PYROLYTIC COATINGS*

PROCESSING GUIDE

ASIA EDITION

VERSION 1.0 – Feb 2022

* Stopsol Classic, Stopsol Supersilver, Sunergy, Planibel G

This version of the guide replaces and cancels all previous versions.

CONTENTS

I. Reception and Storage

1. Unloading

The packs of glass must be inspected on arrival. Any damage – even damage to the packing or the racks – is to be reported, without delay, to AGC. AGC shall accept no liability for faults arising after delivery or during handling, processing or installation of the finished product in the building if this procedure is not followed:

- The rack must be positioned on perfectly level ground
- Use the appropriate handling equipment
- The grab must be perfectly centered
- Avoid damaging the protective packaging whilst handling
- The glass must be stored on appropriate racks
- All recommendations given in this Processing Guide shall be strictly followed.

General comments:

- Clamps, slings, lifting beams and other handling equipment must comply with prevailing regulations and be approved by the relevant authorities.
- Ensure the safety of personnel at all times. Keep all unnecessary personnel out of the handling area. Wear appropriate personal protective equipment.
- Personnel must have received the required training.

2. Storage of the Packs

Storing packs correctly reduces the risk of chemical or mechanical damage to the glass.

As a general rule, care should be taken to avoid major fluctuations in temperature and humidity that may cause condensation on the glass. Such fluctuations generally occur near loading and unloading areas. No water must be allowed to come into contact with the sheets of glass.

Care should be taken to ensure that the ambient air is not polluted by any corrosive elements such as chlorine or sulphur. Sources of such elements include machinery fitted with heat engines, battery-charging points, road salt on the ground and so forth.

Factory racks are used for packaging during transport and are not designed to be used for storage.

Consequently, the packs must be stored on racks with spacers between packs ensuring that all packs of the same size are stored together.

II. Processing

1. Safety

At each stage of the processing procedure, the personnel responsible for handling the glass must have the adequate equipment: safety shoes, safety gloves, safety glasses, etc.

2. Cutting

The following specific precautions must be taken when cutting:

- The coated side must be facing upwards to avoid any contact between the coating and the surface of the table.
- The cutting oil used should be compatible with the coating, sufficiently volatile and water soluble.
- The table and any breaking equipment liable to come into contact with the coating on the glass must be pre-validated.
- If the glass is to be cut using a template, the template must be positioned very carefully and care must be taken not to scratch the coating. We recommend placing a protective sheet between the template and the glass;
- Care must be taken when handling them to ensure that the coating on the first sheet does not rest against the back of the rack. All subsequent sheets should be turned the other way.

After cutting, when the glass is stored on racks, no particular spacer is needed if the original interlayer powder is still present. However, if for any reason there is not enough interlayer powder left on the glass, we recommend that you place cork spacers between the sheets. The same recommendations apply for packs with several glass dimensions.

The Stopsol Classic, Stopsol Supersilver (Gen 2), Sunergy, Planibel G coatings do not have to be edge-deleted.

3. Edge Processing

The Stopsol Classic, Stopsol Supersilver (Gen 2), Sunergy, Planibel G are designed to undergo, if needed, thermal toughening or heat strengthening. Accordingly, the edges of the glass must be shaped.

3.1 Handling the Glass

The personnel responsible for handling and shaping the edges of the glass must wear safety gloves.

3.2 Shaping the Edges

All the edge-processing machines available on the market are in principle suitable for the Stopsol Classic, Stopsol Supersilver (Gen 2), Sunergy, Planibel G:

- Crossed belt system
  We recommend for personnel to work with diamond belts and adhere strictly to the supplier's instructions, specifically in terms of speed and cooling. For thicknesses in excess of 6 mm, we recommend 'smooth edge' shaping.

- Vertical single edging system
  Since the glass is held with chain tracks and, depending on cleanliness and maintenance of the machine, there is a risk of scratching the coating.

- Horizontal double edging system
  It is possible to use this type of machine provided that the glass is held by smooth, non-textured belts. The speeds of the various belts must be synchronised. Mains water jets are placed in such a way that the

coating is soaked and cleared of various impurities (e.g. separating powder or glass dust) just before they come into contact with the upper roller belts.

- Numerical Control Systems (CNC)
  Shaping using a numerically controlled machine is permitted provided that the glass is placed with the coated side facing upwards.

During the shaping, the coated side should preferably be facing upwards. We recommend the pH of 6 to 8 for the water used during the edge-working.

General recommendations for shaping edges:

- The glass must remain moist throughout the shaping process in order to prevent 'natural drying'.
- The glass must be washed as soon as it has been shaped.
- The glass may be drilled provided that the press is covered with a soft protective material.
- The glass may be processed using dry crossed belts provided that the extraction system is sufficiently effective to remove the dust resulting from grinding.

3.3 Unloading

Due to the fact the interlayer powder is removed during the washing process, we recommend placing micro-suction pads[3] around the edge of each sheet of glass in order to prevent contact between the glass and the coatings. Paper with a neutral pH can also be used, for example, for large volumes.

4. Washing

This stage involves washing, rinsing and drying the glass.

- If the glass is fitted with hard brushes (> 150 µ), it is important not to stop the cycle whilst the glass is in the washing machine. The water must be distributed evenly and efficiently across the coating before it comes into contact with the brush.
- There is no special recommendation regarding the quality of the water. Nevertheless, the PH of the clean water in the washer and in the edge-processing machine should be between 6 and 8. As a recommendation, RO and deionised water is possible.
- In each case, the glass has to be perfectly clean after the washing, in order to avoid any contamination of the tempering furnace rollers.
- Due to the fact that the interlayer powder is removed during the washing process, we recommend placing micro-suction pads around the edge of each sheet of glass in order to prevent contact between the glass and the coatings. Paper with a neutral pH can also be used, for example, for large pieces.
- The personnel responsible for handling the glass must wear clean gloves suitable for handling coated glass.
- To prevent the formation of algae, it is recommended that the water-pipes and tanks used should be opaque.
- Please control temperature to prevent moss formation.

Quality Control

The coated glass must be inspected after the washing. Some halogen lights should be installed above the glass, in order that the operator will be able to see the lights reflected by the coating, when the glass is coming out of the washer.

5. Silk Screen Printing and Enameling

5.1 Generalities

The following limitations apply for the silk screen printing and the enameling

	Enamel on glass side	Enamel on coated side
Stopsol Classic	OK	OK
Stopsol Supersilver (Gen 2)	OK	OK*
Sunergy	NO	OK
Planibel G	NO	OK

*a validation of the appearance as indicated in section 5.2 is strictly necessary.

5.2 Precautions for Enamel on the Coated Side

The Stopsol Classic, Stopsol Supersilver (Gen 2), Sunergy, Planibel G can generally be used for silk screen printing on the coated side as long as the instructions given below are followed.

If the silk screen printing is to go as far as the edge of the glass, the compatibility between enamel and the IGU or structural sealing sealant should be checked.

Any impurities on the upper surface (coated side) can be removed using a compressed dry-air jet.

The presence of enamel on the coating changes the optical properties of the final glass product.

In each case, the final result will depend on the type of furnace used, its parameters, the color and type of enamel used and the desired pattern. The processor will have to carry out preliminary tests, on a case by case basis, to validate the visual result and the mechanical and chemical properties of the enameled glass. We recommend producing a mock-up for the final aesthetic approval.

5.3 Precautions for Enamel on the Glass Side

The Stopsol Classic, Stopsol Supersilver (Gen 2) can generally be used for silk screen printing on the glass side as normal float glass.

The presence of the coating on the bottom side will not affect the behavior of the glass in the furnace.

The top and bottom convection pressure profiles, when used, shall be fine-tuned in order to keep the glass flat in the tempering furnace, from the early stage until the end of the heating process. The same approach for the heating profile, when no convection in used.

5.4 Quality Control

The coated glass must be inspected after the silk screen printing. To do so, some halogen lights should be installed above the glass, in order that the operator will be able to see the lights reflected by the coating after the silk screen printing.

6. Thermal Toughening / Heat strengthening

6.1 Introduction

The Stopsol Classic, Stopsol Supersilver (Gen 2) coatings have the same normal emissivity as a float glass (normal emissivity = 0.89). All the tempering furnaces available on the market can be used to heat temper/heat-strengthen these products.

Sunergy, Sunergy Cool, and Planibel G coatings have a normal emissivity of, respectively 0.28, 0.36, 0.16. Low to medium convection rates furnaces will be suitable to temper these coatings.

The values given above served as a general reference for each brand emissivity, for more detailed information and values for each product type, please consult AGC for more information.

6.2 Recommendations

The personnel handling the glass must wear safety gloves.

The following options are possible for the position of the coating and the convection in the furnace:

	Coating position in the furnace		Type of Convection	
	Upwards	Downwards*	Convection top**	Convection bottom**
Stopsol Classic***	OK	OK	Allowed	Allowed
Stopsol Supersilver (Gen 2)***	OK	OK	Allowed	Allowed
Sunergy and Sunergy Cool	OK	NO	Necessary (low)	Allowed
Planibel G	OK	NO	Necessary (medium)	Allowed

* The rollers of the furnace as well as the quench and conveyors systems must be kept clean

** The top and bottom convection pressure profiles, when used, must be fine-tuned in order to keep the glass flat in the tempering furnace, from the early stage till the end of the heating process. The same approach for the heating profile, when no convection in used.

*** Heat treatment with the coated surface facing down is less recommended as it may cause defects such as scratches on the coated surface.

Tempering markings may be made before toughening on the upper side of the glass.

6.3 Settings

The Stopsol Classic, Stopsol Supersilver (Gen 2), has to be toughened / heat-strengthened with the same settings as for the glass substrate without coating.

For Sunergy, Planibel G, the convection settings will be set up according the emissivity of the coating. For further information, please contact AGC Technical Advisory Service for further information (aap.glass@agc.com).

6.4 Unloading

If the glass is unloaded manually, the personnel must wear safety clean gloves.

Larger and heavier sheets should be handled with a suction-pad lifting beam.

Given that toughened glass sheets are never perfectly flat, micro suction pads should be placed around the edge of each sheet of glass in order to prevent contact between the glass and the coatings. For large volumes, paper can be placed in the centre to avoid all contact with the glass/coating during handling and transport.

6.5 Heat Soak Test

For thermally toughened glass, the risk of spontaneous breakage due to Nickel-Sulfide is not covered by AGC Asia Pacific. If necessary a Heat Soak test can be carried out in accordance with standard EN 14179-1 (or equivalent standards for countries out of the EC).

Interlayer's should only be placed on the perimeter of the glass.

6.6 Quality Control

The properties of the Stopsol Classic, Stopsol Supersilver (Gen 2), are not altered during the heat treatment (tempering/heat-strengthening, bending and heat soak).

The emissivity and electrical resistance of Sunergy, Planibel G can change during the tempering process.

Please contact AGC Technical Advisory Service for further information (aap.glass@agc.com).

After the toughening process, The Stopsol Classic, Stopsol Supersilver (Gen 2), Sunergy, Planibel G should be inspected as follows:

- The coating is inspected in accordance with EN 1096-1*
- The eventual Heat Soak Test (HST) must be carried out in accordance with EN 14179-1*

*Or equivalent local standards for countries out of the EC.

6.7 Packaging

If the Stopsol Classic, Stopsol Supersilver (Gen 2), Sunergy, Planibel G, are to be delivered to another factory in cut sizes, the following recommendations for packaging must be adhered to:

- A 1 mm-polyethylene foam spacer should be placed between each sheet
- Care must be taken to ensure that the pack is properly attached to the rack so that the sheets do not rub together.

7. Bending

The Stopsol Classic, Stopsol Supersilver (Gen 2), can be curved, curved tempered or curved heat-strengthened with the same furnace settings as for the glass substrate.

For Sunergy, Planibel G, the convection settings will depend on the emissivity of the coating.

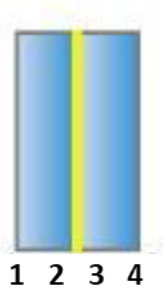
Please contact the AGC Technical Advisory Service for further information (aap.glass@agc.com).

In order to limit the risk of breakage in the oven (annealed curved version) or in the quench section (tempered/heat-strengthened curved version), AGC recommends making a smooth-edge processing of the glass.

In all cases, the coating can be in compression or tension. It is thus allowed to produce “S – shaped” curved glass.

8. Lamination

The Stopsol Classic, Stopsol Supersilver (Gen 2), Sunergy, Planibel G, can be laminated.



The following positions are possible for the coating.

	Coating position in the laminated glass			
	1	2, Against PVB	3, Against PVB	4
Stopsol Classic	OK	OK	OK	OK
Stopsol Supersilver (Gen 2)	OK	OK	OK	OK
Sunergy	NO	OK	OK	OK
Planibel G	NO	OK	OK	OK

Notes:

pos.1 means outside the building; pos.4 means inside the building
when a low-e coating is in contact with the PVB, the low-e effect is lost
when the coating is in contact with the PVB, the color and the optical properties are modified

In general, the laminated glazing cannot be processed in an industrial atmosphere with a high level of humidity. Glazing systems should be designed to prevent de-lamination or corrosion of the inside coating. The processor is responsible for the correct processing of the laminated glazing.

9. Use in Single Glazing

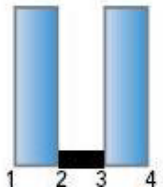
The Stopsol Classic, Stopsol Supersilver (Gen 2), Sunergy, and Planibel G can be used in façades in single glazing with the following restrictions for the coating position.

	Coating position	
	1	2
Stopsol Classic	OK	OK
Stopsol Supersilver (Gen 2)	OK	OK
Sunergy	NO	OK
Planibel G	NO	OK

Notes: pos.1 means outside the building; pos.2 means inside the building

10. Assembly in Insulating Glass Unit

The Stopsol Classic, Stopsol Supersilver (Gen 2), Sunergy and Planibel G are designed to be assembled in double glazing with the following restrictions for the coating position.



	Coating position in the IGU			
	1	2	3	4
Stopsol Classic	OK	OK	NA	NA
Stopsol Supersilver (Gen 2)	OK	OK	NA	NA
Sunergy	NO	OK	OK	NA
Planibel G	NO	OK	OK	NA

NA: no technical reason to put the coating in this position; see comment after the table.

The Stopsol Classic, Stopsol Supersilver (Gen 2), Sunergy, and Planibel G coatings do not have to be edge-deleted.

Comment
Efficient use of the coatings:
To optimize the solar control:

- The Stopsol Classic and Stopsol Supersilver (Gen 2) are used in position 1 or 2
- The Sunergy is used in position 2

When the coating is in contact with the IGU sealant, the compatibility of the primary and secondary sealants of the DGU with the coating(s) will be validated on a case to case basis. The same validation will be necessary for the structural bonding.

Quality Control
It is essential to check that the coating is in the correct position before assembly. Any mistake could lead to changes in performance and/or aesthetics.

Quality control for the final product (insulating glass) involves not only strict compliance with the instructions provided in this processing guide, but also meticulous checks at each stage of the manufacturing process.

Two or three halogen projectors must be placed at the exit of each processing machine to light the glass correctly (vertically from the top to the bottom) to immediately detect any deviation from the regulatory parameters that could affect the appearance of the coating (e.g. scratches or other contamination).

11. Use in Structural Glazing

When installation or assembling is by mechanical methods, structural glazing or other techniques, tests for compatibility and adherence of the coating or the glue must be made in each case with the manufacturer of the glue.

12. Storage of Cut Sizes / IGU

12.1 During Processing in the Same Factory

After each processing step, when the glass is stored on racks, no particular spacer is needed if the original interlayer powder is still present. If for any reason there is not enough interlayer powder left on the glass, and particularly after the washing, we recommend that you place cork spacers between the sheets. The same recommendations apply for packs with several glass dimensions.

The storage must conform to the recommendations of **Section I-2.**

12.2 To send Cut Sizes to Another Factory

If the Stopsol Classic, Stopsol Supersilver (Gen 2), Sunergy, and Planibel G must be delivered from the processing factory to another factory, the following recommendations for packaging must be adhered to:

A 1 mm-polyethylene foam spacer should be placed between each sheet.

Care must be taken to ensure that the pack is properly attached to the rack so that the sheets do not rub together.

The pack of glass should be packaged in watertight plastic. Sachets filled with desiccating agent should be placed inside the packaging.

12.3 On Site

When the glazing is delivered on site to be installed on the façade, it must be stored in a dry, sheltered and ventilated space. It must never be laid flat, nor be stored in the sun or near a heat source.

III. Conformity

1. Conformity

The Stopsol Classic, Stopsol Supersilver (Gen 2), Sunergy, Planibel G comply with the standard EN 1096-1, category A. Information regarding inspection conditions and quality criteria are available in that standard.

2. Warranty

Contact AGC Technical Advisory Service for further information (aap.glass@agc.com).

3. Disclaimer

It is the responsibility of the processor to inspect the processed coated glass adequately before and after each step of fabrication and prior to installation. Failure to apply all professional standards, customary instructions and processing instructions written in this processing guide and related links will automatically void any warranty regarding coated glass of AGC. We advise the processor to undertake some preliminary trials with the typical glass compositions for the project prior to any further commitment with his customer. The processor is solely responsible for the quality of the final product.

IV. Glazing and Cleaning on Façade

The AGC glazing and cleaning instructions are available on our websites, agc-glassasia.com or agc-tas.com.