

groglass

SEE WHAT'S IMPORTANT

GROGLASS ANTI-REFLECTIVE GLASS

HANDLING GUIDELINES

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0. Introduction of Groglass anti-reflective glass

- Groglass anti-reflective glass is a transparent sputter coated glass, which reduces residual reflection almost completely.
- As a two-side anti-reflective coated glass, the glass isn't visible at an angle of 90° ("Normal incidence"), except on the edges.
- Due to the AR coating, finger-prints or dirt are more visible than on normal float glass. They can easily be removed according the description in point 11.
- We recommend that Groglass anti-reflective glass is handled carefully especially in the manufacturing process since finger-prints, dirt, etc. are more pronounced. They must be eliminated before each step of the processing.
- Groglass anti-reflective glass is hard coated and resistant against environmental influences.
- There's no corrosion/oxidation of the Groglass anti-reflective glass coating due to the hard outlayer.
- Groglass anti-reflective glass meets the specifications and has been tested to the following standards:

Abrasion	ISO 9211-4
Adhesion	ISO 9211-4
Humidity	ISO 9022-2
Solvent stability	ISO 9211-4
Temperature	ISO 9022-2
UV and condensation	EN 1096-2
Neutral salt spray	EN 1096-2
Climate cycling	EN 1096-2
Acid rain test	EN 1096-2

- Size of stock sheet is 321 x 225 cm (126"x88")

1. Transportation, Packing and Unloading

- Delivery can be made in following packaging:
 - End Caps (max. 2,2 t)
- Typically, Groglass anti-reflective glass stock sheets are delivered with polyethylene sheet interleaving – it is recommended to use the same foil for interleaving between subsequent processing steps.
- In case of one-sided AR coated glass delivery the coated side is identified with an arrow on the packaging. In addition there is always a label on glass with text "uncoated side" indicating which side is uncoated.
- When moving the glass between processing steps, it is necessary to separate the glasses with an interleaving layer (polyethylene foil)
- Avoid all steps that may scratch the glass such as sliding the glass sheets.
- The packs of glass must be inspected on arrival. Groglass shall accept no liability for faults arising after delivery or during handling, processing or installation of the finished product if this procedure is not followed:
 - Set glass on the long edge and transport and store it in vertical position
 - The rack must be positioned on perfectly level ground
 - Use the appropriate handling equipment
 - The grab must be perfectly centered
 - Avoid damaging the packaging while handling
 - Ensure CLEAN rubber surfaces for vacuum lifters. We recommend to use clean suction cup caps (from cotton) to avoid coating damage.

- When picking up a glass from end-cap with vacuum-lifter, first move the glass up only a very little bit (~5mm), then move it bit back from the other glasses in the case and only then lift it completely up to take out of case. Taking it up immediately (without separation from other sheets) may result in scratching the coating and Groglass cannot be responsible for this.

Comments:

Clamps, slings, lifting beams and other handling equipment must comply with prevailing regulations and be approved by the relevant authorities. Ensure the safety of personnel at all times. Keep all unnecessary personnel out of the handling area. Wear appropriate personal protective equipment. Personnel must have received the required training.

2. Storage

- Groglass anti-reflective glass can be stored 12 months indoors and max. 2 month outdoors in a dry environment. Glass shall be installed in final application no later than the maximum allowed storage time (depending on storage conditions as describe above).
- Racks used for packaging during transport are not designed to be used for storage. Consequently, the packs must be stored on racks with spacers between packs. Store the packs correctly to reduce the risk of chemical or mechanical damage to the glass.
- Care should be taken to avoid major fluctuations in temperature and humidity that may cause condensation on the glass. No water must be allowed to come into contact with the sheets of coated glass.
- Care should be taken to ensure that ambient air is not polluted by any corrosive elements such as chlorine or sulphur. Sources of such elements include machinery fitted with heat engines, battery-charging points.
- Keep the glass interleaved with polyethylene foil. Do not use paper.
- Stock sheets shall not be stored horizontally due to risk of sticking them together.
- Different dimensions of glasses must be separated by polyethylene foil or corks.

3. Handling / Cutting

- When handling Groglass anti-reflective glass always wear clean gloves, which don't leave sweat-, dirt-, grease-residues or similar on the coating (rubber gloves or gummed gloves are ok, but no cotton- or leather gloves).
- When working with one side coated glasses, the coated side has to be up on a working table.
- The working table must be free of glass particles and clean. CLEAN OFF the working table before each new glass.
- Groglass anti-reflective glass should be cut dry or with a evaporating cutting oil (i.e. ACPE 5503 from Aachener Chemischen Werke). The dose and atomization should be the least possible.
- Don't use high lubrication cutting fluids to avoid leaving irremovable residue
- Always keep the cutting table clean and cutters sharp to reduce incidence of scratches

4. Edge working

- Wash the glass immediately after the wed edge working. The glass must be dry totally. Remaining water on the glass causes water spots.

5. Washing

- Washing-machines with cylindric brushes, equipped with soft brushes, are suitable for Groglass anti-reflective glass. Diameter of the bristles <0.15mm and 20-40mm of length should be used.
- Be careful with 0.5 mm thick bristles and plate-bristles (normally used for a hard pre-cleaning), because they could scratch the glasses. Therefore clean without plate-bristles.
- The glass must be washed with warm (about 40°), clean, deionized water with pH of 7 (+/-1) and conductivity of <30 µS/cm.
- No hard particles (such as calcium) or acidic/detergent agents should be present in the water used for washing as these may damage the coating.
- The washing machine's all parts and transportation conveyer must be clean.
- 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: Pre-washing area: Pre-wash ramp followed by one pair of cylindrical brushes, tap water between 30 and 40°C, preferably close to 40°C, without any detergent. Washing area: At least 2 pairs of cylindrical brushes, demineralized water at room temperature, maximum chloride concentration 3mg/l, and pH value 6-8. Rinsing area: Demineralized water at room temperature, maximum conductivity 30µS/cm, maximum chloride concentration 3mg/l, and pH value 6-8.
- Groglass anti-reflective glass should not stand still within the washing-machine.
- After washing, please dry immediately the Groglass anti-reflective glass. Remaining water on the glass causes water spots.

6. Printing on glass

- Full surface printing should not be made on 2-side anti-reflective coated glass, as anti-reflective properties of glass in printed area will be changed.
- Minor surface printing (e.g. frame printing for electronic displays) can be made on surface #1 of 2-side anti-reflective coated glass. When printing is made on surface #2 of 2-side anti-reflective coated glass, some distortion of reflected color will occur when viewing printed area. Please contact Groglass in case of any questions.
- In case of printing on 1-side coated glass, it can be done in either side.

7. Manufacturing of insulation glass

- Insulation glass, consisting of 2 x Groglass anti-reflective coated glass sheets can be built together „dry“ as well as in traditional manner
- It's not necessary to remove the coating on the border, because two-component sealings like polyurethane, polysulfide or silicone connect well with Groglass anti-reflective glass, according our test results. Please ask your sealant producer to confirm tests with Groglass anti-reflective glass.
- It's necessary to test sealants (which haven't been tested with Groglass anti-reflective glass) together with the producer against adhesion, water-resistance and climatic-shocks (DIN 1286 part 1).
- Clean all excess sealant from the glass immediately after the unit is complete.
- Note: Do not write (e.g. with crayon or felt-tip pen) or put stickers/tape on coated side of glass.
- Unpack carefully to avoid scratching the glass
- Wear clean gloves not to leave fingerprints
- Do not touch glass surfaces with any objects to minimize the chance of damaging the coating

- Protect coated surfaces from aggressive materials such as silicone, grease, oil, adhesives, aluminum, paint, glues, lubricants, cement, mortar, glue, paint, varnish plaster, fragments or sparks of welding/grinding devices

8. Manufacturing of laminated glass

- For manufacturing laminated glass one-side coated Groglass anti-reflective glass is used. The Groglass anti-reflective coating needs to be on the Number 1 and 4 surfaces.
- Recognition of the coated side:
 - One side coated Groglass anti-reflective glass has a label on the uncoated side.
- The uncoated side of one-side coated Groglass anti-reflective glass has a higher reflection, e.g. place a white paper against the glass, or look through the edge.
- Laminating Groglass anti-reflective glass:
 - Refer to the washing instructions in Section 5.
 - Ensure that the transport rollers are clean.
 - Devise a marking system where the operator can clearly identify the coated versus uncoated sides.
 - Remove any marks or stickers after having laminated together the glasses.
- Pre-compound-pressing:
 - In this process, the AR coated side of the glasses looks outside (to air). The surfaces of the rollers should be cleaned frequently. It's necessary to control and clean the rollers often (hard-rubber or asbestos).
 - Fast rolls (passage from slow pressing to fast transportation) could damage the coating.
- In the autoclave:
 - Use suitable distance-holders. Cork distance-holders will leave stains on the glasses.
- Otherwise handle the Groglass anti-reflective glass like normal laminated glass in the autoclave.

9. Thermal tempering

- Both one- and two- side coated Groglass monolithic anti-reflective glass can be tempered. The glass and the furnace must be clean. It's necessary to work in a determined temperature and stay-interval to prevent a destruction of the coating and the glass.
- Groglass anti-reflective glass will absorb the heat of the furnace more than normal float glass. Therefore the interval-time and the temperature are lower than for float glass in equal thickness.
- Grind or polish the edges of Groglass anti-reflective glass before tempering.
- The coated side of one-side coated Groglass anti-reflective glass should be facing up.
- Two-side coated Groglass anti-reflective glass must be absolutely clean and dry, transported on very clean rolls. No water-stain and dirt is allowed on the glass, as these could "burn into the glass" during the tempering.
- Adjust the temperature of the top and the bottom to ensure even distribution of heat, as well as the cycle time of the furnace, that the coating doesn't crack („cobweb", crazing).
- Recommended tempering conditions:
 - Start with standard tempering parameters used for regular float or low-iron glass (typically low-iron glass requires higher temperature)
 - If cracking appears reduce temperature in 10C° increments while increasing time in furnace or/and raising quench pressure or/and reducing quench air temperature.
 - Experiment with placing glass on a different sides (upside-down)
 - To avoid glass breakage in furnace assure exit glass temperature of at least 640C° for regular float and 650C° for low iron glass in the center of glass sheet. If glass doesn't break lower the temperature further until cracking disappears or glass starts breaking

- It's difficult to make a precise statement for different furnaces, because the measurement of temperature and the places of these measurements are different.
- Be careful with thermal tempering of glasses with holes or edge-outbreaks, because it will be done by these intervals.

10. Chemical tempering

- This process will damage the anti-reflective coating, thus, such type of tempering is not recommended.

11. Contract coating

- Glass substrate for coating has to be received separated with paper or powder.
- Custom furnished glass must be received clean, free of oil, grease, finger-prints, scratches and circular damages because after applying anti-reflective coating, the dirt and other imperfections of glass substrate become very clear.
- No marks with a pencil or similar on the surface.
- Use „fresh“ glass (max. 3 weeks old).
- Do not put any adhesive labels on the glass.

12. Cleaning of finger-prints etc.

- Finger-prints can be wiped off with ammonia-free glass detergent (e.g. Ajax) and a dry and soft cotton cloth or microfiber cloth. Do not use rags, tools (e.g. glass-plane) or cleaning detergents which scratch or scour.
- For further information see instructions „Technical advice“ and „Cleaning advice“.

13. Angle of View

- Groglass anti-reflective glass is to be viewed at a 90 degree angle. The coating is applied so that it works when it is viewed straight on. As the viewing angle is changed the coating can be detected and will have a color hue. Also as the angle changes, images can be slightly changed. These are normal with this coating and are not reasons for complaints or claims.