VISION-LITE® / VISION-LITE II®

Processing Guidelines

SAINT-GOBAIN

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1. GENERAL

1.1. Product description

VISION-LITE® is a coated glass with very low reflectance (1%). According to the product reference, it is available in annealed monolithic with coating on one or two sides or laminated with coatings on both sides (see below). VISION-LITE® is produced on DIAMANT® base glass for architectural applications.

The two exterior sides of the glass have a transparent coating of oxides or a coating of metallic nitrides which, by reducing the reflectance of the glass surface, enhance the glass transparency and visibility of objects seen through it.

As compared to the standard glass, VISION-LITE® has:

- Higher transparency
- Extremely low light reflectance
- High light transmittance
- Very high colour contrast

VISION-LITE® II is the to-be-tempered version, it can be toughened, heat-strengthened or curved**.**

The VISION-LITE® range includes the following types of products:

- **SEMI VISION-LITE®** monolithic glass - with coating on one side of the glass only, intended for lamination.
- **STADIP VISION-LITE®** laminated glass - with two SEMI VISION-LITE® sheets assembled by means of one or several PVB layers. The sheets are assembled so that the coating is on the exterior, therefore the laminate has coatings on both sides.
- **VISION-LITE® II** monolithic glass - with coating on both sides of the glass, meant to be tempered
- **SEMI VISION-LITE® II** monolithic glass - with coating on one side of the glass only, intended for tempering then lamination.

VISION-LITE® & VISION-LITE® II can be used in single or double glazing unit.

VISION-LITE® is mainly used in retail shops and museums as display case glazing, and in exteriors as shop windows or balustrades. VISION-LITE® can also be used for other specific external applications like lobby / ground floor glazing and roof-top restaurants. **VISION-LITE® is however not recommended for façade projects, including multi-storey shop windows.**

VISION-LITE® II is recommended for specific applications requiring tempered glass, it can be used as external glazing on limited surface. Building applications of VISION-LITE II® must be assessed depending on the project. **VISION-LITE® II is not recommended for high rise front façade (curtain wall).** Contact your sales representative for more information.

VISION-LITE® & VISION-LITE® II cannot be mixed on the same glazing surface.

VISION-LITE® range meets the requirements of Class A products as defined in the European standards EN1096-1 and EN1096-2. The efficiency of the anti-reflective effect will be maximum in the simple glazing.

For complete performance data, please refer to the Glass Guide, our commercial documentations and our website www.saint-gobain-glass.com.

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

VISION-LITE® range products 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

VISION-LITE® range complies 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;

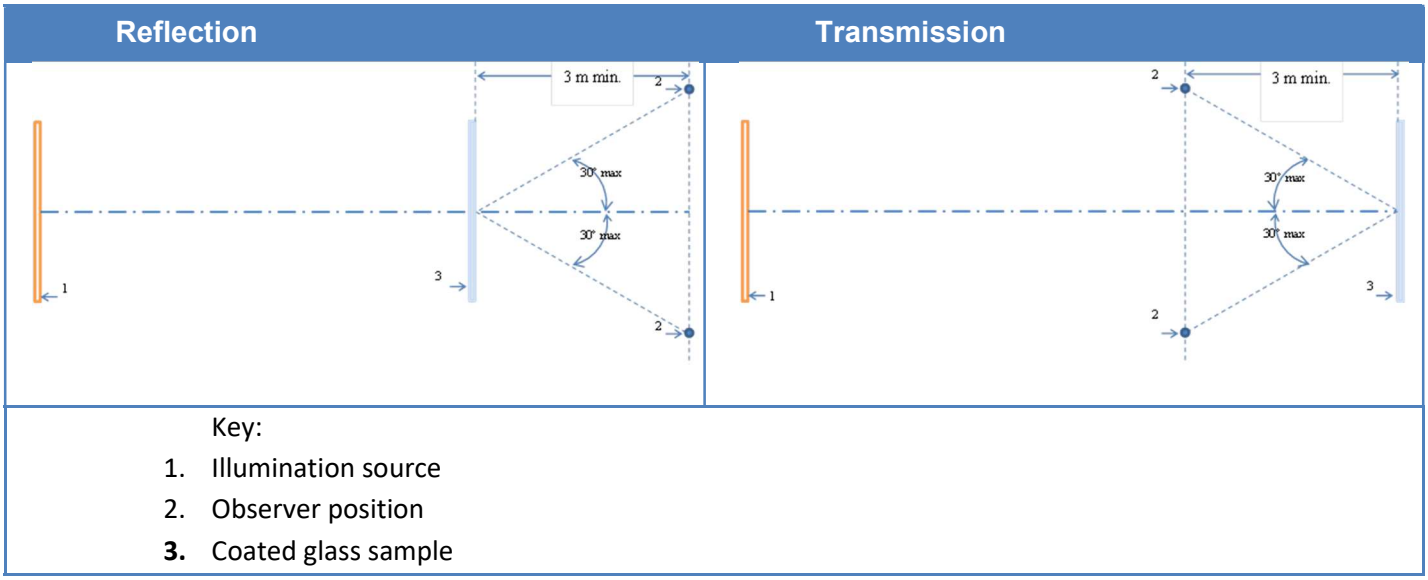
- **Cluster:** accumulation of very small defects giving the impression of stain.

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°."



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

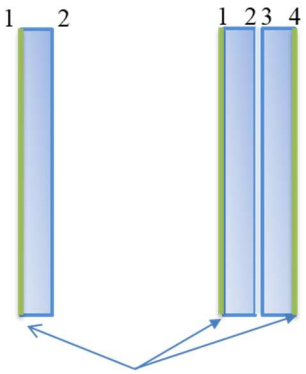
» *Monolithic glass / laminated glass*

VISION-LITE® is a class A coated glass product (as per EN 1096-1 definition). The anti-reflective coating must always be positioned on face 1 of the glazing and for maximizing anti-reflective effect it must be also present on face 2 of the pane.

This coated glass can be laminated taking care to always place the coating outside of the laminate. Use of the coating against the PVB is not allowed.

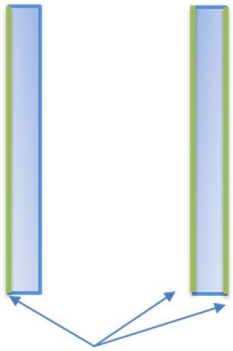
Possible configurations of use:

Laminated glazing VISION-LITE®



(Semi-)VISION-LITE

Tempered glazing VISION-LITE® II



(Semi-)VISION-LITE II

Important:

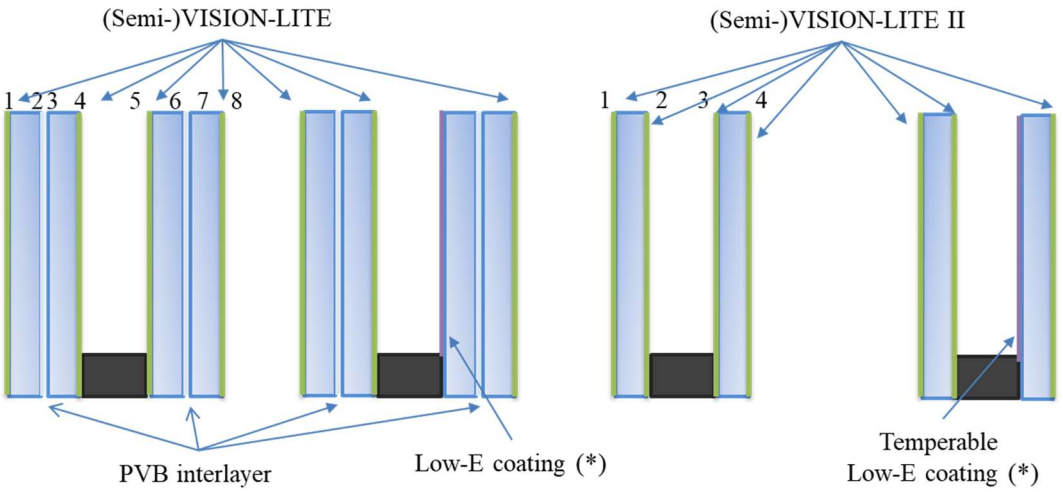
As any coated glass, VISION-LITE® glazing must come from one production campaign only on the same building project.

» *Insulating glass unit (IGU)*

VISION-LITE® range can be assembled in DGU. The coated glasses must always be positioned on face 1 of the glazing and to maximise anti-reflective effect be also present on other faces of the IGU (for instance face 2-3-4 for double glazing unit).

VISION-LITE® & VISION-LITE®II cannot be mixed on the same DGU.

Possible configurations:



For enhanced thermal insulation, VISION-LITE® & VISION-LITE® II can be combined with low-e coatings, to be positioned on the inner sheet of the inner panel.

For (Semi) VISION-LITE® (annealed version), the inner sheet of the inner laminated panel can be replaced with a low-emissivity coated glass like PLANITHERM® XN or ECLAZ® for instance.

The association of Semi VISION-LITE® with other low emissivity coatings must be assessed case by case, please contact your sales representative.

For VISION-LITE® II dual coating (tempered version), the inner side of the inner panel can be coated with PLANITHERM® UN II.

Important:

Combination with low-e coating can induce a very light color change in transmission and reflection of the glazing, for specific applications it is strongly recommended that a sample is viewed in the intended location.

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

Annealed and heat-treated versions of a product are **not** mixable on the same surface.

Saint-Gobain Glass cannot be held responsible of colour mismatch due to the mixing of annealed and tempered glazing on a same façade.

For any other combination, contact your local Saint-Gobain commercial representative.

1.5.2. Identification of the coated face

Anti-reflective coating detector can be used for correct detection of the coating position. Be sure to have a calibrated detector. One example is showed on picture below. Contact either your local “Technical Support Manager” (TSM) or local sales service to obtain such a detector.

When using a label in order to identify the VISION-LITE® range product during processing and installation, it is mandatory to use electrostatic labels which do not leave traces upon sticking. **No metallic tool must be used to remove labels**, as the risk to damage the coating is very high with such tool; it is recommended to use soft tool like Teflon tool for removing traces of labels.

2. TRANSPORT, ACCEPTANCE, STORAGE AND HANDLING

2.1. Transport

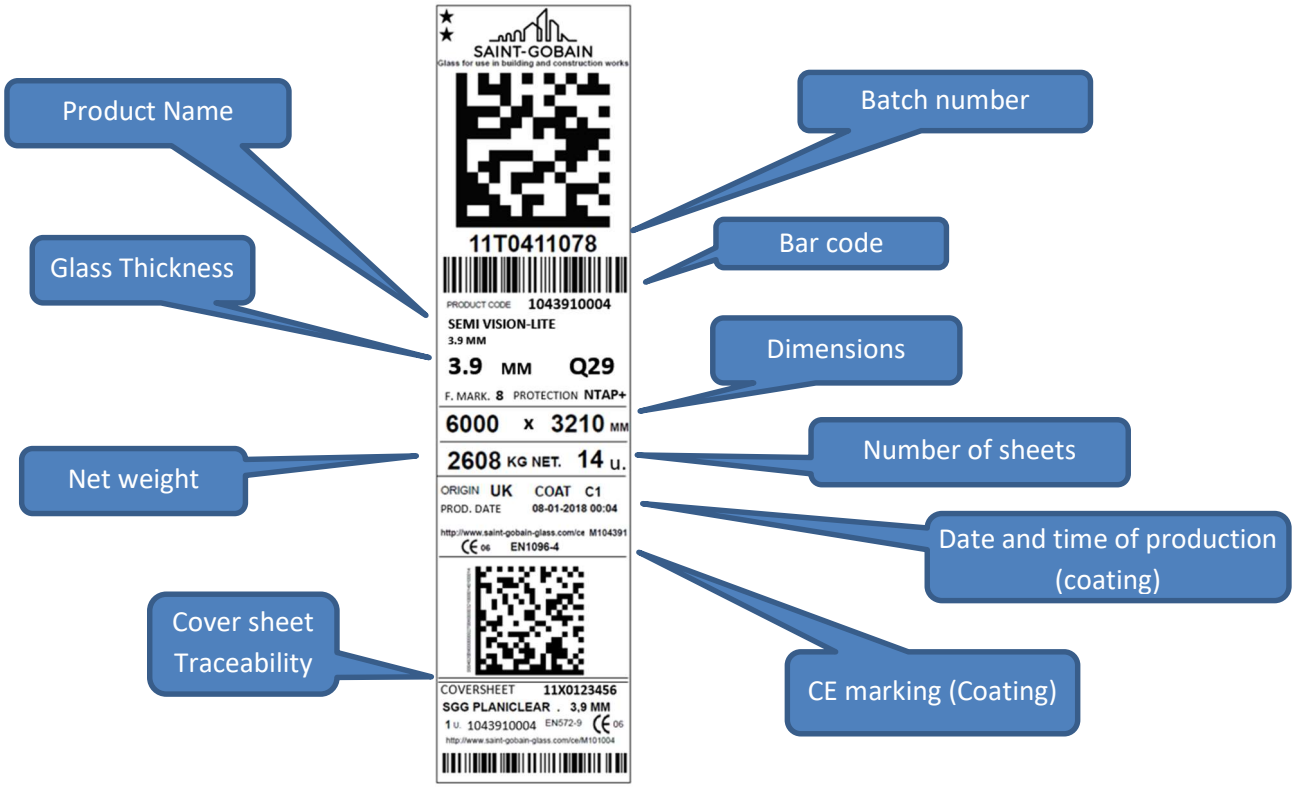
- Coated glass sheets are usually transported in 2.8 tonnes packs (jumbo or split sizes).
- Glass sheets must be transported vertically;
- The individual sheets are packed with the coated side towards the inside of the frame unless otherwise requested by the customer;
- The glass panes never come into direct contact with each other: the glass sheets are always separated by neutral polymeric powder;
- Each coated glass pack contains at least one protective sheet (clear glass) to protect the coating from contact with the stillage dossier or cardboard separators. The nature of this protective sheet will depend on the glass ordered (laminated or monolithic). In case of VISION-LITE® II, two protective sheets (clear glass 4 mm) are used on each side of the pack;
- 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.

- 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 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 Saint-Gobain Glass representative may be requested.

2.3. Storage

2.3.1. General

All glass products may be degraded (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.

VISION-LITE® range glass sheets must be stored, as float glass, vertically (at 3 to 7 degrees) under the following conditions:

- 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, VISION-LITE® range is guaranteed **for 2 years from the date of reception** at the customer's premises. In case the date of reception is lost by the customer, the date of the delivery note will serve as evidence.

2.4. Handling

- VISION-LITE® coated glass sheets must be handled with dry, clean and 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.
- Always avoid fingerprints and dirt traces which would require an additional cleaning of the coating. If necessary, the coating may be gently wiped with a soft dry cloth and a suitable solution (e.g. isopropyl alcohol (IPA)).

Scratches on the coating which occur during handling and processing, if the instructions of this guideline are not respected, are visible when looked at from an incident angle (in reflectance). They are much more visible than on the PLANICLEAR® clear glass. **Wearing gloves is mandatory** and all equipment should be well maintained (without frictions on the coating layer).

3. PROCESSING OF VISION-LITE® RANGE

In general, and to be considered for all steps of processing, it is important to check whether the installation is equipped with glass sensors functioning by detecting the glass reflectance to signal the glass presence.

In fact, the very low reflectance of the VISION-LITE® range glass may not be detected by the sensor and therefore it may not send the information to the equipment. This could generate inappropriate situation and by anticipation **sensor adjustment may be required and should be checked.**

Here are examples of online sensors that works to detect correctly Vision-Lite:

- OMRON E3X-DA41-N
- PANASONIC SUNX cx-421-T

3.1. Handling on the production lines

All the recommendations outlined in § 2.4 remain valid.

- Ensure, as much as possible, that the coating does not come in contact with guide rollers on the line; the coating must be turned towards the operator when facing the line. If it has to go through, make sure the conveying belts are perfectly clean and free from any abrasive material / particle;
- 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 greasy substances;

3.2. Glass cutting

VISION-LITE® range 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;
- 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;
- As coating could face the table, **cutting table must be thoroughly cleaned from all particles** of glass or other material; cleaning must be maintained throughout the cutting process. For the glass with coating on one side only (intended for lamination), the coating must not come into contact with the table, but be on the upper side of the glass.
- If the installation is equipped with rollers for conveying the glass sheets, the rollers must be regularly inspected to check whether they move. **A blocked or malfunctioning roller may scratch the anti-reflective coating**.

- 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.

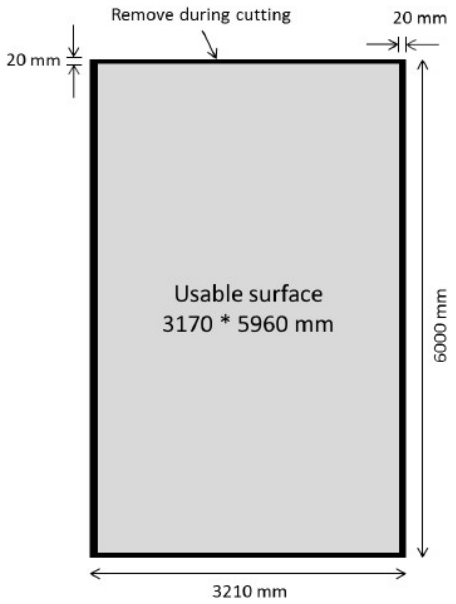
This is especially important with glass of different dimensions. Do not put additional separating powder.

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.

For VISION-LITE® II only (dual coating ‘to be tempered’ version):

- In order to ensure the homogeneity after tempering, it is necessary to remove 20mm all around the plate at the cutting step. The usable surface is therefore 40mm smaller than the full plate in both directions: for instance, with 3210×6000 mm² PLF, the usable surface is 3170×5960 mm².



3.3. Edge deletion

VISION-LITE® range does not need to be edge deleted whatever the configuration of use. It could be used with polysulphide, polyurethane or silicone IGU sealants in respect of plant control plan.

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.

Edge-working machine must be thoroughly cleaned before working with VISION-LITE® range, especially the parts coming into contact with the glass. The conveyor rollers must not slip on the glass (must not be blocked). Water in the self-contained circuit of the edging machines must be regularly changed at short intervals, in order to avoid charging the water with residual from edging.

- 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. Not damaged, hardened belts are recommended. Low belt pressure adapted for coatings is recommended.

3.4.3. 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). For special glazing application (e.g. spider glass) the 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**.

3.5. Washing

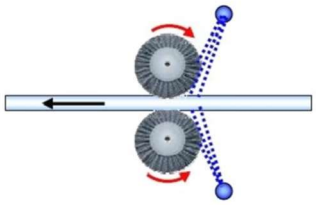
The glass must be clean immediately after edge working (whatever the process uses) to avoid polluted drying marks to remain on the coating. In case VISION-LITE® range is submitted to several processing steps (edge working + drilling +…) each of them followed by washing, it is recommended to pass the 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;**
- Compatible rotation speed with soft coatings

- 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, for VISION-LITE® or VISION-LITE® II, **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.**
  For instance, pollutions left on the coating may induce at tempering hot corrosion (giving the aspect of pinholes) of the coating. Such marks may not be washable.
  Also, even in case of annealed version, there is a risk that residues will be not eliminated during final washing.

3.6. Tempering / Heat-Strengthening

3.6.1. General

VISION-LITE® II (and only the 'to be tempered' version) can be heat-treated to get a tempered / heat-strengthened coated glass.

3.6.2. Prerequisites for tempering / heat-strengthening

The cleanliness of VISION-LITE® 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.

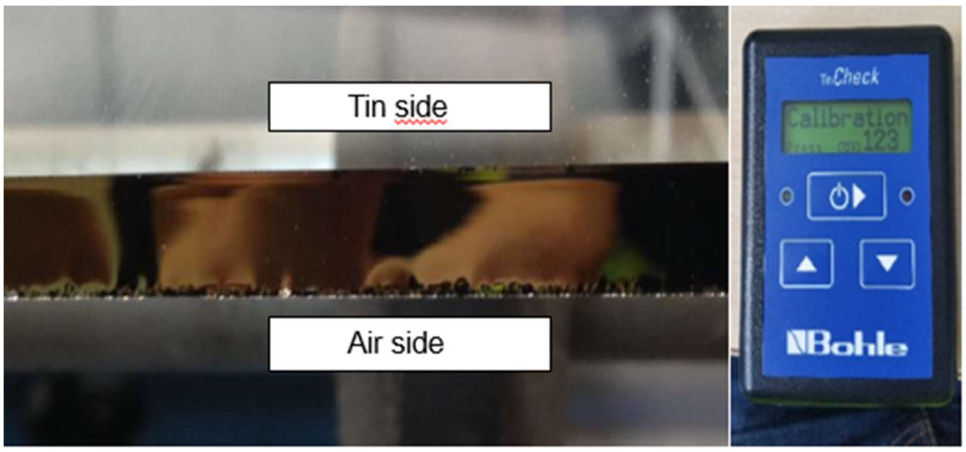
3.6.3. Toughening instructions

Generally speaking, VISION-LITE® II can be toughened using oven settings that are suitable for standard clear glass. The exact settings being of course furnace dependent 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.

Hereafter are some additional instructions:

- As VISION-LITE® II presents both faces with anti-reflective coating, the rollers and Kevlar® quality must be checked in detail.
- Tin side must be placed upwards and as a consequence air side will face rollers. Experience has shown that the sensitivity to overheating is more pronounced when air side is down – this allows more flexibility in the adjustment of the tempering recipe.

The tin side and the air side of the VISION-LITE® II can be identified on the cutting table by looking for the cutting line on the edge of the jumbo which is coming from the cutting wheel of the float line (air side). Tin check from BOHLE in calibrating mode could be used too (lower value = air side), advantage of the tool it that it could be used and works after grinding step and loose of face traceability. In case of need of support, contact your local TSM.



- At description in introduction of part 3, if the furnace is equipped with a glass detection sensor functioning by detecting the glass reflectance in order to signal the glass presence, this must be in certain situations used manually; in fact, the very low reflectance of the

VISION-LITE® II glass may not be detected by the sensor and therefore it may not send the information to the equipment.

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

3.7. Heat-Soak testing

Heat-soaking toughened VISION-LITE® 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.

3.8. Bending

VISION-LITE® II can be curved annealed (sagging process) or tempered (in tempering furnaces fitted with a bending cell). Not all curvature radius 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.

SEMI VISION-LITE® (annealed version) cannot be curved.

3.9. Enamelling

Once again, the cleanliness of VISION-LITE® II coating before entering the enamelling process is important.

VISION-LITE® II may be fully or partially enamelled using screen printing technique. Given the variety of enamelling products, different operations and practical experiences, each processor should carry out tests with its own equipment. It is processor responsibility to validate enamel material compatibility with the layer and its adherence must be previously checked.

It is recommended that any offer for the possible supply of enameled VISION-LITE® II be subject to previous acceptance by the client of samples produced in the operation concerned.

Only enamel without lead content may be applied.

3.10. Handling of heat-treated glass

Following toughening / heat-soaking or heat-strengthening, each pane should be separated with pads. It is also possible to stack the individual panes with strips of 2 mm thick polyethylene – stretch – foam film (in that case, particular care should be taken when stacking different glass dimensions).

- Glass panes must be stored vertically (at 3 to 7 degrees) under the following conditions:
  - In a dry, well ventilated store, to prevent any condensation on the surface;
  - Protected from rain and running water (any roof leaks must be rectified);
  - Never outside or in the open air;
  - Protected from wide changes in temperature and humidity levels (store coated glass products far from opening doors).
- Clean, dry and soft gloves must be worn for all handling.
- In case heat-treated VISION-LITE® II is assembled into double-glazed units, this should be performed within 2 days.

3.11. Lamination

SEMI VISION-LITE® for annealed laminated glass or tempered SEMI VISION-LITE® II only can be laminated with the coating outside the sandwich. It means that the lamination is always carried out on the glass (uncoated) side. Never have the anti-reflective coating on the interlayer side.

- 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 no particles of glass). 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 furnaces or autoclaves.
- Apply the standard autoclaving cycles. Use dry spacers (example: wood) or protected spacers.
- When laminating heat treated SEMI VISION-LITE® II, it is important to 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. 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.

3.12. 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 VISION-LITE® range, please follow the handling, cutting, and washing instructions detailed above.

Important focus on drying marks and possible unwashed residues must be done. Indeed, all traces will be more visible on antireflective coating than standard float glass. **Good efficiency of the washing and drying at IGU line should be controlled regularly**.

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

- As for other processing steps, no roller blocked should mark the coating face against rollers.
- Any traces of sealant remaining on the coating after application must be removed immediately before they harden. They can be cleaned off using a neutral product for windows and soft paper or a soft cloth, or with a clean rubber scraper.
- All types of secondary seal can be used (polyurethane, polysulfide, silicone and hot melt). Check with the sealant supplier that a particular reference has been validated with VISION-LITE® (II).

3.13. 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.

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

VISION-LITE® (II) coated glass products 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 VISION-LITE® range glass products.

6. PROTECTION, CLEANING AND MAINTENANCE OF THE END PRODUCTS

6.1. Protection of the glazing during building works

As for other glass products, it is important with VISION-LITE® range glass products 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 VISION-LITE® range glass products.

6.2. Removal of labels and markings

- Use of semi-permanent stickers (1-3 months) with vinyl frontal and acrylic adhesive is possible. This kind of label represents main part of the label market. Label should not let residues or at minimum residues easy to remove with water or with isopropanol.
- The identification labels on the glass sheets must be removed before or immediately after installation. **Do not use sharp/metallic tools for this purpose**.
- 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.
- Paint or strong stickers like used for promotional events must not be applied on VISION-LITE® range. Above recommendations have to be considered.

6.3. 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. Use of plastic squeegee is possible, just be sure to not have abrasive parts blocked in it.

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.

7. 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 VISION-LITE® (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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