



SUNLUX

PROCESSING GUIDE

Sunlux BlueChroma
Sunlux BronzeChroma
Sunlux GreenChroma
Sunlux Dark BlueChroma
Sunlux Dark GreenChroma
Sunlux Dark GreyChroma
Sunlux Shadow 14
Sunlux Shadow 20
Sunlux Shadow 32

VERSION 2.0 – April 2020

Your Dreams, Our Challenge

WARNING

Carefully read this manual before processing Sunlux Shadow, Sunlux Chroma and Sunlux DarkChroma family products



Preliminary Important Instructions

- At each stage of the processing procedure, the personnel responsible for handling the glass must have the appropriate equipment: safety shoes, safety gloves, safety glasses, etc.
- Stock sheet shelf life 12 months
- We advise processing and handling this coated glass with care in order to avoid damaging the coating.
- Personnel responsible for handling must wear clean gloves to ensure that no fingerprints are left on the glass. The gloves must be approved for use with coated glass.
- If the glass is handled on the coated side, please use protection caps on the suction cups. Please note, the weight that can be handled by the suction cups is reduced if using protection caps.
- We strongly recommend that everything coming in contact with the coating of the glass during preliminary processing be pre-validated.
- Cutting on the coated side. Use volatile oil.
- Edge-processing and washing on appropriate machines.
- Heat-treatment: within 48 hours after cutting. A furnace with at least top convection is compulsory. No SO₂ inside the furnace.
- Lamination, silkscreen printing, bending: see below.
- IGU assembly: within 3 days after toughening/ heat-treatment.
- Further recommendations regarding the product description and processing are available below.

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0. PRODUCTS

This Processing Guide concerns magnetron Sunlux coatings produced in Yanbu: Sunlux Chroma (BlueChroma, BronzeChroma, GreenChroma), Sunlux DarkChroma (Sunlux Dark BlueChroma, Dark GreenChroma, Dark GreyChroma), Sunlux Shadow (Shadow 14, Shadow 20, Shadow 32).

Product family	Heat-Treatable	Bending	Silk-screening	Tempering	Curving tempered	Laminated pos.4	Edge deletion
Sunlux Chroma Sunlux DarkChroma Sunlux Shadow	YES	CAN BE	CAN BE	CAN BE	CAN BE	CAN BE	NOT REQUIRED

I. RECEPTION AND STORAGE

1. Unloading

The packs of glass must be inspected on arrival. AGC Obeikan shall accept no liability for coating defects 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 PLFs (Jumbo) must be stored on racks with spacers between packs ensuring that all packs of the same size are stored together.

General comments:

If, despite the precautions taken, marks do appear on the coating (fingerprints etc.) they should be removed at once using a clean, soft and wet (water) cloth and then a dry cloth. Soft circular movement should be applied.

3. Packaging

The packaging of the glass blocks depends on the type of product and on the final destination.

For some coatings and markets, the glass block is packed with a tape on the perimeter. Desiccant bags are placed between the glass block and the tape. When unloading the truck, the packaging must be inspected carefully.

Any damage must be reported to AGC Obeikan Glass.

4. Shelf life

For packed pile with protection: 12 months.

II. PROCESSING

1. Safety & General Information

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. AGC Obeikan strongly recommends wearing protective equipment when handling glass.

2. Cutting

The following specific precautions must be taken when cutting:

- When cutting, the coated side must be facing upwards to avoid any contact between the coated side 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 break-out equipment coming in contact with the coating on the glass must be prevalidated.
- Cutting personnel must wear clean gloves to avoid leaving finger marks on the coating.
- 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.
- The cut sheets of glass must be stored on racks. 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.
- 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. They will be placed on the perimeter of the glass, never in the centre.
- pH-neutral paper on corrugated cardboard can be used, assuming that they are clean and dry.
- The coating around the edge of the glass may be removed during the cutting process provided that dust from grinding is properly removed.
- Once the glass is cut, care must be taken to ensure that the cut edges do not come into contact with coated glass in the pack to avoid any damage, such as scratches.

If toughening of the glass is required, we recommend doing it within 48 hours of cutting. The glass should be shaped and cleaned during this period.

3. Edge-deletion

Sunlux family products do not have to be edge-deleted. Sunlux family products belong to the Class-B coating classification, according to the EN-1096.

4. Edge processing

Sunlux family products are designed to undergo, if needed, thermal toughening or heat strengthening. Accordingly, the edges of the glass must be shaped.

4.1. Handling the glass

The personnel responsible for handling and shaping the edges of the glass must wear perfectly clean safety gloves. Larger and heavier sheets can be handled with a suction-pad lifting beam. The pads shall be kept clean. 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 the glass in order to prevent contact between the glass and the coating. Paper with a neutral pH can also be used, for example, for large volumes.

4.2. Shaping the edges

Several types of edging machinery are available on the market:

4.2.1. 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. The glass may be processed using dry crossed belts provided that the extraction system is sufficiently effective to remove the dust resulting from grinding.

4.2.2. 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.

4.2.3. 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 synchronized. 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.

4.2.4. Numerical Control Systems (CNC)

Shaping using a numerically controlled machine is permitted provided that the glass is placed with the coated side facing upwards.

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.

5. Washing

This stage involves washing, rinsing and drying the glass. Generally, the washing machine must be maintained regularly and the settings and tools must be adjusted for coated glass.

A mains-water spray station should be installed just before the point where the glass enters the washer. This will remove any abrasive elements on the coating (cutting and edge-processing residues) that could cause scratches when the brushes make contact with the coating.

The glass must be washed in clean, deionized water with a pH of 7 (± 1) and a conductivity of $<30 \mu\text{S}/\text{cm}$. No hard particles (such as calcium) or acidic/detergent agents should be present in the water used

for washing and rinsing as these may damage the coating.

We recommend the use of 'soft' brushes (diameter of the bristles <0,15 mm), 1–2 mm of which come into contact with the glass. There must be enough water to guarantee that the water is distributed evenly and efficiently across the coating before it comes into contact with the brushes.

It is also important not to stop the cycle whilst the glass is in the washing machine. After washing, micro-suction pads should be used on the perimeter of the glass in the area that normally would be edge-stripped in order to avoid any contact between glass and coating. For large sheets of glass, a sheet of paper should be placed on the center of the glass.

Unloading the glass from the washer:

- Due to the fact that the interleaving 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 side and the coated side.
- pH-neutral paper or corrugated cardboard can be used, assuming that it is clean and dry.

Two or three halogen lights should be present at the exit of the washer to light the glass correctly (vertically from top to bottom) and even detect and quickly correct any deviations from the requirements listed above.

	SHAPING	WASHING	
		Washing	Rinsing
Coolant	See above		
Detergent		NO	NO
Temperature		< 40 °C	< 40 °C
Ph	7 +/- 1	7 +/-1	7 +/- 1
Conductivity	—	< 50 µS/cm	< 30 µS/cm

Remarks: The personnel responsible for handling the glass must wear clean gloves suitable for handling coated glass. The water in the washer tanks should have a temperature of maximum 40 °C. We also recommend the use of closed UV light systems to ensure the water is sufficiently disinfected.

6. Silk screen printing

Sunlux Shadow can generally be used for silkscreen printing as long as the instructions given below are followed: if the silkscreen printing is to go as far as the edge of glass, the coating should be trimmed first and the sealing compound should be checked for compatibility with the enamel. If it is not possible to trim the coating before applying the enamel, the silkscreen printing must be trimmed so that the subsequent coating can be stripped. Any impurities on the upper surface (coated side) can be removed using a compressed dry-air jet.

	Enamel on glass side	Enamel on coated side
Sunlux	NO	OK*
* a validation of the appearance as indicated below is strictly necessary		

Similarly, when the coverage percentage is very high and confined to a very small area, the printed section of the glass may behave differently to the uncovered section in the quench. In any case, the final result will depend on the type of furnace used, its parameters, the colour and type of enamel used and the desired pattern. The processor will have to carry out preliminary tests on a

case-by-case basis in order to avoid these problems. AGC Obeikan is not liable under any circumstances for the outcome of the operation. The presence of enamel on the coating changes the optical properties of the final glass product. These performance properties can be obtained from our AGC Obeikan's sales team or info@agc-obeikanglass.com.sa.

7. Thermal Toughening / Heat - strengthening

7.1. Introduction

Sunlux family products can be tempered / heat strengthened with the same settings as for the clear float, same thickness. Sunlux products have normal emissivity close to 0.6. All the tempering furnaces available on the market can be thus used to temper / heat strengthen these products. 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*
Sunlux	OK	NO	Allowed	Allowed

* 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 is used.

7.2. Generalities

When clear glass is placed in a toughening furnace it deforms considerably (concave shape) during the first heating cycle. This is due to the different heating speeds of the surfaces.

In a purely radiation furnace, the lower surface is heated by conduction (contact with the rollers) and radiation (lower heating resistance). Since the upper surface is covered with a low-emissivity coating, which, by definition reflects the radiation emitted by the upper heating elements in the furnace, it does not heat up as quickly. The two surfaces do not, therefore, heat up symmetrically, leading to concave deformation of the glass due to differential expansion (see image below). This phenomenon causes a marking, or even an optical deformation of the glass in the centre of the pane.

The only way to neutralize these defects is to balance the heating process by projecting additional heat onto the upper surface. Significantly increasing the temperature of the roof does not resolve the problem because the low-emissivity coating will still reflect this increase in radiated energy. Moreover, this will cause the rollers to overheat which could aggravate the problem.

The only solution is to create additional energy via convection over the upper surface.

This can be done by creating an air flow over the upper surface that is hotter than the glass itself.

The air is provided by an external compressor and is pre-heated in the furnace before it is pumped over the upper surface of the glass via rollers fitted with jets (see figure below). Another technique involves drawing hot air out of the furnace and pumping it back in again (re-circulation).

The latest generation of convection furnaces no longer has internal radiation elements. They only heat the glass using pre-heated air.

This additional air supply to the upper surface of the glass helps:

- Keep the glass flat during the heating process and avoid the aforementioned defects.
- Significantly reduce the heating time and therefore boost the productivity of the plant.

7.3. Recommendations

- We recommend toughening or heat strengthening within 48 hours of cutting. The glass must be placed with the coated side facing upwards.
- The personnel handling the glass must wear clean gloves. Larger and heavier sheets should be handled with suction pads covered with a protective material.
- Prior to toughening, markings may be made before toughening on the upper side of the glass coated.
- We recommend stopping the SO₂ supply in the toughening furnace at least 24 hours before toughening this kind of glass: the combination of SO₂ and a preliminary process that is not completely correct may change the appearance of the product.
- Regarding the furnaces heated by gas, some coating deterioration could occur. This will give some hazy appearance on the top layer of the coating. The level of haze depends on the gas composition and can be totally or partially washed.

7.4. Settings

Each furnace has its own settings for heating and quenching. As a result, the following recommendations should be taken as general guidelines.

We recommend to keep the furnace temperature below 680°C. The heating time shall be very close as for the clear float, same thickness. Too high oven temperatures / heating time setting could lead to a coating degradation along the edges.

The coated glass must be inspected after the quench section.

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 quench section.

7.5. Unloading

- If the glass is unloaded manually, the personnel must wear clean gloves.
- Larger and heavier sheets should be handled with a suction-pad lifting beam. The suction pads must be covered with a protective material. The toughened sheets are then stored on racks.
- 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.
- 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 with a neutral pH can be placed in the center to avoid all contact with the glass/coating during handling and transport.

7.6. Heat Soak test

The risk of spontaneous breakage due to nickel-sulphide inclusions is inherent to thermally toughened glass. The presence of such inclusions can in no way be considered as a fault in the glass. In order to eliminate the risk of spontaneous breakage, an additional heat soak test can be carried out in accordance with standard EN 14179-1 (or equivalent standards for countries outside the EU).

AGC Obeikan highly recommends using electrical equipment. Gas-fired furnaces must not be used for heat soak tests due to the risk that the coating could react with the smoke.

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

7.7. Quality control

After the tempering process, Sunlux family products should be inspected as follows:

- The coating is inspected in accordance with EN 1096-1*
- Toughened glass must comply with EN 12150-1*
- Heat strengthened glass must comply with EN 1863-1*
- 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 EU.

7.8. Packaging

If Sunlux family products are not assembled in double glazing in the same factory, the following recommendations for packaging must be followed:

A 1 mm-polyethylene foam spacer should be placed between each sheet. The glass must be cooled to temperatures below 40 °C prior to packaging, otherwise the interlayer will leave marks on the coating.

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

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

The glass will be assembled into insulating glass within one week after it has been toughened.

8. Bending

Sunlux products can be curved, curved tempered, curved heat-strengthened or curved annealed with the same furnace settings

The technical values stated (cycle times, temperatures and so forth) were noted during tests on certain types of bending equipment and obviously depend on the individual characteristics (shape, strength, convection rate and so on) of this equipment. The recommendations set out here are therefore intended as general guidelines and preliminary tests must be carried out for each bending furnace.

8.1. Curved annealed glass (on a concave mould)

Only bending ovens with top and bottom heating elements and with an upper convection system are suitable for bending coatings. The coated glass can be bent with the coating in tension or compression. All instructions regarding the pre-process (unloading, storage, cutting, shaping, washing and handling) must be strictly adhered to.

The glasses should be shaped to a smooth ground edge.

Place the coating on the concave mould (coated surface facing upwards).

Apply the appropriate packing powder (ESKAL 10 from KSL Staubtechnik gmbh).

The powder will be spread without any medium, as uniformly as possible.

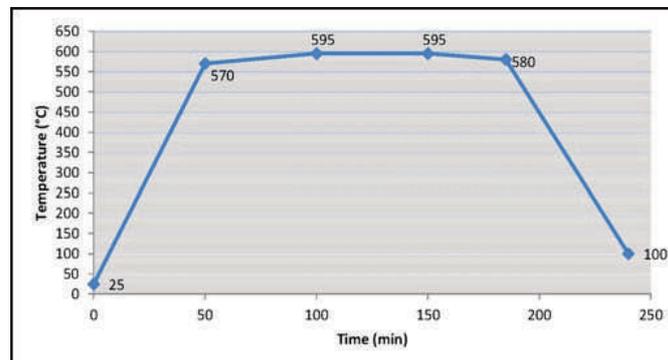
Place a sheet of float glass on top, with the tin side facing upwards.

Apply the appropriate packing powder (generally crystalline silica).

The same operation can be done with the float glass bottom and the coated glass on top, with the coating facing downwards.

Heating / cooling parameters

- The temperatures must be adjusted so that the upper surface of the glass matches the following curve as closely as possible.
- The temperature must not exceed 580 °C.



NB: The final heating phase must be adjusted according to the position of the glass in the bending mould.

8.2. Curved toughened glass

- This operation is done on a flat tempering oven, fit with an adjustable quench in order to get the right curving radius.
- Compared to the flat tempering settings, the heating time must be increased by 15 to 30%.
- As the coating is facing upwards (opposite side of the rollers), it will be in compression, on the concave side of the glass.

9. Use in single glazing

Sunlux family products can be used as single glazing / in monolithic applications with the exception of Sunlux GreenChroma and Sunlux Dark GreenChroma.

These two Sunlux family products can only be used in double glazing.

10. Lamination

Sunlux family products can be laminated in annealed, tempered or heat-strengthened version.

	Coating position in the laminated glass		
	1	against PVB	2
Sunlux Shadow	NO	OK	OK

11. Assembly in Insulating Glass Unit

Sunlux products can be* assembled in double glazing unit with the following restrictions

* Sunlux GreenChroma and Sunlux Dark GreenChroma must be assembled in double glazing unit.

	Coating position in IGU			
	1	2	3	4
Sunlux Shadow	NO	OK	NA	NA
NA: no technical reason to put the coating in this position				

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).

12. 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 adhesive must be made in each case with the adhesives manufacturer.

13. Identifying the coated surface

Before the shaping process, the coated side can easily be identified by the cut, which is visible on the edge of the glass.

After shaping, and until the glass is assembled in double glazing, the coating may be identified using an electric tester, available on request from any AGC Obeikan representative.

Nonetheless, we recommend carrying out this test somewhere around the edge of the glass in an area that will later be stripped before the glass is assembled into double glazing.

14. Storage of cut sizes / IGU

14.1. 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 sheets⁴. The same recommendations apply for packs with several glass dimensions.

14.2. To send cut size to another 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 washing, we recommend that you place cork spacers between the sheets⁴. The same recommendations apply for packs containing sheets with multiple dimensions.

14.3. On site

When the glazing is delivered on site to be installed on the facade, 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 and GUARANTEE

1. Conformity

Sunlux coatings comply with standard EN 1096-1, category B. Information regarding inspection conditions and quality criteria are available in that standard.

2. Warranty

The warranty is available on request from your local AGC Obeikan' s sales representative.

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 Obeikan. 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.

Regarding preliminary trials advices can be obtained at AGC Obeikan's sales team or IBP (International Building Projects) team info@agc-obeikanglass.com.sa.

VI. NOTES

¹Recommended protective material for suction pads:

Product description: suction cup housing

NB: max. diameter: 300 mm.

Supplier: IMPEXACOM

Rue des tourterelles 14-16

B - 5651 Thy le Château -Belgium Tel.: + 32 71 612145

Fax: + 32 71 612164

²Recommended gloves:

Product description: HYD TUF 52-547 (glove size 8-10 for handling coated glass)

Supplier:IMPEXACOM

Rue des tourterelles 14-16

B -5651 Thy le Château -Belgium Tel.: + 32 71 612145

Fax: + 32 71 612164

³Recommended cutting oil:

Product description: ACPE 5503 cutting oil

Supplier: ROLAND

Rue de la petite Ile 4 B - Brussels -Belgium Tel.: + 32 2 5250618

Fax: + 32 2 5200856

⁴Recommended spacer for toughened/heat-strengthened:

Product description: Cork disks with micro suction pads (3 × 20 × 20 mm)

Supplier: VITO IRMEN

Mittelstrasse 74-80

D - 53407 Remagen - Germany Tel.:+ 49 26 42 40 07 10

Fax:+ 49 26 42 42 913

⁵Recommended packing foam:

Product description: 1 mm packing foam

Supplier: SCRIPHORIA

Wellen Belgium

Tel.: + 32 11 370 111

⁶Recommended sachets of desiccating agents:

Product description: desiccating agent in sachets of 125 g

Supplier: STOKVIS Vilvoorde -Belgium Tel.:+ 32 2 255 06 11

Suppliers are listed for reference only.