BIOCLEAN® / BIOCLEAN® II

Processing Guidelines

(Including bi-coated glasses processing instructions)

SAINT-GOBAIN

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1. GENERAL

1.1. Product description

BIOCLEAN® and BIOCLEAN® II is a family of easy to clean coated glass manufactured by vacuum cathodic sputtering either on clear PLANICLEAR®, or PARSOL® body tinted glass. Product is designed for exterior application only.

BIOCLEAN® (II) consists of a clear glass onto which a transparent coating of a photocatalytic and hydrophilic material has been applied. The coating uses the dual action of the UV-rays from the sun and water to remove dirt that has accumulated on the outer face of the glass.

- Exposure to UV rays breaks down organic dirt and makes the surface hydrophilic;
- Water (eg. Rain or a water jet), by spreading out over the glass, removes the broken down residues by water runoff.

As a consequence, BIOCLEAN® and BIOCLEAN® II, allows to reduce both the frequency and difficulty of the glass cleaning routine.

As for some other Saint-Gobain Glass products, the "II" in "BIOCLEAN® II" product name means that the product is to be tempered to acquire its nominal performances, being for self-cleaning or spectrophotometric (including colours) characteristics. On the contrary, BIOCLEAN® must not be tempered at the risk of losing the product performances.

BIOCLEAN® II can be produced with solar control properties and product name is so BIOCLEAN® SC II or BIOCLEAN® SC LSF II. It is to be tempered version and it is process in same way than standard BIOLCEAN® II coating.

Both products meet the requirements of Class A products as defined in the European standards EN1096-1 and EN1096-2. They can be used in single (monolithic or laminated) or double glazing, the coating being always placed on face 1 of the glazing.

Contact your sales representatives for more information. For complete performance data, please refer to the Glass Guide, our commercial documentations and our website www.saint-gobain-glass.com

In the rest of the document:

- When the term **"BIOCLEAN® (II)"** is used, the reader has to understand that the instructions described apply to both BIOCLEAN® and BIOCLEAN® II. Otherwise, only the term BIOCLEAN® or BIOCLEAN® II will be used.
- Mono-coated glass means that only one face of the glass presents a coating (BIOCLEAN®, BIOCLEAN® II or BIOCLEAN® SC II);
- Bi-coated glass means that a second coating, in addition to BIOCLEAN® (II) with Low-E or Solar control performances is present on the other side of the glass.

To improve customer satisfaction, we constantly improve the quality of our coatings. This could lead to improvement in the processability of our coating, so please make sure you have an up-to-date version of these guidelines.

1.2. Thickness, dimensions and tolerances

1.2.1. Thickness and dimensions

BIOCLEAN® (II) are usually available in standard thicknesses and sizes. For more details, please refer to the relevant product documentation from Saint-Gobain Glass or contact your local sales service.

1.2.2. Thickness recommendations

- Calculations and recommendations are the same as those for conventional glass sheets (annealed, tempered, laminated …) assembled in double glazing.
- Relevant national and local regulations should be complied with.

1.3. CE-Marking

BIOCLEAN® (II) comply with EN 1096-4 harmonised European standard for coated glass. The **D**eclaration **o**f **P**erformances (DoP) of the products are available on the CE-marking section of Saint-Gobain Glass web sites and at www.saint-gobain-glass.com/ce.

1.4. Quality criteria

1.4.1. Defect types: definitions

Coated glass defect types are listed and defined in EN 1096-1 standard. The following definitions are extracted from this norm:

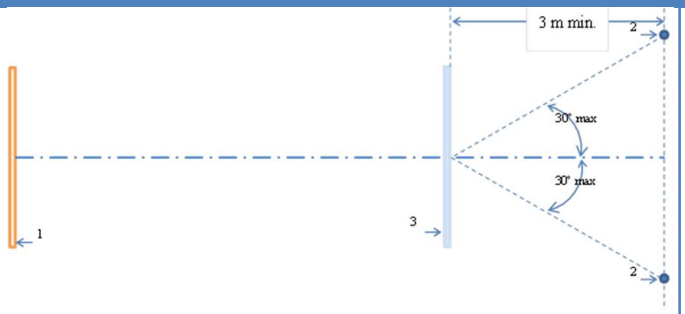
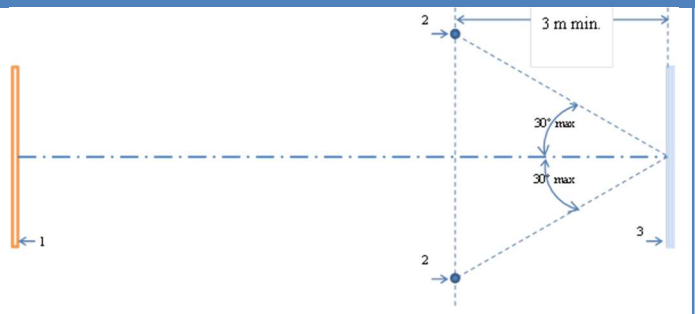
- **Uniformity defect:** slight visible variation in colour, in reflection or in transmission within a coated glass pane or from pane to pane;
- **Stain:** defect in the coating larger than punctual defect, often irregularly shaped, partially of mottled structure;
- **Punctual defects:** punctual disturbance of the visual transparency looking through the glass and of the visual reflectance looking at the glass. Spots, pinholes and scratches are types of punctual defects;
    - **Spot:** defect that commonly looks dark against the surrounding coating, when viewed in transmission;
    - **Pinhole:** punctual void in the coating with partial or total absence of the coating. Normally contrasts clear relative to the coating, when viewed in transmission.
    - **Scratches:** variety of linear score marks, whose visibility depend on their length, depth, width, position and arrangements;
- **Cluster:** accumulation of very small defects giving the impression of stain.

1.4.2. General observation conditions and acceptance criteria

Without prior agreement between both parties, applicable defect acceptance criteria under standard observation conditions (Figures 1.a) and 1.b)) are those described in EN 1096-1:

"Coated glass may be examined in stock size plates or in cut sizes ready for installation. The examination may be undertaken in the factory or on site when glazed.

The pane of coated glass being examined is viewed from a minimum distance of 3 m. The actual distance will be dependent on the defect being considered and on which illumination source is being used. The examination of the coated glass in reflection is performed by the observer looking at the side which will be the outside of the glazing. The examination of the coated glass in transmission is performed by the observer looking at the side which will be the inside of the glazing. During the examination the angle between the normal to the surface of the coated glass and the light beam proceeding to the eyes of the observer after reflection or transmission by the coated glass shall not exceed 30°."

Reflection	Transmission
	

Key:

1. Illumination source
2. Observer position
3. Coated glass sample

Figure 1: Schematics of examination procedures for coated glass (as per EN 1096-1)

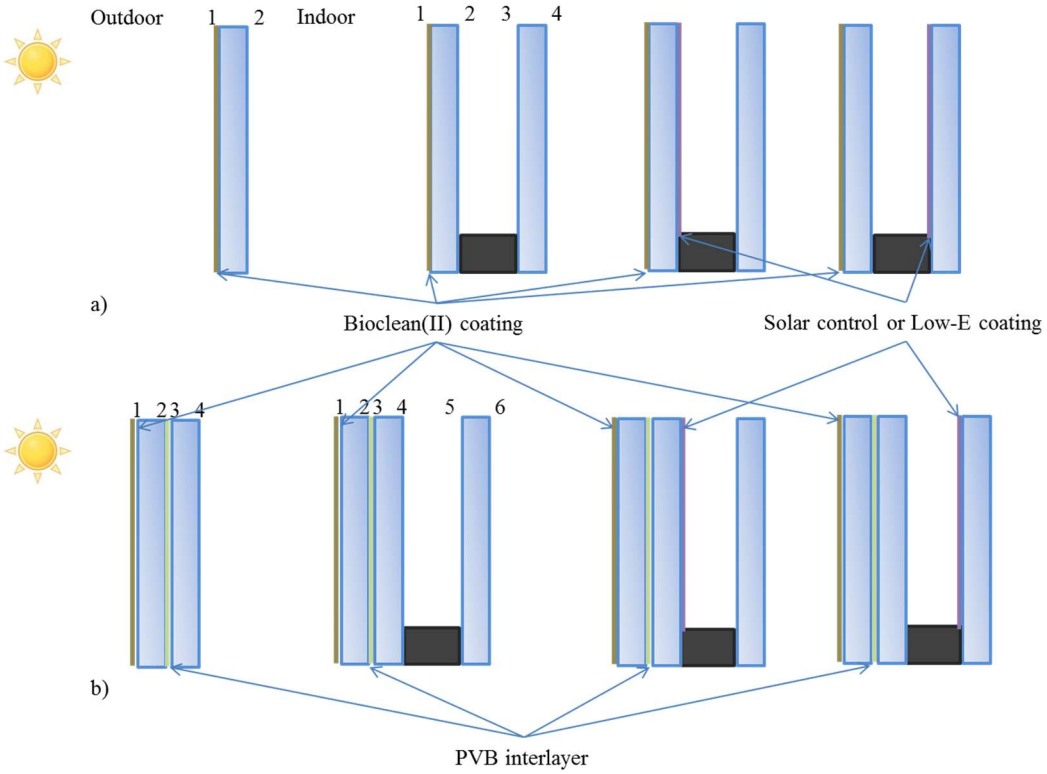
1.5. Position of the coating and identification of the coated face

1.5.1. Position of the coating

Possible configurations of use of BIOCLEAN® (II).

a) Monolithic or in DGU.

b) Laminated: monolithic or integrated in an IGU (for sake of simplification, Triple Glazing Units configurations are not displayed).



» ***Monolithic glass***

BIOCLEAN® (II) coated glasses must always be positioned on face 1 of the glazing.

» ***Insulating glass unit (IGU)***

BIOCLEAN® (II) coated glasses must always be positioned on face 1 of the glazing even if associated with solar control or Low-E coatings on side 2, 4 (in case of laminated) or 5. The possible position of the solar control or Low-E coating must be checked in accordance with the guidelines of those products.

» ***Laminated glass***

BIOCLEAN® (II) can be laminated taking care to always place the coating outside of the laminate. The counter glass of the laminate can either be a clear glass (e.g. PLANICLEAR®) or a Solar control or Low-E coated glass.

» ***Mixing annealed / heat-treated coated glass***

BIOCLEAN® II once heat treated exhibits spectrophotometric characteristics similar to the ones of BIOCLEAN® even though not perfectly identical. Mixing on a same façades annealed and heat treated glasses with BIOCLEAN® (II) products is thus possible but, in any case, the following should be ensured:

- A real size mock-up, representative of the final configuration (hence mixing annealed and tempered pieces) must be proposed to the final customer.
- This mock-up should be observed and accepted by the final customer.
- A report of this observation and a signed agreement should be evidenced.

Saint-Gobain Glass cannot be held responsible of colour mismatch due to the mixing of annealed and tempered glazing on a same façade when such a mock-up validation has not been properly performed.

1.5.2. Identification of the coated face

BIOCLEAN® (II) coatings are almost invisible and non-conductive. Their presence can however be identified using a BIOCLEAN® (II) detector. Contact either your local "Technical Support Manager" (TSM) local sales service to obtain such a detector.

Figure 2: Example of adapted detector for BIOCLEAN® (II)

2. TRANSPORT, ACCEPTANCE, STORAGE AND HANDLING

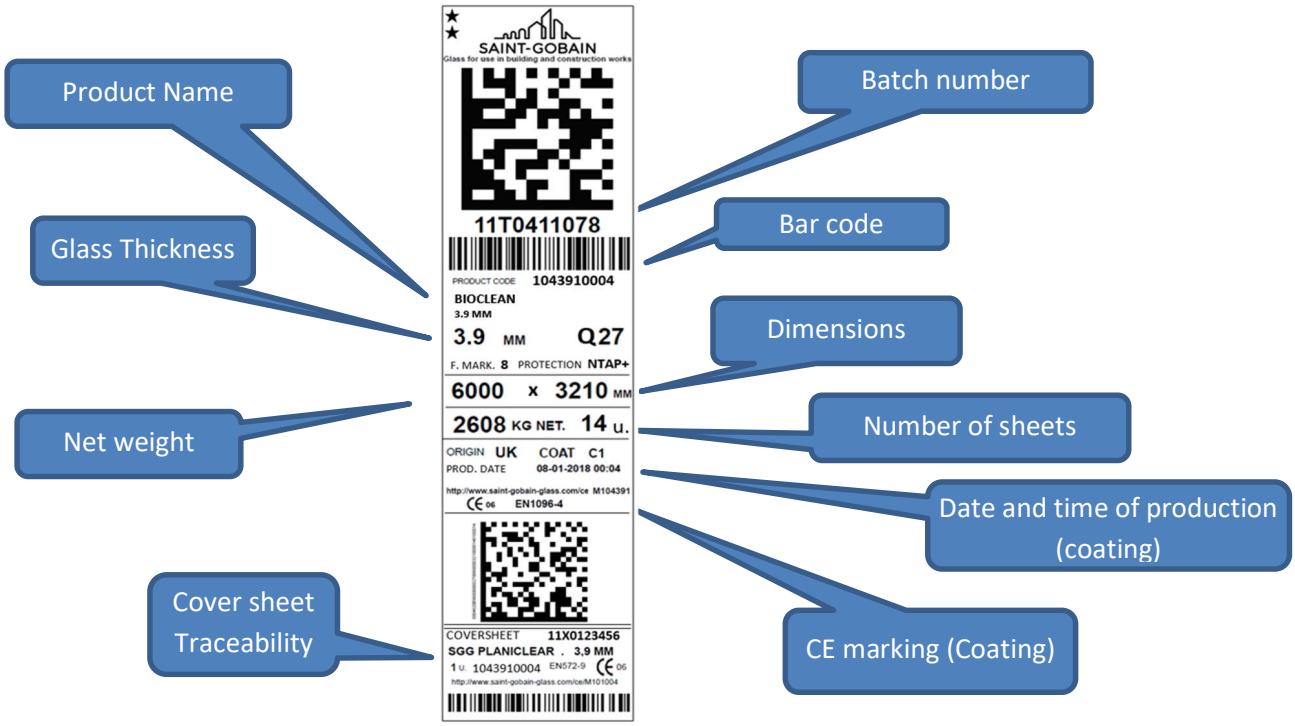
2.1. Transport

- Coated glass sheets are usually transported in 2.8 tonnes packs (jumbo or split sizes).
- Glass sheets must be transported vertically;
- The individual sheets are packed with the coated side towards the inside of the frame unless otherwise requested by the customer;
- The glass panes never come into direct contact with each other: the glass sheets are always separated by neutral polymeric powder;
- In each pack, a clear 4 mm float glass pane is placed as the first sheet during loading to protect the coating of the first coated glass sheet;
- The pack and its contents must be protected from water.
- If the glass is wrapped and sealed, the seal should remain closed until the product is used in the factory;
- During transport, violent and repeated shocks should be avoided;
- When handling with a hoisting apparatus, measures must be taken not to damage the pack.

2.2. Receipt of the delivery

Care must be taken concerning the orientation of the coating that has been ordered. Please check it before starting processing.

  - For mono-coating: it is generally on the inner face but might have been placed on the other side on request. Labels are never placed on the coating.
  - For bi-coated glass: The Low-E or solar control coating is generally turned towards the inside of the stack;
- Every pack must be opened with care in order not to damage the glass sheets or the coating(s) (contacts, scratches, etc.). Handling instructions on the packing must be respected, particularly the instructions for opening.
- Before processing, glass sheets should be checked in accordance with the specifications defined above. Any possible defect in the coating must immediately be reported to the supplier, accompanied by:
  - The date of delivery;
  - The data mentioned on the identification label;
- All deliveries are identified with a label providing the following data:



- In case of delivery with obvious disagreements detected at reception (water, breakages…), glass should not be unloaded and waybill (CRM) fully completed by customer and transport entities. A possible expert visit could be organized to define responsibilities.

No claim can be accepted for damages caused during and/or after processing due to a lack of adherence to these guidelines. Therefore, glass processor should ensure that the process is adapted for coated glass and that the quality control is relevant to detect any quality problem as soon as possible. In case of claim, samples will be required and a visit from a SGG representative may be requested.

2.3. Storage

2.3.1. General

All glass products may degrade (become stained or corroded) when stored in humid conditions. The iridescence may take the appearance of a "rainbow" or milky white haze on the surface of the glass, or corrosion pitting on the coated side.

BIOCLEAN® (II) glass sheets must be stored, as float glass, vertically (at 3 to 7 degrees) under the following conditions:

- **Never close (< 10 m) to a source of silicone**;
- In a dry, well ventilated warehouse, to prevent any condensation on the surface;
- Away from glass dust;
- Protected from rain and running water (e.g. any roof leakage must be rectified);
- Never outside or in the open air (even when packed);
- Protected from wide changes in temperature and humidity levels (coated glass products should be stored far from opening doors).
- In case the coated glass is delivered packed (aluminium, PE):

Before breaking the seal, to avoid condensation, one should ensure that the temperature of the pack has reached the temperature of the environment of the warehouse.

2.3.2. Shelf life

If the above (§ 2.3.1) storage conditions are respected, BIOCLEAN® (II) is guaranteed for 2 years from the date of reception at the customer's premises. In case of bi-coated glass, the warranty to be applied is the one corresponding to the coating of lowest shelf life (highest Class as per EN1096-1). For example:

- Bi-coated BIOCLEAN® / COOL-LITE® SKN: The warranty will be the one corresponding to COOL-LITE® SKN.

  Refer the corresponding product guidelines.

It is thus important to record the date of reception of the glass. In case the date of reception is lost by the customer, the date of the delivery note will serve as evidence.

2.4. Handling

- **Make sure that no glove / object / conveying rollers or bands in contact with BIOCLEAN® (II) is polluted with silicone**;
- BIOCLEAN® (II) coated glass sheets must be handled with dry, clean appropriate safety gloves.
- In case handling operations with vacuum cups on the coated side cannot be avoided, make sure that the vacuum cups are perfectly clean. Not all solutions are suitable for cleaning vacuum cups, see manufacturer documentation for details. A sheet of interlayer paper (acid-free, thin, soft and air-permeable) or suitable suction-cups caps can also be placed on the coated side, between the vacuum cups and the surface, but care must be exercised as this may reduce the vacuum level (especially in the case of thick and heavy panes).
- Each coated glass pane must be released from the next pane before being lifted from the pack. Any relative movement of the coating with the next glass pane must be avoided.
- Automatic unstacking of glass sheets or removal using a glass clamp is possible, but the gripping area should be kept to a minimum and condemned from the cutting pattern;
- In case of doubt, the position of the coating must be checked (see § 1.5.2). Do not place the coating in contact with a rough surface or hard objects.
- Try to avoid wiping the coating. If necessary, the coating may be gently wiped with a soft, dry cloth and a suitable solution (e.g. isopropyl alcohol (IPA)).

3. PROCESSING OF BIOCLEAN® (II)

3.1. Handling on the production lines

All the recommendations outlined in § 2.4 remain valid.

- Conveying side:
  - **Bi-coated glass**: BIOCLEAN(II) coating must be placed downward so that the solar control or Low-E coating is not conveyed on the rollers or bands;

    Make sure all conveying rollers or bands are perfectly free to rotate and synchronised so that the coating is not rubbed onto those rollers or bands
  - **Mono coated glass**: place the BIOCLEAN(II) coating upwards to limit risks of scratching or polluting the coating by the contacts with rollers, bands,…
- Hoisting and handling instruments, tools and vacuum cups must be kept perfectly clean (or covered with adapted caps) so as not to leave traces on the coating;
- Wear dry and clean safety gloves when lifting the glass sheet manually. Limit area of contact as much as possible;
- The coating must be protected from any contact with silicone or greasy substances;

3.2. Glass cutting

BIOCLEAN® (II) is cut in the same way as any other ordinary coated glass. However, the following recommendations have to be respected:

- Any irregularity or damage of the edges must be avoided since it is likely to increase the risk of breakage during the toughening process;
- In case of bi-coated glass, BIOCLEAN® (II) coating must be placed directly on the felt of the cutting table. In such a case, one has to make sure that:
  - The table is perfectly free of glass splinters or shards;
  - The conveying bands are perfectly clean and free of silicone or other greasy substances.
  - During the automatic breaking, make sure that the conveyors are clean and in good working order;
  - During manual breaking and evacuation, limit the sliding of the glass on the table so as not to scratch the coating.
- Otherwise (i.e. mono coating) always position the glass on the cutting table with the coating facing upwards to limit risks of scratching or polluting the coating;
- Use only light **vaporising cutting oil** (for instance Acecut 5503 or 5250) adapted to coated glass;
- Do not dilute or mix the cutting oil;
- Avoid all excess of cutting oil: Max width : 1 cm;

- For cutting operation, avoid using natural latex coated gloves as latex tends to dissolve in cutting oil. This leaves a greasy residue on the coating which may be difficult to wash in the industrial washing machines. Grade 5 leather or PU palmed gloves as well as NBR nitrile dipped gloves should be preferred;
- Cutting templates can be used but great care must be taken not to scratch the coating. Soft protection (soft tissue, felt or cork pad) should be placed underneath the template;
- Fine glass splinters on the coated surface should not be wiped off by hand, but blown off by **dry and oil-free air**;
- When stacking cut sizes prior to further processing, separate the panes by either:
    - New cork pads (recommended);
    - Paper interlayer (chlorine free);
    - Foam pads;
    - Corrugated cardboard strips.

This is especially important with glass of different dimensions. Do not put additional separating powder.

- Cut sizes (or final IGUs in which BIOCLEAN is integrated) should not be stored on carts also used for storage of silicone sealed IGUs. It is recommended to use dedicated carts.
- The use of so-called “harp carts” to store the cut sizes is not recommended as the contact of the wires on the coating may damage the latter when the cut sizes are pulled from or pushed in between the wires
    - In case such carts are however used: it must be ensured that the metallic wires are well protected with plastic sleeves on their whole length. Those protections must be totally free of glass shards;
    - The cut sizes must be inserted in such a way that the coating is never rubbed onto the wires;
    - Such carts must not be used in case the coating is to be tempered.

3.3. Edge deletion

- BIOCLEAN(II) do not need to be edge deleted whatever the configuration of use.
- In case of bi-coated glass, the Solar control or Low-E coating opposite BIOCLEAN must of course be edge deleted. Please refer to the corresponding guideline.

3.4. Edge working

It is good practice to edge work the glass directly after cutting. Provided the glass is stored under above defined conditions, the glass must be edge worked within 5 days from cutting. In case of bi-coated glass, refer to the corresponding guidelines.

- Wet edge-working: it is essential to keep the glass fully wet during the whole grinding process and to wash the glass directly afterwards so that the grinding water is not able to dry on the coated surface.
- Dry edge-working: such processing is generally not recommended as small glass dust particles may be sprayed on the dry coated surface. In case of use, make sure the suction is powerful enough to avoid a too important dispersion of dust.

3.4.1. Manual Edge Working

Generally carried out using manual cross belts to achieve arrissed edges (100 - 120 grit belts are recommended);

- The top belt should run downwards to minimise grit deposited on the coated surface;
- Horizontal roller backstops can be fitted to ensure consistent pressure and arriss width;
- The glass should be handled (with glass dust free gloves) at the edges to avoid damaging the coating.

3.4.2. Automatic Edge Working

It is possible to grind the coated glass on vertical, CNC and double edger machines provided that the handling instructions are observed and adaptations of the machines are made (if necessary, contact your local Technical Support Manager). For double-edger and vertical machines, cleanliness and perfect synchronization of the pressure belts must be checked.

3.5. Drilling

The drilling of coated glass can be performed provided that the handling instructions are observed and adaptations of the machines are made (if necessary, contact your local Technical Support Manager - TSM).

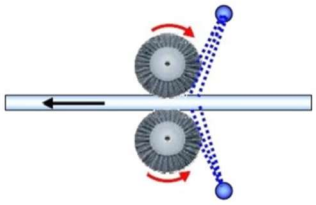
In case of bi-coated glass and for special glazing application (e.g. spider glass) the solar control or Low-E coating may have to be placed on the conveying rollers. In such a case, it is recommended to protect the coating with a low tack plastic film.

3.6. Washing

It is recommended to wash the glass immediately after edge working. In case BIOCLEAN® (II) is submitted to several processing steps (edge working + drilling +…) each of them followed by washing, it is recommended to pass the cut sizes in the same direction for each washing phase (to avoid possible generation of multiple crossed scratches).

We recommend the use of the following installation. If the washing installation differs from the one described here, we recommend that tests be carried out to check the washing quality (traces, rings, dust, etc.) and to ensure that the installation does not damage the coating. Please contact your local TSM:

- Pre-washing area:
  - Prewash ramp followed by one pair of cylindrical brushes
  - Tap water between 30 and 40°C, preferably close to 40°C, without any detergent
  - The prewash ramp is particularly important for the removal of the glass dust and splinters created during the edge-working process
- Washing area:
  - 2 pairs of cylindrical brushes
  - demineralised water
  - pH value comprised between 6 and 8;
- Rinsing area:
  - Demineralised water at room temperature
  - Maximum conductivity 20 µS/cm
  - pH value comprised between 6 and 8;
- Brushes:
  - Flexible (soft) clean polyamide bristles
  - Maximum diameter of 0.2 mm, 20 - 40 mm long.
  - Take care that all the brushes are perfectly clean and regularly maintained. Any hard brushes must be lifted;
- Drying:
  - Use an air-blowing installation equipped with filters
  - Clean and regularly maintained filters;
- Water should be sprayed directly onto the glass, not onto the brushes (as per below drawing;



- The glass sheet does not stop inside the washing machine. The washed panes should not remain in the washing unit for any length of time, especially not while the brushes are rotating;
- No water must remain on the coated surface after the drying process;

- It is strongly recommended that the washing machine is regularly cleaned, especially for the brushes and in areas where demineralised water is used. Clean the filters every day, and the tanks every week. For the brushes, steam cleaning gives good results, but do not spray the bristles with high temperature and high pressure water.
- In case dirt / stains are still present on the coating after the washer, cleaning may be performed using a soft cloth and isopropanol (IPA) or ethanol followed by rapid drying, provided this is done carefully and immediately after contamination has occurred.
- For interim stacking of washed panes, use cork pads near the edge of the sheets.

In case, in a further step, BIOCLEAN® II will be tempered, it is of the highest importance that no residues or marks are left on the coating surface after the exit of the pre-processing washing machine. Pollutions left on the coating may induce hot corrosion (giving the aspect of pinholes) of the coating in the tempering furnace. Such marks may not be washable.

3.7. Tempering / Heat-Strengthening of BIOCLEAN® II

3.7.1. General

- BIOCLEAN® II can be heat-treated to get a tempered / heat-strengthened coated glass.
- BIOCLEAN® must not be tempered.

3.7.2. Prerequisites for tempering / heat-strengthening

The cleanliness of BIOCLEAN® II coating before entering the tempering furnace is important. From the exit of the washer to the entrance of the tempering furnace, only the use of perfectly clean gloves should be permitted. The coating may be gently cleaned with isopropanol (IPA) on the furnace entry bed to remove dirt or marks (from gloves, separators, fingerprints…).

Special care and attention must be taken at every stage of processing, in particular before and during the toughening process. Please consult your local TSM if necessary. Washed panes should be toughened maximum 2 days after washing.

3.7.3. Toughening instructions

Generally speaking, BIOCLEAN® II can be toughened using oven settings that are suitable for PLANICLEAR®. The exact settings being of course furnace dependant cannot be given in these guidelines. However, it is recommended that the sheets should be handled as “cold” as possible to achieve a flawless coating after toughening and obtain the desired level of stress (breaking pattern). This means that the temperatures and heating times are set so as just to avoid breakage in the blower box and to meet the requirements for single-sheet safety glass.

Pay attention to possible source of silicone contamination. Indeed, existing practice could be to stick Kevlar quench rollers with silicone that could impact final product behaviour.

Do not use SO_2 in the furnace when tempering BIOCLEAN® II. Do stop SO_2 right in time. SO_2 may remain in the furnace for up to 48h.

3.8. Heat-Soak testing

Heat-soaking toughened BIOCLEAN® II cut sizes must be carried out in accordance with EN 14179 European standard. Every piece must be individually separated. The separating blocks may be made out of PTFE (e.g. Teflon) and contact with the coating should be limited to a minimum and located at the edge deleted area so that there will be no contact of the PTFE with the coating. Gas fired heat-Soak-Test furnaces with direct combustion in the oven must not be used as hot fumes may damage the coating.

For projects, it is advised to carry out heat soak testing of tempered glass. Its purpose is to reduce the risk of spontaneous breakage due to the possible presence of nickel sulphide inclusions in the glass. Local regulation may make this test mandatory according final intended use of the glass.

3.9. Bending

BIOCLEAN® II can be curved annealed (sagging process) or tempered (in tempering furnaces fitted with a bending cell). Not all curvature radii may be attainable with convex or concave shape according to the type of process used. The processor is then asked to check and validate that its bending process is capable to obtain a good quality on a particular shape before giving a final offer for a project requesting this shape.

3.10. Enamelling

Enamelling of BIOCLEAN® II, whenever needed, must be performed on the side opposite to the coating.

The spectrophotometric properties of the BIOCLEAN® II coating change the colours of the enamel seen on PLANICLEAR® glass. It is therefore advisable for the customer to validate the colour beforehand.

The installations (enamelling and screen-printing line and toughening furnace) must be cleaned before any production with BIOCLEAN® II.

3.11. Handling of heat-treated glass

All instructions listed in § 3.2 remain valid for the handling of tempered cut sizes.

3.12. Lamination

- BIOCLEAN® (II), can be laminated taking care to always place the coating outside of the laminate. The counter glass of the laminate can either be a clear glass (e.g. PLANICLEAR®) or a Solar control or Low-E coated glass.
- Please refer to interlayer supplier recommendations to obtain best final qualify product (storage conditions...)
- To assemble the glass, ensure that the calendaring rollers are in good condition (clean and free of glass shards or particles). Check that the circumferential speed is regular and corresponds to that of the conveyor system. Clean off all deposits of PVB in contact with

the coating before placing in the furnace or autoclave. Calendaring rollers must touch the glass and should be flat to apply regular pressure at any position.

- When laminating heat treated BIOCLEAN® II take care that the PVB thickness is adapted as to compensate the possible glass deformation (roller wave, bow, edge lift) created during the heat-treatment process. Optimised heat treatment recipes are recommended to limit glass deformation and avoid any defect after the lamination process. Contact your local TSM if necessary.
- Use of clamps to do lamination is not recommended at any time, especially during autoclaving. This could be a cause of optical distortion of the glass and possible delayed glass delamination. Use of clamps can hide possible quality deviation in production.
- **Do not seal the containers with silicone**, make sure they are cleaned regularly (removal of plasticizers). Apply the standard autoclaving cycles. Use dry spacers (example: wood) or protected spacers.

3.13. Manufacture of Insulating Glass Units

It is recommended to assemble the panes in insulating glass units as quickly as possible. When manufacturing double-glazed units using BIOCLEAN® (II), please follow the handling, cutting, and washing instructions detailed above.

The coated glass must be washed before making it into insulating glass units. Recommended washing conditions are described in § 3.6.

- Make sure that BIOCLEAN® (II) coating is place on the line so **that it will be fitted on face 1 of the final IGU**;
- In case BIOCLEAN® (II) has to be conveyed on the rollers of the IGU line, make sure those rollers are perfectly free to rotate (to avoid scratches) and clean (to avoid pollution);
- Do not use silicone mastic sealants or mastics containing silicone;
- Any other kind of second sealant barrier can be used (polyurethane, polysulphide and hot melt);
- If you use silicone seals for the assembly of other products, check that the equipment to be used for BIOCLEAN® (II) (gloves, suction cups, etc) does not contain silicone and is not contaminated with silicone.
- Traditional presses or gas presses are compatible. Suction cups must be clean and silicone-free;
- Clean the exit conveyors regularly (in particular on *LISEC* or *FOREL* lines);
- After assembly, each sheet of glass must be separated using cork pads affixed to the BIOCLEAN® (II) face on the edges;
- After assembly, each sheet of glass must be identified.

3.14. Processing quality checks

It is the responsibility of the processing plant to define and adjust the quality process control to match the quality standards acceptable for its own market and in respect of relevant national requirements.

- **Reception**: Control of delivery document of the coated glass supplier. Visual inspection of the packs (breakages, condensation…);
- **After cutting**:
  - Visual aspect control (scratches, oxidation/corrosion, splinters etc.);
  - Normal control of the cutting quality;
- **After grinding / drilling / washing:**
  - Visual aspect control (scratches, oxidation/corrosion, splinters etc.);
  - Visual control (as to whether the pane is completely dry);
  - Check for suction cups or cork pad marks etc…;
  - Normal control of the grinding / drilling quality;
- **Prior to toughening (or heat-strengthening):**
  - Check for glass splinters (if present, remove them by rewashing);
  - Check for marks, dirt… If any remove them by gently wiping the coating with a soft cloth and IPA;
- **After toughening (or heat-strengthening):**
  - Visual aspect control (burns, cracks, scratches, oxidation/corrosion, haze…);
  - Optical quality (distortion, bow etc.);
  - Visual detection of roller wave;
  - Normal control of the toughening quality (break pattern etc.);
- **After heat-soak testing:**
  - Visual aspect control (scratches, oxidation/corrosion, splinters etc.);
  - Check that no damage has been caused by separating blocks;
- **On the insulating glazing unit line:**
  - Visual aspect control in conformity with the relevant national quality standard for double-glazed units.
- **Before delivery:**
  - Hydrophilic test to validate good working on the easy to clean product (no scratches, no silicone pollution…)

For plants just starting to use coated glass products, a system of “first off” inspection after each process can be useful until experience is gained. Operator training and experience in identifying faults (which are often difficult to see, especially before toughening) is important. In any case, a visit from your local TSM should be organised.

4. ENVIRONMENT / WASTE GLASS / HEALTH ISSUES

BIOCLEAN® (II) coated glass product can be disposed of as per clear float glass.

Edge working residues have to be continuously and completely collected during the grinding process. These residues must be further treated in compliance with national legislation about industrial wastes. In some legislation, residues from grinding process have to be treated as toxic wastes.

As for any dust coming from the grinding process, any inhalation or skin contact of these residues must be avoided.

On request, a **S**afety **U**se **I**nstruction **S**heet (SUIS) relating to the ECDirective 91/155/EEC can be supplied.

5. GLAZING INSTRUCTIONS

The selection of a suitable and practical glazing method depends on a variety of factors such as the size of the glass, the exposure and the type of framing material and system.

Glazing and fixing techniques must comply with the recommendations of the relevant national standards. Glazing blocks, frame size and maximum frame deflection for double-glazed units are not specific to BIOCLEAN® (II) glass products.

6. INSTALLATION OF DOUBLE-GLAZED UNITS ON SITE

6.1. General

The choice of the most appropriate method for the installation and assembly of double-glazed units depends on a large number of factors, including the size of the glass, exposure to external stresses and the type of frame or facade system.

The installation and fixing techniques that are used for the glass must be conform to the recommendations of current national standards.

The setting and location of the glass, the dimensions of channels and the permitted deflection for the frames of insulated glass units are not specific to BIOCLEAN® (II) products.

6.2. Identification of the final product

In order to avoid the installation of the IGU on the wrong side, the finished product may be identified using special BIOCLEAN® (II) labels. This label should be affixed in one corner of the glass on the coated side. Only the specific BIOCLEAN® (II) labels must be used as sticking non compatible ones may locally alter with the properties of the coating. Contact your local sales service to get those labels.

6.3. Assembly in a frame

It is important to follow the instructions below for BIOCLEAN® (II) insulated glass or filmed BIOCLEAN® (II).

- Always position the BIOCLEAN® (II) coating on the outside of the window.
- Limit as much as possible the use of silicone during assembly (blocks, grease joints, mastics, glues, lubricants, etc.) and avoid any direct contact between the silicone mastic and the coating. Please refer to product list compatible to avoid any function passivation after installation.

6.3.1. Seal between glass and frame:

- Extruded seals (EPDM, TPE, PVC, etc.)
  - Use seals with no silicone lubricant. In fact, silicone oils migrate and cause an edge effect on the glass with a loss of functionality across several centimetres.
  - The co-extruded or pre-integrated seals in the PVC profiles are usually compatible with BIOCLEAN® (II).
  - Where a silicone seal has to be used, make sure that all grease is carefully removed.

6.3.2. Extrudable seals (humid mastics):

- Do not use silicone mastic to create a seal as it contains oils which migrate and reduce the efficiency of the BIOCLEAN® (II) function.
- Do not use linseed oil mastics.

The list of seals which are compatible with BIOCLEAN® (II) is available from our sales department

7. CLEANING ONCE WORK HAS BEEN COMPLETED

For the initial cleaning, please follow the maintenance and installation instructions which are available from the Saint-Gobain Glass sales department.

8. CLEANING IN ROUTINE (INFORMATION FOR FINAL USER)

BIOCLEAN® (II) are not 100% “maintenance-free” product.

For instance, it is not recommended to install BIOCLEAN® (II) front to sea with potential salt pollution. Indeed, salt will block UV radiation action on the coating and therefore limit his efficiency. Another example can be given in case of punctual building work with important generation of dust. Recovery of 100 % efficiency is possible with an occasional cleaning.

Should the glass require occasional cleaning carefully follow these instructions:

Cleaning equipment required: A soft, clean lint-free cloth or chamois leather or a clean, soft non-abrasive sponge or a clean non-metal window squeegee. All equipment must be kept clean. This is to prevent any dirt or abrasive particles transferring from the equipment back onto the glass which may scratch or damage the coating.

Cleaning products: Clean water is normally enough. Standard, mild glass-cleaning products canal so be used (visit www.selfcleaningglass.com to view our list of recommended cleaning products). ‘Soft’ water is best for cleaning glass. In hard-water areas a small amount of washing-up liquid can be used to soften water.

Important: Do not use any glass treatment products containing silicones or abrasive particles. Do not use any commercial cleaning products which are intended specifically for cleaning elements other than glass. Do not use chemical products: soda, bleach, washing powder, white spirit etc. Avoid contact with all sharp or abrasive objects including jewellery, buckles, tape measures, azor blades, Stanley knives, scouring pads, steel wool, sandpaper etc.- Never attempt to clean off a specific mark on the surface of BIOCLEAN® (II) without applying water first.

9. PROTECTION, CLEANING AND MAINTENANCE OF THE END PRODUCTS

9.1. Protection of the glazing during building works

As for other glass products, it is important with BIOCLEAN® (II) product to respect the following:

- In order to avoid damaging the glass with aggressive contaminants from site-works (e.g. paint, plaster, mortar…), it is recommended that glazings are installed after all other work on site has been completed. In case this cannot be respected, efficient protection of the glazing, by means of polyethylene film for instance, must be put in place;
- Minimise, as far as possible, the amount of time that the glass is stored on site prior to installation;
- Follow the usual recommendations: store in a dry, well ventilated location, protected from adverse weather conditions and variations in temperature and humidity;
- Avoid splashes of concrete, plaster, mortar residues as much as possible. To prevent a chemical attack on the glass, such substances must be removed from the glass immediately. It is recommended that the glass is cleaned as soon as it is installed.
- Glazing and fixing techniques must comply with the recommendations of the relevant national standards. Glazing blocks, frame size and maximum frame deflection for double-glazed units are not specific to BIOCLEAN® (II) glass products.

9.2. Removal of labels and markings

On cut-sizes, the label is to be found on the face opposite to the coating.

The identification labels on the glass sheets must be removed before or immediately after installation. Do not use sharp tools for this purpose. Acetone and alcohol are the approved solvents.

To indicate the presence of the glass sheet, do not use materials such as lime, chalk or soap on the coating. If warning signs must be placed, we suggest fixing a notice or streamer to the frame, making sure they do not touch the glass.

9.3. Cleaning and maintenance

Alkaline products may be emitted from concrete, plaster, mortar... Such materials or materials containing fluorine and acids will lead to a staining or matting of the surface. To prevent such an occurrence, all such substances must be removed from the glass immediately. It is recommended that the glazing is cleaned as soon as it is installed.

Cleaning means: washing, rinsing and drying the glass. A mild soap or neutral detergent can be used, and subsequently and immediately rinsing with clear water. Excess water must be removed quickly. Washing tools and towels must be free of abrasive particles. Never use abrasive cleaning products or compounds likely to generate fluorine salts or hydrofluoric acid.

Grease, oil and materials used for facilitating the installation must be removed. The materials recommended for cleaning the coating are isopropanol (IPA) or ethanol. Cleaning with the help of solvents must be immediately followed by normal washing with water and rinsing.

The owner of the building must ensure the regular and proper maintenance of the glass. This entails washing the windows, checking and if necessary repairing joints and frames, checking and, if necessary, unclogging the drain and ventilation holes and detecting any anomaly.

10. DISCLAIMER

SAINT-GOBAIN GLASS has taken every reasonable measure to ensure that the information contained in the present leaflet was exact at the time of its publication.

However, SAINT-GOBAIN GLASS keeps the right to modify or add any information without previous notice. SAINT-GOBAIN GLASS is not liable for the possible lack of information on BIOCLEAN® (II) products that would not be contained in the present document.

No claim can be accepted for damages caused during and after processing due to a lack of adherence to these guidelines. Therefore, glass processor should ensure that the process is adapted for coated glass and that the quality control is relevant to detect any quality problem as soon as possible. In case of claim, samples will be required and a visit from a SGG representative may be requested.

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