

Guidelines for processing arcon soft coatings for usage in the North American Market

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1 Introduction

arcon is the coating division of Arnold Glas.

Soft coatings by arcon contain at least one silver function layer and are produced by the magnetron process.

The finished product is used in insulating glass units.

arcon coatings include the products

- arcon sunbelt A40
- arcon sunbelt A50
- arcon sunbelt A60
- arcon sunbelt A70
- arcon N34

In order to process coated glass products for their best performance processing guidelines as detailed in this document must be followed.

The finished product is used in insulating glass units.

The period between cutting and GU assembling should be as short as possible and must not exceed 5 business days, provided that the glass is properly handled.

This document contains processing guidelines including information on specific steps for surface detection, handling and storage, glass cutting, machine washing, insulating and storage.

This document is permanently reviewed and updated. The latest version can be downloaded on the internet at www.arnold-glas.com.

Special requirements have to be taken into consideration for heat treatable coatings which are described in the "Guidelines for processing heat treatable arcon coatings for usage in the North American Market".

Ignoring and non-compliance can result in damage to coated surface.

2 Package and storage

Coated glass products by arcon are delivered in all commonly used packages. Sizes are available in split sizes of 7.38' x 10.53' (2250 mm x 3210 mm). The sizes can be adjusted. The available thicknesses are 4, 6, 8, 10 and 12 mm float. Low-iron glass is available on request.

The first pane in the package is an uncoated float pane that is used for protecting the coated surface. The subsequent panes are positioned in a manner that the coated surface faces the first float pane. The position of this float pane is clearly marked on the package label according to the customer's request (on the front or rear side). A special powder (PMMA type with qualified grain size) is applied as a separating agent between the individual panes to avoid damage during the transport.

The package label must be kept since data are required for any warranty claims.

All coated glass products by arcon must be stored in constant conditions. Relative humidity may not exceed 70 per cent. All coated glass products by arcon must not be exposed to condensation. Open air storage must be avoided.

Coated glass products by arcon are usually sealed to avoid condensation on the exposed glass surface and inside a glass pack during transport. Moisture will affect the coating immediately and the coated surface will become corroded. Hence the seal should remain closed until the product is used for processing. If not all glass sheets will be used after opening it is recommended to seal the package again. A sufficient distance to washing machines, external doors and chemicals (e. g. NaCl, HCl intended for use in water preparation plants) has to be maintained.

Coated glass products by arcon can be stored in their original package under normal conditions up to 6 months. Opened stacks should be processed within 12 weeks, but special attention has to be paid due to the risk of corrosion of silver layer containing coatings. However, first in first out principle should be adopted.

All boxes must be inspected for any damage on arrival and damages reported and recorded for potential insurance claims etc. Damages and defects should be reported and this glass should be stored for inspection by Arnold Glas or arcon representative.

3 Identification of the coated side

During all processing steps it is important that the coated side remains towards the air side i.e. not facing cutting pad or conveyor systems. Coating can be clearly identified by using a coating tester or ohmmeter. Coating testers can be obtained from arcon.

4 Handling

Before processing all plant workers have to be informed about special requirements for arcon soft coatings as well as trained in its handling.

During each processing step marking-free clean gloves must be used. Lubricants, oils, liquid drops or finger and glove prints can cause irreversible imperfections. Therefore, any kind of soiling must be avoided. Glass cutting pads should be frequently cleaned by compressed air to avoid scratches on the glass surface.

An additional risk is the use of vacuum cups on the coating. The vacuum cups should not be in contact with the coated surface when unstacking the glass sheets. However, if the manufacturing process requires the use of vacuum suction systems it must be ensured that they are always absolutely clean and silicone free. Therefore, we recommend the use of special protective covers for them.

Separators (e.g. cork) can leave irreversible prints on the coated surface. The coated side must not be marked or labeled.

All devices and tools which come into contact with coatings must be kept permanently clean.

5 Cutting and cutting oils

To avoid damages caused by scratches, glass splinters or dirt, the coated glass surface must remain towards the air side during cutting and all other processing steps. Only soft cutting fluids that can easily be removed during the washing process are to be used for the cutting procedure. Avoid all excess of cutting fluid and remove any residual glass splinters or dust from the cutting table. Rulers or templates for cutting the glass should be avoided in order to reduce risk of scratches.

The cutting table must be cleaned regularly by using compressed air.

6 Edge deletion

Edge deletion is required for all arcon coatings.

Edge deletion could be on line during cutting or prior to insulating respectively manually using hand held grinding systems. Suitable grinding wheels have to be used (recommendations are given in chapter "production aids"). Parameters are to be adapted (rpm, rate of feed, grinding pressure).

arcon recommends soaking off the wheel swarf to avoid the scratching of the panes by fine glass splinters in the follow processing steps.

The width of edge deletion depends on the insulating glass system which is used. Minor overlapping of coating and sealant should not affect the functionality of the IGU edge seal. Because of processors responsibility for IGU edge seal, regularly testing of edge deletion quality is recommended.

The effectiveness of edge deletion can be checked by using coating testers.

In order to achieve proper surface quality, fixed sizes can be masked with an adhesive tape before the coating process. This adhesive tape must be removed before IGU assembling.

7 Washing process

Coated and uncoated panes have to be washed before assembling. When washing the glass the following specific aspects are to be taken into consideration.

- The coated glass surface must not be moved directly on the transport rollers.
- It is necessary to use clean demineralized water (conductivity < 30 µS/cm, pH value 6.0 – 7.5). Washing agents must not be used.
- A water temperature of 86 °F (30°C) is recommended.
- The brushes directly in contact with the coating must be particularly suited for coated glass (bristle diameter at least of 0.15 – 0.20 mm) to avoid scratches on the coating.
- Ensure the best possible continuous flow of production to avoid scratches on the coated surface if the washing process is stopped and restarted on one pane.
- Leaving the washing machine the panes must be completely drying to avoid remaining water- drip stains on the coating.
- After the washing process, the glass should be visually inspected at the test station using an appropriate illumination in transmittance and reflectance.
- Rubber lips or brush bars must not rub against the coated surface and should be removed if necessary.

The washing machine is to be maintained at regular intervals. During this inspection particularly the brushes are to be checked for their cleanness and correct adjustment. The washing water must be renewed regularly.

To remove stains use a mild, quick-drying cleaning agent. For this purpose, dab the surface carefully with a clean, soft cloth without applying any pressure onto the coating. Cleaning agents must not remain on the coated surface.

Recommendations for cleaning agents are given in chapter “production aids”.

8 IGU assembling

arcon soft coatings must be used as part of insulating glass units (IGU) and the coating must face the inside of the IGU. The inner space is filled with dry air or an inert gas. In order to achieve their best performance arcon solar control coatings (A70, A60, A50 and A40) must be placed on #2 surface of an IGU and low-e coatings (N34) on #3 surface of an IGU. Their monolithic use is not allowed.

The edge seal of an IGU consists basically of a two-stage sealing system – the butyl as the primary sealant, and a secondary sealant. This permanently elastic edge seal must take up the strain exerted upon the IGU and ensure that the IGU remains airtight and gastight respectively throughout its lifetime.

The processing guidelines of the sealant manufacturer are to be followed.

Insulating glass units using arcon soft coatings must fulfil mandatory local market standards and requirements. The processor is fully responsible for proper IGU production.

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Ensure the best possible continuous flow of production to avoid scratches or abrasions on the coated surface if the washing process is stopped and restarted on one pane.

A water temperature of 86°F (30°C) is recommended.

After assembling, the glass should be visually inspected at the test station using an appropriate illumination in transmittance and reflectance.

The edges of coated fixed sizes in IGU units can be coated for technical reasons. This coating residue corrodes by and by.

The processor is fully responsible for proper IGU production.

9 Transport and Storage of Coated Insulating Glass Units

Coated insulating glass units (IGU) are to be protected against solar radiation during transport and storage.

10 Quality features of coated glass

The coating or other defects of coated glass are based on US standard C1376.

Coated glass may be examined in cut sizes ready for installation. The examination may be undertaken in the factory or at site when glazed.

The pane of coated glass being examined is viewed in transmission at a viewing angle of 90° from a minimum distance of 10 ft (3 m) for cut size coated vision glass and 15 ft (4.6 m) for cut size coated overhead glass in accordance with C1376. A bright uniform background is required.

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.

11 Color aspects

11.1 Color appearance of non heat treatable and heat treatable version of one product

Some arcon coatings are available both as non heat treatable and heat treatable version (e. g. sunbelt A70 and sunbelt A70 HT). Heat treatable versions are marked with "HT" and need to be heat treated for their best performance.

Radiation properties of both non heat treatable and heat treatable version are adapted.

Although both non heat treatable and heat treatable version of one product are matched in terms of color, arcon strongly recommends the fabrication of samples in original size and the comparison among each other in advance when a jointly use in one facade is intended.

11.2 Angle dependence of architectural coatings

The color appearance of solar control coatings especially with a high selectivity can change with angle of view. These variations can only be measured online. Currently there is no on site instrument on the market.

Consequently the homogeneity of the color of the facade viewed under an angle can only be evaluated by visual observation. The maximum angle must not exceed 45° (see Figure 1)

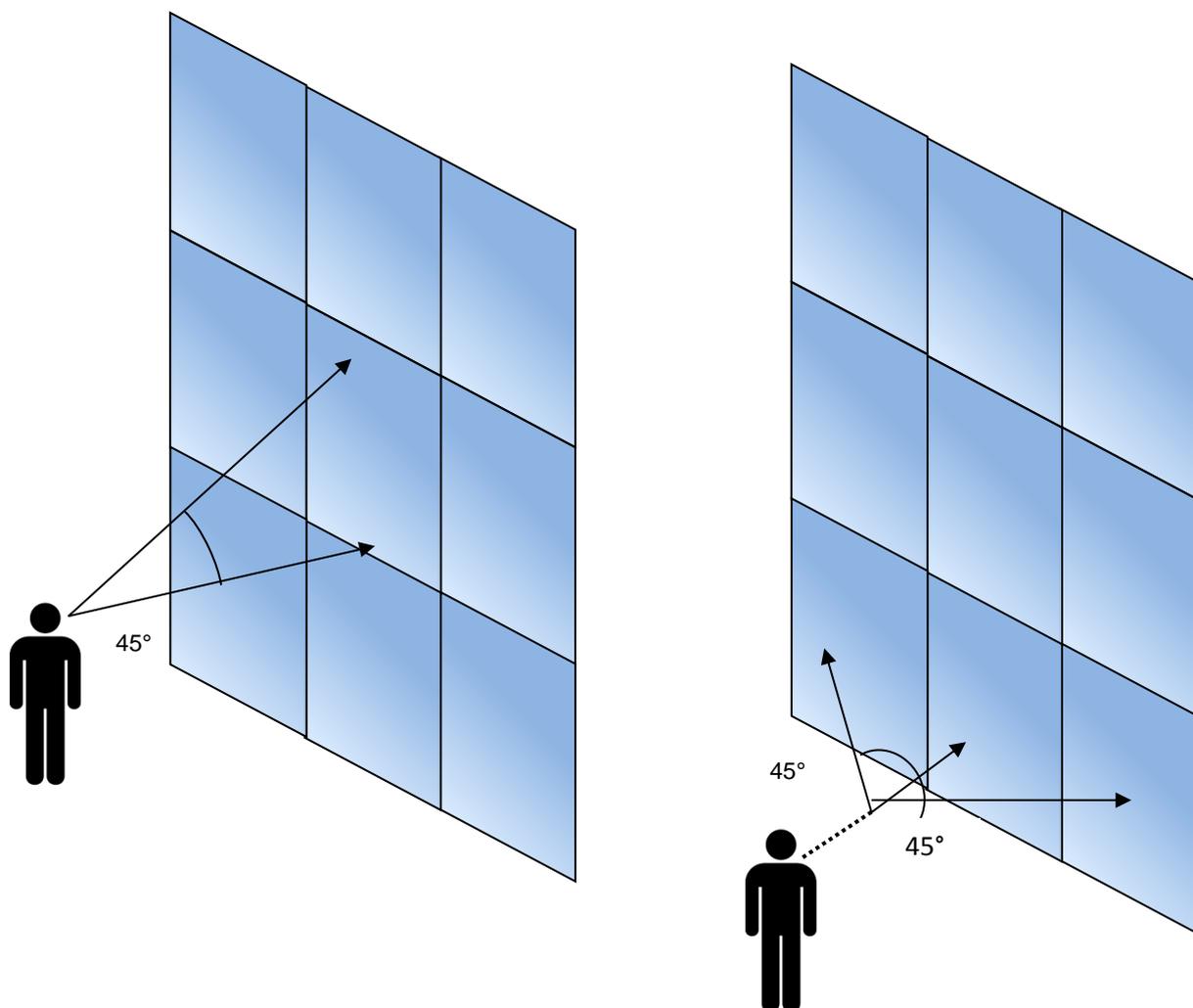


Fig. 1: Visual observation of angle dependence

11.3 General notes on color assessment

For the assessment of the reflected color (outside view of the façade) arcon solar control coatings (A70, A60, A50 and A40) must be placed on #2 surface of an IGU and arcon low-e coatings (N34) on #3 surface of an IGU. The facade is viewed normal the surface.

Differences of color as viewed from the interior of the building are not considered as a defect.

In transmission color differences may also be observed. These differences cannot be measured on site as no device is available. This color can only be evaluated by visual observation.

The transmission as well as reflection color is influenced not only by the coating but also by the glass type, glass thickness and the uncoated pane in the IGU.

One must realize that the notion of color is linked to the impression and perception of the individual, the sensibility of the eye being a very personal characteristic.

Furthermore, a variety of conditions affect how a color looks, for instance when observing the facade of a building from the outside,

- Luminosity: a dark covered sky and very cloudy might reveal color differences, invisible under direct sunlight.
- Distance and angle of observation.
- Type and color of mullions and transoms.
- Distance between two adjacent glass panes.
- The eye of the observer.
- Background: the absence of any lighting in the building (dark background), might increase the perception of color differences.
- Environment: presence or absence of other buildings which are likely to reflect in the facade

12 Quality Assurance

The processor of arcon coatings has to ensure that the requirements of those guidelines are permanently fulfilled. It's glass processor's responsibility to implement a quality assurance system. Attention should be paid to visual inspection of glass panes.

The processor of arcon coatings has to implement a system of product identification and traceability. ISO 9000 certified processors usually fulfil these requirements.

If you intend to use the heat treatable version and the non heat treatable version of one product jointly in one project please consult our sales department in advance. Furthermore, arcon strongly recommends the fabrication of samples and the comparison among each other. When using triple glass units with two coated panes in the glazing this aspect should be considered too.

13 Warranty

Compliance with aforesaid processing guidelines will ensure the production of high quality insulating glass units. Failure to comply with the aforesaid processing guidelines and other procedures introduced by Arnold Glas or arcon will render product warranty in-valid.

If there is a cause for complaint, Arnold Glas or arcon reserves the right to control all claims.

14 Production Aids

The following list of production aids gives recommendations for processing of coated glass into insulating glass units.

arcon underlines that only materials checked for their compatibility may be used in IGU production.

arcon cannot guarantee the quality of the recommended production aids.

Production aids from other suppliers can be suitable too.

- **Gloves**

Type: KCL-Protective cloves
Supplier: Kächele-Cama Latex GmbH
36124 Eichenzell
Germany

- **Cutting Fluids**

Type: CUTTING FLUID AC PE 5503, 5250
Supplier: Aachener Chemische Werke GmbH
52146 Würselen
Germany

Type: DIONOL GT 641, 644-1
Supplier: MKU-Chemie GmbH
63322 Rödermark
Germany

- **Protection Cover**

Type: Protection cover type MTC
Supplier: Euro Tech Vakuum-, Hebe- und Transporttechnik
72348 Rosenfeld
Germany

- **Separating agent**

Type: AC Separol type F, G, TN
Supplier: Aachener Chemische Werke GmbH
52146 Würselen
Germany

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- **Glass Cleaner**

Type: ACECLEAN 614
Supplier: Aachener Chemische Werke GmbH
52146 Würselen
Germany

Type: Mixture 50 per cent by volume Isopropanol and 50 per cent by volume demineralised water

- **Grinding Wheels for Edge Deletion**

Type: FISCHLER type 3055
Supplier: Franz Fischler GmbH & Co. KG
86343 Königsbrunn
Germany

Type: NORTON RapidFinish Art. 69957387512
Supplier: Saint Gobain
Germany

Type: ARTIFEX EK 120 HT
ARTIFEX SK 120 HT
Supplier: ARTIFEX Dr. Lohmann GmbH & Co. KG
24568 Kaltenkirchen
Germany

Type: TYROLIT A1507 BE15TF grey
Supplier: ROTTLER RÜDIGER PARTNER GmbH
90579 Langenzenn
Germany

- **Manual Devices for Edge Deletion**

Supplier: HEGLA
37688 Beverungen
Germany

R&R Sondermaschinen GmbH
90579 Langenzenn
Germany