SAINT-GOBAIN

MIRASTAR®
GLASS WITH MIRROR EFECT

EDITION 11.2025

SAINT-GOBAIN GLASS

Document code: SGG-QD-C-GUI-0008-E
Date: 10/2025

TABLE OF CONTENTS

1. General

1.1. PRODUCT DESCRIPTION

MIRASTAR® is a coated glass manufactured by magnetron sputtering deposition, exhibiting mirror-like aesthetics. Thanks to its composition, MIRASTAR® glass can withstand a wide variety of processing steps (such as lamination, edging, drilling, tempering…) which will be described in more details in this document, while exhibiting an enhanced chemical durability (Class A coating as per EN 1096-1 standard). MIRASTAR® range is available on PLANICLEAR substrate.

MIRASTAR® glass is intended to be used in monolithic for interior applications. It benefits from high resistance to corrosion and can be tempered to bring safety performances by tempering, thus it can be used as doors, wall partitions, mirrors, furniture.

MIRASTAR® is ideal for use as spy-mirror. Thanks to its shifting design effects depending on light conditions, it can be transparent or reflect light like a mirror. Used as space divider or shower screen, it ensures privacy on one side while maintaining vision on the other. It can also be used to create light effect on furniture pieces. A more specific application for MIRASTAR® is the infinity mirror, creating a LED tunnel effect within the mirror reflection.

MIRASTAR® is not intended to be used for external vision glazing such as windows, in façade or entrance doors.

It can however be used in such applications for decorative effects e.g. in spandrels, balustrades, etc.

This product is a Class A product as per EN1096-1 standard. 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.

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

MIRASTAR® is 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

MIRASTAR® complies with EN 1096-4 harmonised European standard for coated glass. The “Declaration of Performances” (DoP) of the products are available on the CE-marking section of Saint-Gobain Glass web sites.

1.4. QUALITY CRITERIA

1.4.1. Defect types: definitions

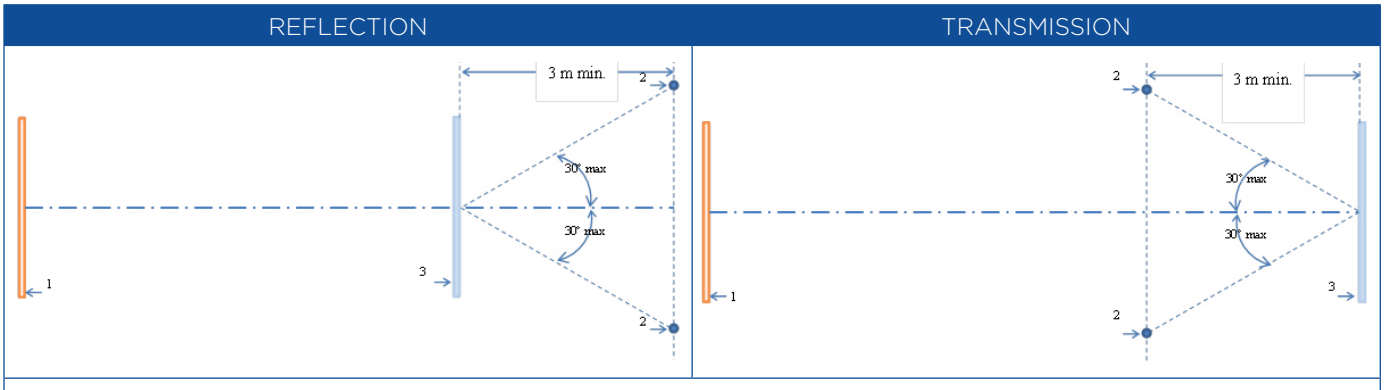
Coated glass defect types are listed and defined in EN 1096-1 standard. The following definitions are extracted from this norm:

- **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

Except for the special case of punctual defects, which will be discussed below, and 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)

1.4.3. Punctual defects observation conditions and acceptance criteria

Pinhole generation is inherent to the production process and cannot be totally avoided.

MIRASTAR® being dark coatings, pinholes may produce a high contrast with reference to the surrounding coating.

MIRASTAR® is then specified with tighter acceptance criteria than those required by the standard. Those acceptance criteria, along with the observation conditions are summarized in customer specification reference SGG CS – 005 which can be obtained on request from your local sales service. The acceptance criteria are also summarized in table 1 and observation conditions on figure 2.

DEFECT SIZE (mm)	ACCEPTABILITY CRITERIA
Ø ≤ 0.3	Not considered
0.3 < Ø ≤ 1	No aggregates (i.e. no more than 4 within a 20 cm circle). Maximum 10 defects/m^2
1.0 < Ø ≤ 3.0	No aggregates (i.e. no more than 4 within a 20 cm circle). Maximum 1 defect/m^2
Ø > 3.0	No defect

Table 1: Punctual defects acceptance criteria for MIRASTAR®

The density of defects should not vary by much upon tempering and shall remain in agreement with the above acceptability criteria. In case a large amount of defects is created during this processing step the customer is kindly requested to contact Saint-Gobain Glass technical assistance to evaluate the possible influence of tempering process parameters.

Assistance of Saint-Gobain Glass technical support is recommended for the first use of MIRASTAR®, and qualification is mandatory when MIRASTAR® processing includes tempering phase.

Those criteria apply under the following observation conditions: a mat grey screen with a 500 cd/m^2 luminance is placed 3 m behind the glazing to be observed. Cut sizes are inspected in vertical position, the observer being placed 1.5 m away from the glazing and looking perpendicularly through it. The inspection time is limited to 20 s/m^2. The identified defects are marked and measured thanks to a scaled optical magnifier or any other means precise enough to measure the defect size.

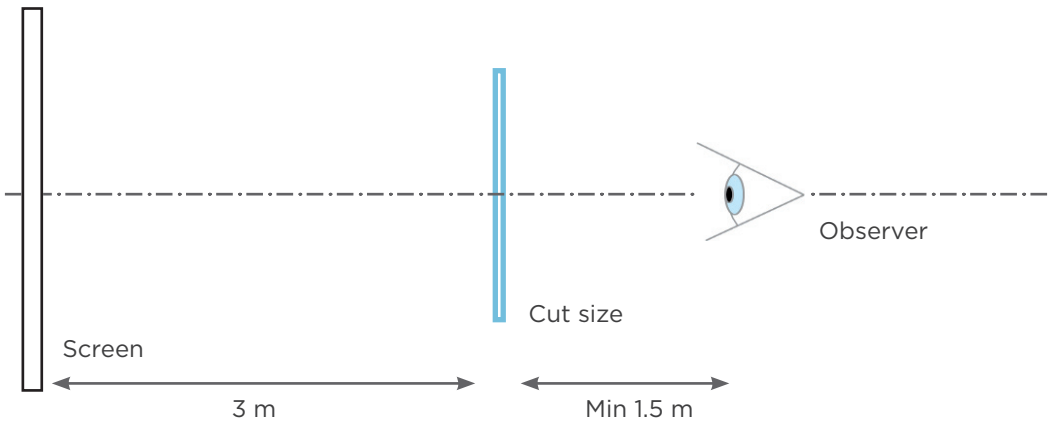
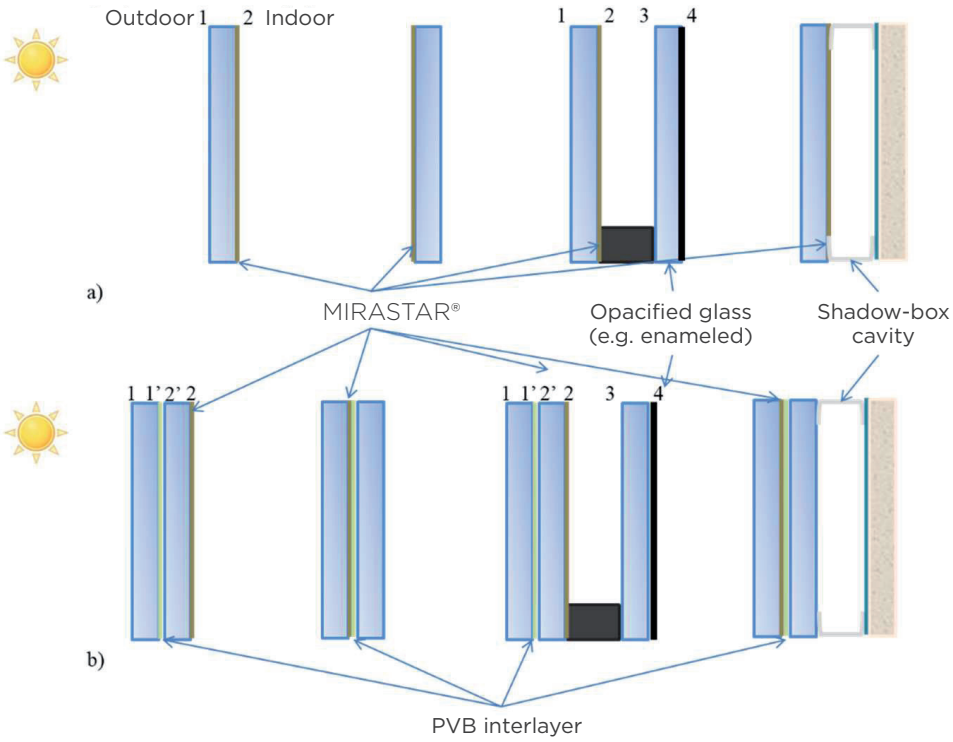


Figure 2: MIRASTAR® standard observation conditions for punctual defects characterisation

1.5. POSITION OF THE COATING AND IDENTIFICATION OF THE COATED FACE

1.5.1. Position of the coating

MIRASTAR® could be used in monolithic glass, tempered or not. MIRASTAR® can be used in DGU and laminated glass. The coating can be positioned inside or outside, integrated or not in one DGU.



- **Monolithic glass**

MIRASTAR® range is a class A product (as per EN 1096-1 definition). It can then be used with the coating facing the outside or the inside of the building. In case both orientations can be freely chosen, always prefer the coating placed towards the inside as it is usually less prone to shocks or direct contact with aggressive material (wind born dust / particles, hail…). It should be ensured that the same side always faces the outside (or the inside) in order to avoid colour mismatch.

In the case of monolithic use in spandrels, MIRASTAR® range can be positioned on face 2. However, one has to ensure:

- An efficient system of draining or ventilation (in case of prefabricated panels) is foreseen to avoid accumulation of water or condensation to occur on the coated side.
- Direct contact on the coating of corrosive materials, or materials likely to emit corrosive vapours with the action of heat (acids, ammonia, mortar water, acetic-curing silicones, among others) is prohibited.

- **Insulating glass unit (IGU)**

MIRASTAR® can be assembled in IGU, for spandrel glazing for instance when no "see-through" applications are intended. In that case, the coating should be placed on face 1, 2 or 4 of the IGU. As written above face 2 or face 4 applications should be favoured whenever possible. Whatever the face chosen for the coating, it should be ensured that the same side always faces the outside (or the inside) in order to avoid colour mismatch.

MIRASTAR® cannot be used in external vision insulating glazing (windows, façade, entrance doors). But it can be used for decorative effects (in spandrels, balustrade…).

- **Laminated glass**

MIRASTAR® can be placed inside (against the PVB) or outside the laminate. However, the final rendering will not be the same (visible colour differences) according to the position of the coating. It should then be ensured that the chosen position of the coating will remain the same throughout a same project to ensure colour consistency. The list of validated interlayers is given in document SGG-TI-01 which can be obtained on request from your local sales service.

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

The heat-treatment process of MIRASTAR® may slightly modify the optical characteristics of the product (coated side), including colour and reflection. Mixing annealed and heat treated versions of MIRASTAR® is therefore not recommended.

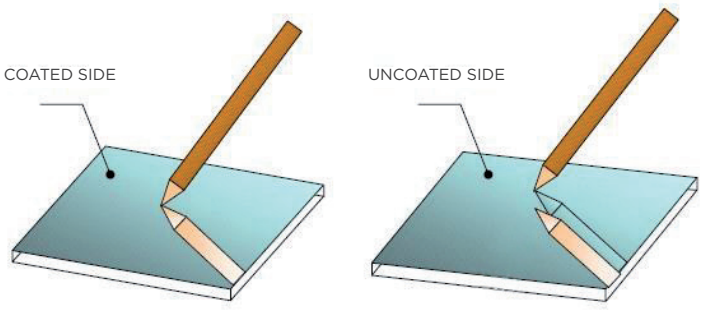
However, if the combination is still foreseen on a project, the following must be ensured:

- 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

The coated side of MIRASTAR® range is readily detected by means of the pencil point test, the coating having a substantial reflection. When proceeding to this, care must be taken not to scratch the coating.



2. Transport, acceptance, storage and handling

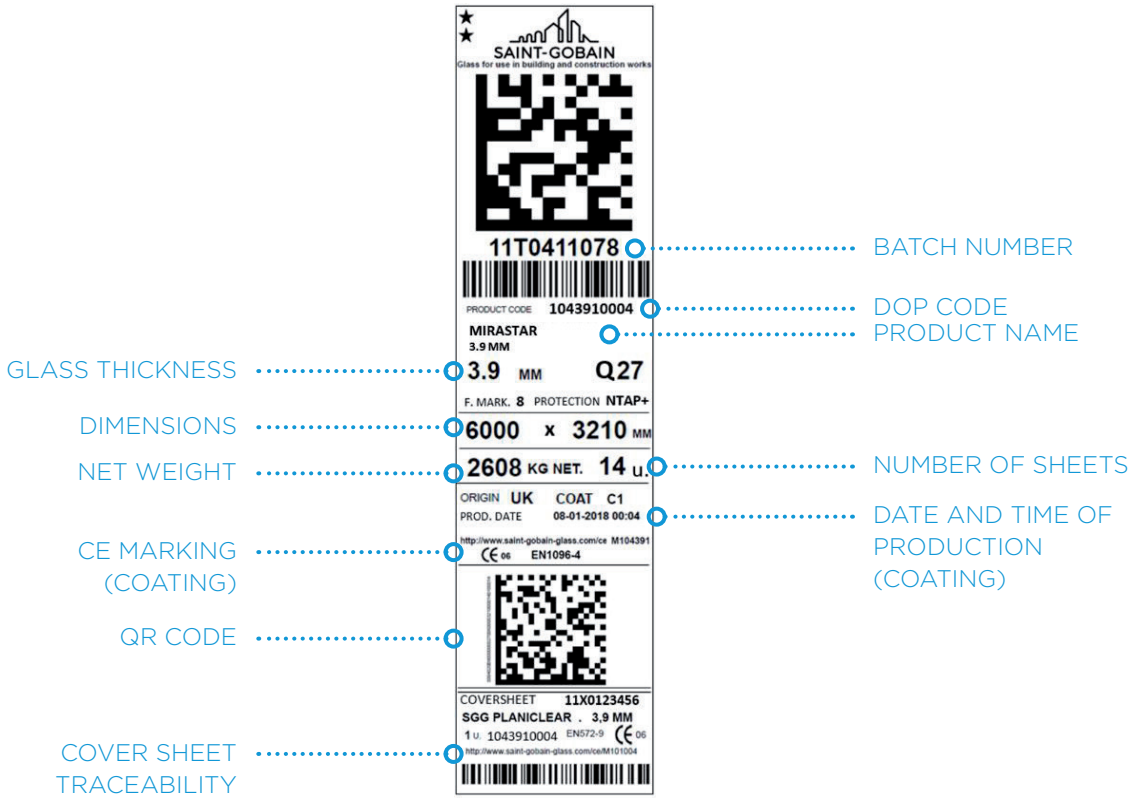
2.1. TRANSPORT

- Coated glass sheets are usually transported in 2.8 tonnes packs (jumbo or split sizes).
- Glass sheets must be transported vertically (at 3 – 7 degrees from the vertical);
- 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 MIRASTAR® range 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 – 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.

- Every pack must be opened with care in order not to damage the glass sheets or the coating (contacts, scratches, etc.). Handling instructions on the packing must be respected, particularly the instructions for opening.
- All deliveries are identified with a label providing the following data:



- 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;

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 (local TSM or quality manager) 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.

MIRASTAR® 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 storage conditions are respected, MIRASTAR® range is guaranteed corrosion free:

- 2 years from the date of reception at the customer’s premises;
- 6 months following the reception, in the case MIRASTAR® range has to be tempered. 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

- MIRASTAR® range 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 airpermeable) 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. Do not place the coating in contact with a rough surface or hard objects.
- Do not place the glass sheet in a horizontal position with the coating in contact with the cutting table or conveying belts, rollers…
- 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 MIRASTAR® RANGE

3.1. HANDLING ON THE PRODUCTION LINES

All the recommendations outlined in above 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

MIRASTAR® 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;
- The glass must always be placed on the cutting table with the coating facing up;
- 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. The bead must not be wider than 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 or felt) 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:
    - Special 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.

3.3. EDGE DELETION

MIRASTAR® range does not need to be edge deleted whatever the configuration of use.

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 24 hours from cutting.

- 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). 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.

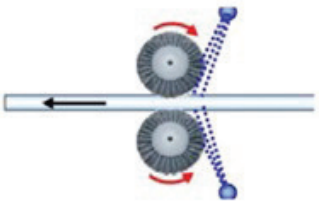
3.6. WASHING

It is recommended to wash the glass immediately after edge working. In case MIRASTAR® 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);



- Ensure that 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, MIRASTAR® 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 are not washable.

3.7. TEMPERING / HEAT-STRENGTHENING OF MIRASTAR®

3.7.1. General

MIRASTAR® can be heat-treated to get a tempered / heat-strengthened coated glass.

3.7.2. Prerequisites for tempering / heat-strengthening MIRASTAR®

As mentioned above, the cleanliness of MIRASTAR® 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 IPA (preferred) or ethanol 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

From a general point of view, toughening of MIRASTAR® range can be carried out using appropriately adjusted furnace settings. This will obviously vary depending upon the type of furnace being used. 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. It is good practice to carry out the heat treatment at reduced temperatures inside the tempering furnace, which has a positive effect on the appearance of the final product. Also, the glass should only be loaded into the furnace once the machine has reached the set temperature level.

- The sheets are always toughened with the coated side upwards, never place the coating against the furnace rollers;
- The functional layers giving their properties to MIRASTAR® bring some low emissive characteristics to the product.
    - Radiation furnaces:
        - MIRASTAR® can be tempered with such furnaces. However, reaching a good final quality will be obtained to the expense of cycle time. Keeping the glass flat during the heating cycle may represent the main difficulty;
        - As the heat load received by the coating may be higher than in convection furnaces, any damage / coating pollution resulting from poor pre-processing could lead to degraded coating quality after tempering. Perfect adherence to the guidelines described above are thus of highest importance when working with such furnaces.
        - In any case, your local TSM should be contacted to set-up the appropriate settings;
    - Convection Furnaces:
        - Convection furnaces are recommended for the heat treatment of MIRASTAR®. Contact your local TSM for the adjustment of the appropriate settings.
        - Note: the high convection furnaces give much faster cycle times as well as improved optical quality of the end-product.
- The furnaces require frequent cleaning. Any dust (e.g. coming from edge-working or from enamelled or screen-printed glass) will increase quality defects like dust bands.
- Do not use SO_2 in the furnace when tempering MIRASTAR®. Do stop SO2 right in time. SO_2 may remain in the furnace for up to 48h.

3.8. HEAT-SOAK TESTING OF MIRASTAR®

Heat-soaking toughened MIRASTAR® 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 PTFC (e.g. Teflon) and contact with the coating should be limited to a minimum and located at the extreme edge of the glass.

Gas fired Heat-Soak-Test furnaces with direct combustion in the oven must not be used as hot fumes may damage the coating.

In general, and in order to limit possible spontaneous breakage phenomena, heat-soak test is recommended for all tempered glass even when the glazings are intended for indoor application.

3.9. BENDING OF MIRASTAR®

Saint-Gobain Glass cannot commit on the bendability (either annealed or tempered) of MIRASTAR®. The capability to supply bent MIRASTAR® glazing would be on the processor's sole responsibility

3.10. ENAMELLING AND SCREEN PRINTING OF MIRASTAR® RANGE

MIRASTAR® cannot be enamelled nor screen printed.

3.11. 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.

3.12. LAMINATION

- Lamination of MIRASTAR® can be performed with the coating placed outside or inside (against the PVB). However, the final rendering will not be the same according to the position of the coating. It should then be ensured that the chosen position of the coating will remain the same throughout a same project to ensure colour consistency.
  - MIRASTAR® coating in face 1' resp. 2' (on laminated glass n°1 resp. n°2) are not giving same aesthetical rendering view from exterior and this type of mix is not possible for a project.
- 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 MIRASTAR® take care that the PVB thickness is adapted as to compensate the possible glass deformation (roller wave, bow, edge lift) created during the heattreatment 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.

- Important note for the lamination of MIRASTAR® against PVB:

Saint-Gobain Glass, as the supplier of the coated glass, cannot guarantee that the adhesion of the laminated glass produced by the laminated glass manufacturer will meet the desired safety level. It is therefore the sole responsibility of the laminated glass manufacturer to check that the adhesion of the assembly corresponds to the level required for the final use of the product.

The list of tested films is contained in the document SGG-TI-01, which can be obtained on request from your technical service centre.

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 MIRASTAR®, 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 above.

- The coating should always face outwards on the production line to avoid contact with the guide rollers.
- 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 MIRASTAR®.

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.

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

MIRASTAR® 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 Safety Use Instruction Sheet (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 MIRASTAR® range glass products.

To fix MIRASTAR® in interior, it is recommended to use neutral glues & tapes for mirrors. It is the responsibility of the installer to perform a preliminary test to check good compatibility between the coating and gluing products (good adhesion and no aesthetic trouble).

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 MIRASTAR® 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 MIRASTAR®.

6.2. 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.

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.

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 glass, 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 MIRASTAR® products that would not be contained in the present document.

No claim can be accepted for damages caued during and after processing due to a lack of adherence to these quidelines. 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 a SGG representative may be requested.

SAINT-GOBAIN

SAINT-GOBAIN GLASS

ul. Szklanych Domów 1
42-530 Dąbrowa Górnicza, Poland

bgp@saint-gobain.com
www.saint-gobain-glass.pl