we can provide edge screen printing at an extra charge.
- The deflection of the (free) insulating glass edge seal with a maximum stress may be a maximum of 1/200 of the length of the glass edges (DIN 18008-2).

## 5.6 All-glass systems (GGA) and all-glass doors (GGT) and all-glass showers (GGD)

- All-glass systems (GGA) are non load-bearing and non-bracing components. They are construction products or types of constructions (as they are composed of several construction products).
- Every constructor of all-glass systems must check whether the correct certificate of usability is present for their all-glass system, a general building authority approval (AbZ), general building authority test certificate (AbP) or approval on an individual basis (ZiE) regulated according to the MVV TB (if introduced by the federal state concerned). The verification must be kept ready at the construction site.
- If necessary, the tests required shall take place on the basis of DIN 18008-3.
- In the case that tempered glass (ESG) is used, there is the risk that a spontaneous breakage occurs due to possible, unavoidable and indistinguishable nickel-sulphide inclusions in the glass. With a heat-soak test (→ ESG-H) that is ordered separately, we can ensure that spontaneous breakages can be ruled out apart from a residual risk that cannot technically be avoided. **Please inform us in this case if you are interested in a quotation for the implementation of a HS test.** In this regard, we would like to point out the additional product information about heat-soaked tempered glass (ESG(-H)) in Section 4.3.
- Full or partial adhesive films on tempered glass (ESG) panes could lead to a change in the breakage behaviour (e.g. formation of slabs instead of a fine fracture pattern) and hence lead to an alteration in the specific safety glass characteristics.
- Glazing and translucent surfaces must be easily and clearly identifiable, at least in areas of transport.
- We would like to point out Section 4.6 for product-specific information about laminated safety glass (VSG). For structures made from tempered glass (ESG) or annealed glass (TVG), we would also like to point out Sections 4.3, 4.4 and 4.5.
- Furthermore, we would like to point out the upcoming Technical Guidelines no. 6 „„Ganzglasanlagen" (All-glass systems) from the Bundesinnungsverband des Laserhandwerks in Hadamar.
- For glass for shower enclosure systems, we recommend using heat-soaked tempered glass. In this context, we also refer to the Technical Guideline No. 24 „All-glass Showers" of the Federal Guild of Glassworkers in Hadamar.

## 5.7 Glued windows

- Windows glued with insulating glass have separate system requirements that must always be assessed and approved with the support of our sealing compound suppliers. General information can be found in „Kompass für Geklebte Fenster" (Compass for glued windows) from Bundesverband Flachglas at (**http://www.semcoglas.com/service/merkblaet-**

ter.html).

### 5.8 (UV-)glued glass connections

- During manufacturing, order specifications will be implemented but will not be checked (e.g. for static requirements, glass thicknesses, dimensioning of the adhesive joint, design, intended purpose etc.).
- Our glasses and glass connections are not suitable for humidity effects (e.g. with their use in wet or external areas), vibrations (e.g. during transportation), direct radiation (e.g. due to interior lighting or other sources of heat) as well as uneven temperature differences between neighbouring glass components.
- We shall accept no liability if the preceding instructions have not been observed.
- Furthermore, occasional air pockets along the adhesive joint may also occur for adhesive joints of laminated safety glass (VSG) with other glasses, metal or similar objects for production reasons. The air pockets cannot be avoided and do not represent a ground for a complaint.

## 6. Product specifications special glasses

### 6.1 Lacquered glasses (Semco Lac)

- The glass edge is lacquered as standard. If this is not desired,it must be specifically adressed when placing the order.
- Lacquered glass surfaces will not be checked for their suitability for wet areas. The processor shall have the responsibility for ensuring that no humidity gets to the rear side of the lacquered glass.
- Lacquered glasses will not undergo the thermal tempering process. They therefore exhibit a reduced thermal load capacity (like float glass). Uneven heating of the glass surface must absolutely be prevented to avoid glass breakage. If it is not possible to prevent uneven heating during the processing and during the intended application, it is recommended that coloured and heat-soaked tempered glass (ESG-H according to EN 14179) is used to reduce the risk of thermal glass breakage. Thermal glass breakage is no ground for a complaint.
- In order to guarantee opaqueness with many colour tones, the rear side is generally coated with a multiple-component stop-out varnish. If this is not desired (e.g. for the side walls of furniture or for glass shelves), then it is essential to state this in the order.
- Lacquered glass is not suitable for wet areas. The customer shall have the responsibility for ensuring that no humidity or water gets to the rear side of the lacquered glass panes.
- For additional and more general information, first see „Colorierte und siebbedruckte Einscheiben-Sicherheitsgläser (Semco Color/Design)" (Coloured and screen-printed tempered glasses) under Section 4.4.

### 6.2 Wire-reinforced glasses

- The consistency of the wire course within the insulating glass cannot be guaranteed.
- Glasses with wire inlays are at an increased risk of thermal breakages due to the different thermal expansion coefficients of wire and glass.
- Temperature effects (e.g. from sunlight) that lead to the uneven warming of the wire and the surrounding glass must be avoided. Production is therefore performed without a guarantee.
- Wire-reinforced glasses must be not stored outdoors - high risk of thermal breakage.

### 6.3 Satin-finished and sandblasted glasses

- In the case of other sources of supply for our basic glass, e.g. in the case of follow-up orders, there may be not insignificant differences in colour and differences between the nominal thickness and the actual thickness, in particular for thick glass. The same is true if different raw glass batches are used (e.g. due to scheduled partial deliveries, the number of glasses, the total amount of glass required or similar reasons).

- This gains particular importance for satin-finished glasses, as we cannot guarantee that every batch will be manufactured with the same base material and that the etching shade will always be the same. A completely different colour impression may appear merely due to the use of a different base glass, unfortunately we do not have any influence on this.
- With the subsequent processing of sand-blasted glass and frosted glass, we shall assume no liability for any optical shortcomings or impairments. Any contact can become visible on the sensitive glass surface. We recommend that the surface of monolithic glass is suitably sealed by commissioning a Semco Drop coating.
- For insulating glass where flat frosted glasses are used (float glass satin-finished), cloud-shaped appearances due to humidity cannot be excluded. This is no ground for a complaint.
- Only treat sand-blasted frosted glasses with warm water and do not use any chemical cleaning agents.
- Sand-blasted glasses with Semco Drop coating must be stored in dry conditions and ventilated sufficiently.

### 6.4 Crash glasses (Semco Crash)

- Every glass pane is a unique item - the fracture pattern is never the same. The tessellation is similar to the general fracture pattern of tempered glass (ESG). For glass edges that remain free, it cannot be excluded that individual tempered glass fragments could break free.
- Laminated safety crash glass: As the tempered glass pane will fracture if one of the edges is struck, there results a type of damage in this area. This is caused for technical reasons and is no ground for a complaint.
- The crash glass pane is arranged as the middle pane of the laminated safety glass unit and is realised in a crumb structure for creative use. The safety characteristics for the laminated safety glass package are therefore altered and restricted. The fracture pattern of the tempered glass (ESG) can turn out differently depending on the number of laminate layers and the glass thickness and as a result not comply with the normative specification under certain circumstances. Crash glass therefore exhibits particular production-specific properties and characteristics.

  For the production of the typical visual appearance and the accompanying destruction of the middle tempered glass, a high amount of energy is released that can generally lead to detachment and to the formation of shifted fragments.

  At the edge region, it can result in clouding in places in the event of contact with moisture and cleaning agents. The visual appearance described above are physical phenomena and are therefore not a ground for a complaint.
- Crash glass exhibits an additional offset tolerance of the individual panes of +/- 3 mm.

### 6.5 Modelled panes

- Model facets are pure manual work. Unevenness, imprecise transfers and waves are possible and do not represent a ground for a complaint.

### 6.6 Curved insulating glasses

- For insulating glass made from curved glass, there is an increased risk of stress breakage, the warranty shall therefore not apply.
- Curved ISO units in combination with coloured patterned glass (e.g. Altdeutsch K) are particularly fragile.
- With the curvature of glass panes, small deviations in the curvature are possible within the oven batches for production technical reasons, as several panes are laid on top of each other during the firing process and hence due to the thicknesses of the panes alone, a deviation in the curvature is present. This does not represent a ground for a complaint.
- Burnt points at the edge of the curved panes are due to production factors and do not represent a ground for a complaint.
- The transparency and the colour impression will be affected by the curvature of the glass.
- Curved insulating glass may only be supplied when filled with air.

- We would like to point out explicitly that colour changes in the surface of the glass (a blue shimmer) may occur for curved panes made from float glass, depending on the quality of the glass. This is not a ground for a complaint. It is advisable in any case to carry out a sampling in advance.

### 6.7 Lead and brass glasses

- For insulating glass combinations with lead or brass glasses, the otherwise normal liability shall not be assumed (e.g. as a result of an increased risk of thermal glass breakage, increased manufacturing tolerances or reduced environmental stress capacity).
- The functional values of the insulating glass unit will change as a result of the installation of artistic glazing units.
- The installation of lead or brass glazing units into coated insulating glass is only possible when the unit is filled with air.

### 6.8 Antique glasses

- We shall assume no liability for insulating glass combinations with antique glasses in the event of glass breakage.

### 6.9 Artistic glasses

- Artistic glazing that consists of light float glass could cause cleaning problems that in parts cannot be solved. Such glass will therefore only be supplied by us without a warranty.

### 6.10 One-way glasses („two-way mirror")

- The mode of functioning of one-way glass depends on certain lighting conditions, e.g. it is lighter on the outside than it is on the room side. A change of the lighting conditions is not within our area of responsibility.

### 6.11 Insulating glass with pass-through hole, drill hole or corner and edge cut-out

- Production is only possible from 2x ESG.
- The distance from the edge of the drill to the edge of the pane must be at least 10 cm.
- Hole cut-outs in insulating glass units are only carried out at the express wish of the customer and with the exclusion of the guarantee for the permanent sealing of the edge composite.
- The use in customary temperature ranges is -30°C to 80 °C.

### 6.12 Glasses provided by the customer

- Impurities due to the cleaning agents for the artistic glass may arise for lead or brass glazing. Cleaning of such glass units shall be performed exclusively at the behest of the customer and is their responsibility. Liability for any damages to the glazing made available arising as a result will only be accepted for intentional or grossly negligent misconduct.
- Residues and blemishes on the artistic glazing provided shall not represent a ground for subsequent complaint. The risk of breakage for all glass panes provided by the customer in the processing to make insulating glass shall be at the expense of the customer. In principle, we reject the separating or slicing of customer glass for safety reasons.
- Liability for accidental damages (e.g. scratches) and the destruction (e.g. breakage) of glasses or models supplied by the customer (e.g. templates, lead glazing, items of furniture, etc.) shall only be accepted by us for intentional or grossly negligent misconduct.

## 7. Special information on the storage, handling and maintenance

### 7.1 Storing the glass (on frames)

- Insulating glass, tempered glass (ESG) and laminated safety glass (VSG) units and coated glass should always be stored in dry, well ventilated areas that are protected from the weather.
- All underlays and separators must not cause any damage to the glass, the glass edge and the seal edge. It should be ensured that there is an underlay underneath the entire element thickness.
- The thickness of the individual glass joints must not exceed 50 cm. The insulating glass units must be stored with their surfaces separated at a slightly inclined position (approx. 5 ° to 6 °) and on suitable frames or underlays. Intermediate

layers must not be made out of a moisture absorbing material.

- Moisture can lead to chemical reactions on the surface of the glass for insulating glass units that are standing flat next to each other, and hence to damages. Therefore, the surfaces of the glass units must be protected from moisture for as long as they are standing together.
- UV radiation (sunlight) and humidity (moisture) will damage the edge seal of insulating glass. Therefore the edge seal of insulating glass units must not be exposed to sunlight and/or humidity (moisture) for a long period of time. We recommend that a period of time of 4 weeks is not exceeded, without suitable protective measures.
- As a result of longer direct sunshine onto non-glazed insulating glass packaging units or onto individual insulating glass panes, there is an increased risk of a stress fracture (thermal breakage), in particular for coloured glasses, patterned glasses, cast glasses, glasses furnished with wire inlays and coated glasses. The danger of stress rupture for these glasses is increased further by partial shading.
- As a result of the very low heat transition value, coated insulating glass must in any event be covered against direct sunlight, in particular if several units are standing in front of each other in storage, during transportation and before installation.
- When being stored outdoors or in open storage, the span bars and fastening straps of our glass frames must be loosened, as otherwise constraints and therefore glass breakage may occur as a result of the thermal expansion behaviour.
- Labels should be removed promptly, otherwise there is a danger that the residues shall remain.
- The packaging film is not a transportation film. It serves the purpose of protecting the panes. Additionally, the packaging film or the film packaging (shrink tunnel) from an individual door cannot be stored forever, in particular when it is exposed to these weathering influences it has to be removed after a maximum of ten days. There may be an impairment to the visual appearance like glass corrosion.
- The protective film for protecting the glass surface during the construction phase is UV and weather-resistant for a limited period of time. We shall assume no liability for films that remain on the panes for more than 3 months. The same shall apply for damages to the glass surfaces (e.g. adhesive residues) that arise from the adhesion of the film to the surfaces for more than 3 months.
- Sand-blasted glasses with Semco Drop coating must be stored in dry conditions and ventilated sufficiently.

## 7.2 Glazing work

- To protect against glass damage, the glazing work should be carried out correctly and in accordance with the latest technology.
- In this respect the relevant „Technische Richtlinien des Glaserhandwerks" (TR 3 and TR 17) (Technical Guidelines of the Glazier Trade) of the Bundesinnungsverband des Glaserhandwerks, Hadamar, should be observed, as well as DIN 18545, Parts 1 to 3: Abdichten von Verglasungen mit Dichtstoffen (Sealing of Glazing with Sealants), Beuth-Verlag, Berlin. Furthermore, the European wide applicable regulations in DIN EN 12488, Glazing recommendations - Assembly principles for vertical and sloping glazing, Beuth-Verlag shall apply. DIN EN 1279-1:2018-10 is to be used for the visual assessment.

  We would also like to point out „Fenster/Türen/Fassaden - Leitfaden für die fachgerechte und sichere Verglasung" (Windows/doors/facades - Guidelines for correct and safe glazing) (The Gretsch-Unitas company), „Die Klotzfibel – Grundlagen für die fachgerechte Verglasung" (The Glazing Guide - The foundations of correct glazing), (The Gluske company) as well as the German Construction Contract Procedures part C (VOB/C) ATV DIN 18361 Glazing work). In the event of any deviations, the last standard sets out particular reasons for the reporting of deficiencies in accordance with Paragraph 4 Section 3 of the German Construction Contract Procedures part B (VOB/B).

  The correctness and up-to-dateness of these external provisions should be checked independently by the processor; this is merely an indication of the provisions that have been published. We cannot accept any liability for the correctness and reproduction of the current latest state of technology.
- All requirements of (window/facade) systems must be clarified by the processor (preventive protection against damages). The insulating glass manufacturer does not know all systems and the corresponding requirements.

- The insulating glass edge seals must be covered.
- **In the further processing and for the prevention of damage to insulating glazing with the Semco Spacer BL thermo-plastic edge seal system in combination with the polysulphide sealing compound GD 116 (NA), the separate Semcoglas processing instructions shall apply.** The processing instructions are available at http://www.semcoglas.com/service/merkblaetter.htm. Damages that arise from the fact that the processing instructions have not been observed shall not represent a defect.
- Before the glazing work, the processor must check the compatibility of the individual components (wet sealing, glass block, etc.) that will be in direct or indirect contact with the edge seal of the insulating glass unit.
- For the glazing of wet areas and indoor swimming pools, the technical guidelines of the Glaserhandwerk no. 16 „Fenster und Fensterbände in Hallenbädern" (Windows and windowsills in swimming pools) in particular should be observed for the realisation (e.g. larger edge block as a result of increased edge seal overlap) and the glazing of multiple pane insulating glass.
- **When placing an order, the notification „Damp area glazing" (sauna among others) is absolutely necessary to achieve the guarantee preconditions.**
- Labels on the surface of the panes of non-tempered glasses must be removed immediately after the insulating glass unit has been installed to prevent thermal glass breakage and damage to the surface (e.g. adhesive residues).
- Use in typical construction temperature ranges is from -30 °C to 80 °C.

## 7.3 Cleaning recommendations for glass

- Only commercially available detergents or dilute alcohol (e.g. isopropanol) may be used for glass surfaces. Under no circumstances are pure alcohol, caustic, or abrasive agents to be used. The water for cleaning should be clean and regularly replenished.
- Cleaning cloths, sponges, or a spatula suitable for glass surfaces must also be clean and in working order. Tools that can damage the layer of the glass (such as razor blades) may not be used.
- In this context, please refer to the leaflet „Cleaning recommendations" by the (German) Federal Flat Glass Association (available at http://www.semcoglas.com/service/merkblaetter.html).
- Sand-blasted glass may only be treated with warm water – without the use of chemical cleaning agents.
- Thermally toughened glass does not have a „softer" surface than float glass. Scratches are seen comparatively differently or become visible earlier in the case of first-mentioned glass due to their surface properties (pre-stressing) and the associated altered crack propagation or chipping of small glass flakes in the region of the scratch mark.
- Glass with a cleaning-promoting coating (Semco Clean) must be absolutely avoided in order to avoid damage, taking into account that silicone-containing cleaning utensils are irreversibly destroyed, since these irreversibly destroy the hydrophilic functioning.

## 7.4 Fogs („milky" coating) on the glass external surface

- To simplify, it can be ascertained that this phenomenon is caused in an interaction between the „altered" surface properties of the glass panes (roughness, leaching), a lack of exposure to rainwater as a result of roof overhangs for example and environmental influences (dust/particles in the surrounding air, air humidity) as well as under certain circumstances the perspiration of the framework and sealant materials used.

  It occurs exclusively on the external surfaces of the glass (see the customer information at **http://www.semcoglas.com/service/merkblaetter.html**).
- Furthermore, residues from unsuitable and greasy detergents and cleaning agents, cleaning cloths, etc. could also leave smears behind on the glass surface.
- This phenomenon is no ground for a complaint, as experience has shown that the smears can be removed after a period of time by intensive cleaning of the surface of the pane.

- Our cleaning recommendations are as follows:
  - Clean the window surfaces at regular intervals (somewhat more frequently at the beginning). This is particularly true if no rain can get to the surface of the glass as a result of the position of installation.
  - „Radora Brillant" (Radora Chemische Werke) and standard commercially available ceramic hob cleaners (e.g. Johnson) have shown themselves to be effective and long-term cleaning agents. Redora however contains hydroflouric acid and is strongly caustic and hence should only be used with caution.
  - Cleaning agents that contain ammonia and acetic acid are particularly effective.
  - A well proven but difficult to handle mixture is 50 % liquid ammonia and 50 % spirits. A linen cloth that has been well soaked with „Wiener Kalk" will form a sludge that can be used to good effect by strongly rubbing the surface of the glass. „Wiener Kalk" is available in well-stocked specialist shops and many drugstores (possibly after a discussion about window cleaning and building cleaning agents).

  Please read through the cleaning instructions from the manufacturer carefully before use and observe them precisely to prevent any damage to the neighbouring materials such as window frames, windowsills, seals etc.

## 8. Technical regulations, standards, guidelines, and leaflets

- For the respective requirements and tolerances of the glass products, the following (European) product standards in their valid version apply as follows:
  - DIN EN 572, parts 1 to 9: Glass in construction – basic products made of soda-lime silicate glass, Beuth-Verlag, Berlin
  - DIN EN 1279, parts 1 to 6: Glass in construction – multi-pane insulating glass, Beuth-Verlag, Berlin
  - DIN EN 12150, Parts 1 and 2: Glass in Construction –Thermally toughened soda-lime safety glass, Beuth-Verlag, Berlin
  - DIN EN 14179, Parts 1 and 2: Glass in construction - Hot - deposit thermally toughened Soda-lime tempered safety glass, Beuth-Verlag, Berlin
  - DIN EN 14449: Glass in construction – Laminated glass and laminated safety glass, Beuth-Verlag, Berlin
  - DIN EN ISO 12543, Parts 1 to 6: Glass in construction – Laminated glass and laminated safety glass, Beuth-Verlag, Berlin
  - DIN EN 1863, Parts 1 and 2: Glass in construction – Partly pre-tempered soda lime glass
  - General Building approval for curved float glass (Finiglas): Z-70.4.146

- For the application glazing, the following technical regulations and standards in the latest version must be observed:
  - DIN 18008, parts 1-6
  - Occupational Health and Safety papers/DGUV/ASR
  - Technical Guidelines of the (German) Federal Association of Glazier Trades in Hadamar, TR 3 – Blocking of glazing units and TR 17 –- Glazing of insulating glass
  - DIN EN 12488: Glass in construction – Recommendations for glazing – Glazing bases for vertical and sloped glazing
  - The Logflat - Guideline for professional glazing (Fa. Gluske)
  - Windows/Doors/Facades - Guideline for professional and safe glazing (Gretsch-Unitas)
  - VOB/C ATV DIN 18361 (glazing work)
  - DIN 18545, parts 1-3: Sealing of glazing with sealants, Beuth-Verlag, Berlin

## Glossary

- **Ug-value**

Measurement unit for the heat loss of glazing. The smaller the Ug-value, the better is the heat insulation. Ug values are investigated in accordance with DIN EN 673 for vertical installation. For physical reasons, the Ug value of insulating glazing increases when the installation is slanted, depending on the angle of inclination.

- **g-value**

Measurement unit for the complete energy transmittance of glazing. High g-value: Additional and free use of heat from sunlight. Low g-value: Reduction in the heating of rooms in summer due to sunlight.

- **Light transmission**

Light translucence level in percent. Indicates the proportion of visible light (for the electromagnetic range from 380 nm to 780 nm) that is let through by a glass, and is therefore dependent on the thickness of the glass and the coating. The higher the light transmission, the greater is the usage of sunlight.

- **Light reflection**

The proportion of visible light (for the electromagnetic range from 380 nm to 780 nm) in percent that is mirrored or reflected at the surface of the glass pane. A higher light reflectance value means a reduction in the glare in the internal area.

- **Ra value**

The general colour rendering index Ra describes the colour impression that the human eye has when observing an object that is illuminated by sunlight behind glazing. Clear glass has an Ra value of 99%.

- **Shading coefficient (b-Factor)**

Median sunlight energy transmittance factor, based on the complete level of energy transmittance of a double glazing unit, for the calculation of the cooling load of glazed areas. Shading coefficient (b-Factor) = g-value / 0.80 (VDI 2078)

- **Rw value**

The value for sound insulation. The higher the sound insulation value, the better the sound insulation. Alongside the sound insulation value, the frequency of the noise source is taken into account for good noise insulation with the corrector factors (C;Ctr).

- **Facade panel**

Facade panels that have been colour matched to the glazing made from enamelled (coloured) glass. As the colour impression is assessed subjectively, a sampling is recommended before the glass is decided upon. The facade panels primarily serve the purpose of covering the blank sections in the structure, such as for example the floor slabs.