MIRALITE® EASYSAFE

Processing Guidelines

SAINT-GOBAIN

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1. GENERAL

1.1. Product description

MIRALITE® is a range of innovative mirror glass. It is produced by depositing on the glass a reflective silver coating which is protected from damage and corrosion. It meets the requirements from European standards EN1036.

A "safe" version named MIRALITE® SAFE can be proposed too. In addition to MIRALITE® brand, mirror is filmed to give additional safety properties.

An "anti-shatter" version named MIRALITE® EASYSAFE is available. During MIRALITE® PURE manufacturing, an anti-shatter top coat layer is applied onto the anticorrosion paint to give anti-shatter properties to the mirror without any additional filming needed at processing.

Product is for interior applications. 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 products. This could lead to improvement in the processability of our mirrors, so please make sure you have an up-to-date version of these guidelines.

1.2. Thickness, dimensions and tolerances

The complete product range including thicknesses and dimensions is available on Saint-Gobain Glass websites or through your local sales service.

1.3. CE-Marking

MIRALITE® complies with EN 1036-2 harmonised European standard called "Mirrors from silver-coated float glass for internal use". The **D**eclaration **o**f **P**erformances (DoP) of the products are available on the CE-marking section of Saint-Gobain Glass websites and at www.saint-gobain-glass.com/ce.

1.4. Quality criteria

1.4.1. Definition of visible defects

The following definitions are given by the standard EN 1036-1.

- **Optical faults:** faults directly associated with the distortion of the reflected image;
- **Reflective silver coating faults**: faults in the reflective silver layer which will alter the appearance of the silvered glass. They consist of scratches, stain, color spots and edge deterioration
- **Spot faults:** defect in the coating larger than punctual defect, often irregularly shaped, partially of mottled structure;
- **Linear defects:** scratches, extended spot faults etc.;
- **Brush marks:** very thin circular scratches that can hardly be seen and are associated with glass cleaning techniques;

- **Stain:** alteration of the reflective coating characterized by a more or less brownish, yellowish or greyish coloration of zones which can sometimes cover the whole reflective surface;
- **Edge deterioration:** discoloration of the reflective silver at the edge of the silvered glass
- **Protective coating faults:** faults where the metallic layer is exposed. They can be scratches or loss of adhesion of the protective coating;
- **Cluster:** group of not less than 3 spot faults, separated by not more than 50 mm;
- **Halo:** distortion zone around a spot fault;

1.4.2. Conditions of observation

The conditions of observation are given in the standard EN 1036-1. Please refer to it for details.

1.4.3. Acceptance criteria

Without prior agreement between both parties, the standard EN 1036-1 will apply.
In general, all defects visible on coating face and not visible on glass face are acceptable.

1.5. Reflectance and colour

For silvered mirrors, level of reflection complies with EN1036-1 standard. As described in the norm, level of reflection could be different between thin and thick glass. Moreover, silvered mirrors made from tinted glass have a reflectance lower than those made from clear glass.

As for any glass and in general, colour is also influenced by glass thickness. Colour is assed in built-in vertical state only.

2. TRANSPORT, ACCEPTANCE, STORAGE AND HANDLING

2.1. Transport

- The mirror sheets are usually transported with L-Racks, VEC, end caps…
- Glass sheets must be transported vertically (at 3 – 7 degrees).
- The glass panes never come into direct contact with each other: the glass sheets are always separated by neutral polymeric powder.
- During transport, violent and repeated shocks should be avoided as well as intensive breaking.
- When handling with a manipulator, care must be taken to not damage the pack.
- If the glass is wrapped and sealed, the seal should remain closed until the product is used in the factory;
- To avoid any damage during transport of MIRALITE®, avoid any contact between paint side and any standard transport material. Use of coversheet is a good practice.

2.2. Receipt of the delivery

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

2.3. Storage

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. The glass sheets have to be stored vertically (at 3 - 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 (e.g. any roof leaks must be rectified);
- Never outside or in the open air;
- Protected from wide changes in temperature and humidity to avoid condensation.
- Mirror package should not exceed 300mm, as it provides proper air circulation.
- Mirrors should never be placed with the varnish side facing each other's.
- Never close to heat sources, corrosive materials or vapour sources (chemicals substances, solvents, fuels, acids...).

3. PROCESSING

3.1. Handling on the production lines

The mirror sheets must be handled with dry, clean gloves.
In case you cannot avoid handling operations with vacuum cups, make sure that the vacuum cups are silicone free and perfectly clean.

Direct contact between painted face and rubber on trolley should be avoid. Don't use humid spacers that could degrade the coating face.

3.2. Cutting

Mirror is cut as normal float glass on glass side. However, the following recommendations must be respected:

- Cutting table should be clean:
  - Perfectly free of glass splinters or shards;
  - The conveying bands are perfectly clean and free of silicone or other greasy substances;
- 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;
- Fine glass splinters on the coated surface should not be wiped off by hand, but blown off by **dry and oil-free air**;
- During manual breaking and evacuation, limit the sliding of the glass on the table so as not to scratch the coating;
- 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.

3.2.1. MIRALITE® SAFE

For MIRALITE® SAFE, **angle of cutting wheel must be reduced about to 20°, cutting is done on film side** and cutting pressure is increased (equivalent to a glass 2mm ticker).

Cutting on glass side is possible but use of cutter present safety risk. There is high risk to create shells and scratches too. For these reasons cutting on glass side is not recommended.

3.2.2. MIRALITE® EASYSAFE

For MIRALITE® EASYSAFE,

- **angle of cutting wheel must be reduced about to 20°, cutting is done on anti-shatter top coat side** and cutting pressure is increased (equivalent to a glass 2mm ticker). Cutting on glass side not possible.
- **The following references from Bohle were tested and are recommended** to cut on anti-shatter top coat side providing increase of cutting pressure (equivalent to a glass 2mm ticker): 03A115M; 03A120M and 03125M all 5.6mm diameter wheels.

Good working should be checked directly on corresponding cutting machine / model. If necessary, contact your local Technical Support Manager – TSM to support and run some tests

In general:

- Make sure that the cut has no interruption. If necessary, reduce the cutting speed.
- If you face problems during automatic breaking, ensure that the glass cut is positioned at a distance of approximately 2 cm from the breaking bar.

3.3. 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.

- 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.

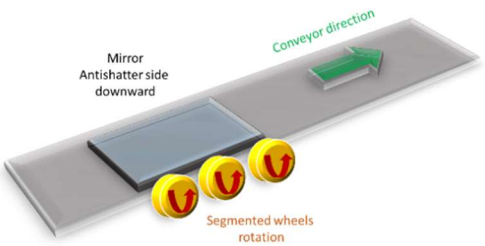
3.3.1. Manual Edge Working

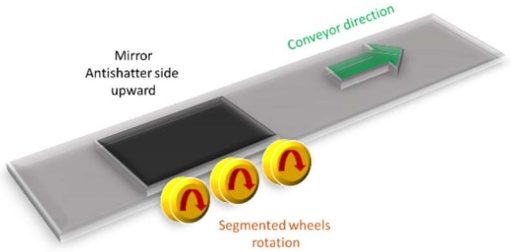
Generally carried out using manual cross belts to achieve arrissed edges (100 - 120 grit belts are recommended);

- 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 painted face.

3.3.2. 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. No damages of painted faced by unadjusted grinding wheel should be observed. **Use of segmented wheel for MIRALITE® SAFE and MIRALITE® EASYSAFE is compulsory** to obtain best edge quality. Grinding wheels should turn as drawn below to avoid any film or anti-shatter delamination during the process.





3.4. Drilling and sand-blasting

The drilling of mirror can be performed provided that the handling instructions are observed. Possible machine adaptations could be necessary to not generate defects.

MIRALITE® EASYSAFE can be drilled like standard MIRALITE® mirror.

The sand-blasting process is not possible with MIRALITE® EASYSAFE with traditional equipment. Please contact your local Technical Support Manager in case of questions.

For other MIRALITE®, the sand blasting is a possible source of damaging, thus following recommendations must be applied:

- Protection film should be applied on painted face.
- A first test with film supplier is advised to evaluate film compatibility with paint face. Criteria to validate a compatible film are **no glue residues and no paint damage**.
- No abrasive particles (glass/sand) should be trapped between the plastic film and the paint surface during the process
- Regular machine and conveyors cleaning
- Special care and attention to edges with paint is important, no degradation

If necessary, contact your local Technical Support Manager – TSM to support and run some tests.

Possible safety impact could not be quantified. So initial possible safety function is not guaranteed after both processing (drilling and sand-blasting).

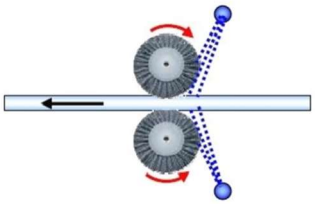
3.5. Washing

It is recommended to wash the glass immediately after edge working. In case product 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).

Tap water could be used for pre-washing, washing and rinsing itself. For sure, use of demineralised water is better and could avoid some residues. Important is to have regular maintenance and cleaning, to have also good drying (blowing installation with filters, clean filters) to avoid water remaining on the glass after drying process.

As general indication:

- 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. 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 glass after the washer, cleaning may be performed using a soft cloth and isopropanol (IPA) 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.

3.6. Tempering / Heat-Strengthening

MIRALITE® products can't be heat-treated to get a tempered / heat-strengthened coated glass. **Mirrors are not temperable**.

3.7. Lamination

MIRALITE® can't be laminated by glass processors in cut size or at their own responsibilities. No safety function is guarantee.

MIRALITE® STADIP version complying with EN14449 standard can be directly order to SAINT-GOBAIN GLASS, please contact your local sales representative. This is not applicable with MIRALITE® SAFE or MIRALITE® EASYSAFE.

Please refer to guideline for STADIP to process this final product.

3.8. Packaging

To pack and deliver MIRALITE®, good practice is to regroup all same sizes together. In case where different sizes will be stacked in same position, special care is important to avoid damages (scratches, breakages).

Separate the panes by either:

- New cork pads (recommended). Pads must have adhesive part on paint side of the mirror;
- Paper interlayer (chlorine free);
- Foam pads;
- Corrugated cardboard strips.

3.9. 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, paint degradation, splinters etc.);
  - Normal control of the cutting quality;
- **After grinding / drilling / washing:**
  - Visual aspect control (scratches, paint degradation, splinters etc.);

- Visual control (as to whether the pane is completely dry);
- Check for suction cups or cork pad marks etc…;
- Check paint face edges, no local degradation
- Normal control of the grinding / drilling quality;

For plants just starting to process mirrors, it is recommended to make an inspection after each process until experience is gained. Operator training and experience in identifying faults is important. In any case, a visit from your local TSM should be organised.

4. ENVIRONMENT / WASTE GLASS / HEALTH ISSUES

MIRALITE® can be recycled. Collection of substrates in what we call cullet is important for many reasons**. Collection should respect rules to get clean cullet possible to reuse in new glass production**.

Mirror glass must be separated to monolithic float in order to collect it and use it as new cullet. All type of MIRALITE® could be mixed in same glass container.

Here is a not exhaustive list of cullet pollutant:

- Papers and cartons
- All metallic sources as aluminium spacer bar
- Pyro ceramic glass
- Borosilicate glass
- Bottle glass
- Georgian wired glass
- Cutting wheel metallic parts
- Glass marker and more generally all elements no nickel sulphite free
- …

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 waste. 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. CLEANING AND MAINTENANCE OF END PRODUCTS

5.1. Removal of labels and markings

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

5.2. 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 is isopropyl alcohol. Cleaning of the glass side with solvents must be immediately followed by standard washing with water and rinsing.

The owner of the building must make sure that glass is regularly and properly maintained. This entails washing the windows, checking and if necessary repairing joints and frames, checking and as necessary unclogging the drain and ventilation holes and detecting any anomaly. Avoid use of chloride or any solvent that can corrode the mirror, mirror must keep dry and in case of reparation be sure to use validated glues and respect procedure to apply them.

6. 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 MIRALITE 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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