Technical Data Sheet
Matelac Silver (SAFE+)

05/2021

1 INTRODUCTION

This Technical Datasheet gives information about the range of acid etched decorative glass Matelac Silver, safety backed or not with a SAFE+ film. The substrate of Matelac Silver is a float glass in accordance with EN 572-2.

2 NORMATIVE REFERENCES

There is not yet a published EN standard.
All Matelac Silver products are produced in factories being ISO 9001 certified.

3 COMPOSITION AND PROPERTIES OF THE GLASS

The basis glass used for Matelac Silver production is float glass conform to EN 572-1 & 2. The properties of the float glass are listed hereunder.

3.1 CHEMICAL COMPOSITION

The EN 572-1 defines the magnitude of the proportions by mass of the principal constituents of float glass as following:

SiO_2	69 to 74 %
Na_2O	10 to 16 %
CaO	5 to 14 %
MgO	0 to 6 %
Al_2O_3	0 to 3 %
Others	0 to 5 %

3.2 MECHANICAL PROPERTIES

- Weight (at 18°C): ρ = 2 500 kg/m³
- Density: 2,5
- Young's Modulus (modulus of Elasticity): E = 70 000 N/mm²
- Poisson Ratio: μ = 0,2
- Shear Modulus: G = E/ [2 (1+ν)] ≈ 29 166 N/mm²
- Knoop Hardness: 6 GPa
- Mohs Hardness: 6
- Characteristic bending strength: 45 N/mm²

3.3 THERMAL PROPERTIES

- Softening point: ≈ 600 °C
- Fusion temperature: ≈ 1500 °C
- Linear expansion coefficient: $\alpha = 9.10^{-6}$/K (between 20° and 300°)
- Specific heat capacity: C = 720 J/(kg.K)

3.4 OPTICAL PROPERTIES

- Refractive index N to visible radiation (380 to 780 nm):
  - air/glass: 0,67
  - glass/air: 1,50

3.5 ELECTRICAL PROPERTIES

- Specific resistance: 5.10^7 Ω.m at 1 000 Hz and 25°C
- Dielectric constant: 7,6 at 1 000 Hz and 25°C

4 DURABILITY OF MATELAC SILVER

Matelac Silver products are tested following the durability method described in EN 1036-1.

	EN 1036-1 criteria	Performance of Matelac Silver
Neutral salt spray test: • Maximum corrosion around the edge	1.0 mm	Punctual: 1.0 mm Average: 0.05mm
Copper accelerated acetic acid salt spray test: • Maximum corrosion around the edge • Maximum number of spots (diameter between 0.2 and 3 mm)	1.5 mm 2 (accepted provided ≤ 0.2 mm)	Punctual: 1.5 mm Average: 0.25 mm ≤ 1 (accepted provided ≤ 0.2mm)
Condensation water test • Maximum corrosion around the edge • Maximum number of spots (diameter ≤ 0.3 mm)	0.2 mm 1	Punctual: 0.2mm Average: 0.05 mm 0

The acceptance levels for surface defects on acid-etched surface are given in table for stock sizes.

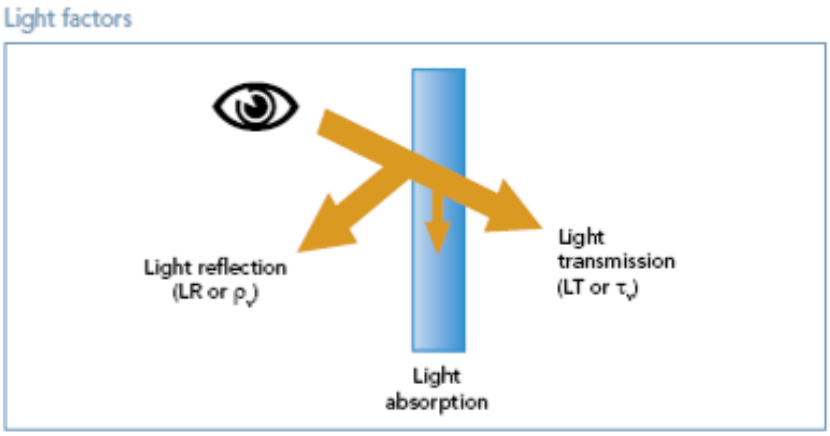
Punctual faults (mm)	**Max/10 m²**
≤ 0.5	Accepted[a]
> 0.5 and ≤ 1	5
> 1 and ≤ 2	2
> 2	0
[a] Accepted, providing there is no accumulation	

5 LIGHT PROPERTIES

The light properties are calculated using spectral measurement that conforms with standard EN 410. The following property is given:

- LR' (ρ'_v): Light reflection on glass side in % (tolerance +/- 5%)

D65,2°	ρ'v: Light reflection on glass side in % (+/-5%)				
Thickness (mm)	Clearlite MNGE	Clearvision MNGE	Grey MNGE	Bronze MNGE	Green MNGE
2	92	94	60	65	82
3	91	94	48	54	76
4	90	94	38	45	71
5	89	94	31	37	66
6	88	94	25	31	61
8	86	93	17	22	53



6 TOLERANCES ON DIMENSIONS

6.1 THICKNESS

The actual thickness shall be the average of four measurements, taken to the nearest 0,01 mm, one taken at the center of each side.

The actual thickness rounded to the nearest 0,1mm shall not vary from the nominal thickness by more than the tolerances shown in the table (according to EN 572-2).

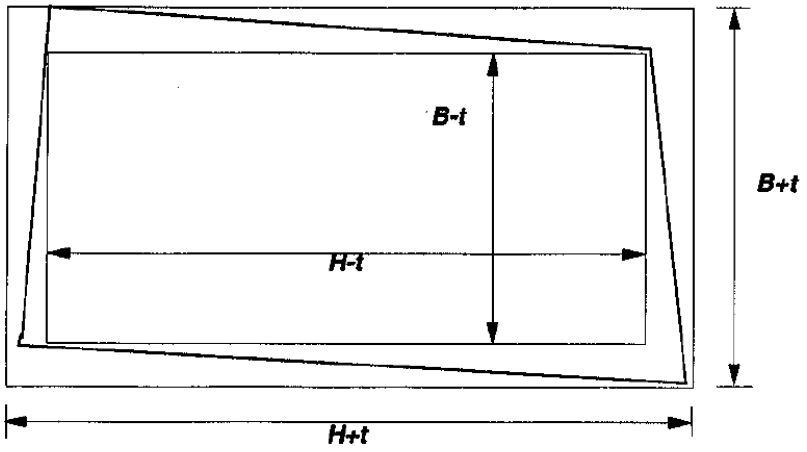
Table 1 — Tolerances on nominal thickness

Dimensions in millimetres

Nominal thickness	Tolerances
2	± 0,2
3	± 0,2
4	± 0,2
5	± 0,2
6	± 0,2
8	± 0,3
10	± 0,3
12	± 0,3
15	± 0,5
19	± 1,0
25	± 1,0

6.2 LENGTH AND WIDTH

The tolerances *t* on nominal dimensions length H and width B are respectively ± 3 mm and ± 2 mm.



The limit of squareness is described by the difference between diagonals. The difference is maximum 5 mm.

The same tolerances than for the float used as support of Matelac Silver apply.
This information is related to jumbo sizes (PLF and DLF) of float without the paint coating.

7 QUALITY REQUIREMENTS

7.1 INTRODUCTION

The quality of Matelac Silver can be affected by faults, which alter the appearance of the image of reflected objects. Such alteration of the image can result from faults in the glass, faults in the acid etching, and faults in the reflective coating.

7.2 DEFINITIONS OF DEFECTS

The following definitions apply:

- Uniformity defects: slight visible variation in haze effect within a pane or from pane to pane. Defects associated with a non-processed zone or with a different processed intensity zone (e.g. clouds)
- Glass appearance defects: defects which alter the visual quality of the silver-coated float glass. They can be spot and/or linear and/or enlarged area defects
- Spot defects: nuclei (solid or gaseous inclusions), deposits, crush marks etc. In certain instances spot defects are accompanied by a distortion zone called ‘halo’. The nucleus of the spot defect is measurable. Spot defects may also be due to cutting oil droplets, silicone pollution etc on the acid etched surface.
- Linear defects: scratches, extended spot faults etc.
- Scratches: any kind of scratches that are not brush marks
- Reflective silver coating faults: faults in the reflective silver layer which will alter the appearance of the silvered glass. They consist of scratches, stain, colour spots and edge deterioration.
- Stain: alteration of the reflective coating characterized by a more or less brownish, yellowish or greyish colouration of zones which can sometimes cover the whole reflective surface
- Colour spots: alteration of the reflective coating in the form of small, generally coloured spots
- Edge deterioration: discolouration of the reflective silver at the edge of the silvered glass
- Protective coating(s) faults: faults where the metallic layer is exposed. They can be scratches or loss of adhesion of the protective coating(s).
- Edge faults: faults that affect the as-cut edge of the silvered glass. They can include entrant/emergent faults, shelling, corners on/off and vents.
- Cluster: group of not less than three spot defects, separated by not more than 50 mm.

7.3 GLASS FAULTS

7.3.1 INSPECTION METHOD

The processed glass shall be observed in a vertical position, with the naked eye and under normal diffused lighting conditions, (natural daylight or simulated daylight, between 300 lux and 600 lux at the processed glass), from a distance of minimum 1 m. The direction of observation is normal, i.e. at right angles, to the processed glass. The use of an additional lighting source, e.g. spotlight, is not allowed.
The dimension and number of scratches and spot faults which cause disturbance to diffused reflection shall be noted.

7.3.2 ACCEPTANCE LEVELS

The tables give the acceptance level for glass faults respectively for standard sizes.

Acceptance level for linear defects in standard sizes

	Matelac Silver with clear and tinted glass substrate	
	Jumbo size (defects/ sheets of 6 m x 3,21 m)	Other sizes (defects/m²)
Scratches (≤ 50 mm)	3	0,139

Acceptance level for spot faults [a] in standard sizes

	Matelac Silver with **clear** glass substrate			
	Jumbo size (defects/ sheets of 6 m x 3,21 m)		Other sizes (defects/m²)	
	Max/sheet	Average/sheet	Max/sheet	Average/sheet[b]
≤ 0,2 mm	Accepted [c]	Accepted [c]	Accepted [c]	Accepted [c]
> 0,2 mm and ≤ 0,5 mm	26	18	1,35	0,93
> 0,5 mm	3	2	0,16	0,11

[a] The dimensions stated are without the effect of halo and relate to the largest of the fault dimensions
[b] The average shall be calculated taking into account the total individual pack area (m²)
[c] Accepted, providing they do not form a cluster.

	Matelac Silver with **tinted** glass substrate			
	Jumbo size (defects/ sheets of 6 m x 3,21 m)		Other sizes (defects/m²)	
	Max/sheet	Average/sheet	Max/sheet	Average/sheet[b]
≤ 0,2 mm	Accepted [c]	Accepted [c]	Accepted [c]	Accepted [c]
> 0,2 mm and ≤ 0,5 mm	30	29	1,55	1,50
> 0,5 mm	4	3	0,21	0,16

[a] The dimensions stated are without the effect of halo and relate to the largest of the fault dimensions
[b] The average shall be calculated taking into account the total individual pack area (m²)
[c] Accepted, providing they do not form a cluster.

7.4 ACID ETCHING FAULTS

7.4.1 INSPECTION METHOD

Same as §7.3.1

7.4.2 ACCEPTANCE LEVELS

The acceptance levels for surface defects are given in the table below for stock sizes.
These defects refer to the acid etched surface only.

Punctual faults (mm)	Max/10 m²
≤ 0,5	Accepted [a]
> 0,5 and ≤ 1	5
>1 and ≤ 2	2
> 2	0
[a] Accepted, providing there is no accumulation	

7.5 ASPECT AND COLOUR OF THE ETCHING

7.5.1 INTRODUCTION

The aspect of the etching is defined by the color measurement.
The color measurement is defined by L*, a* and b* values (illuminant D65, 10°).
The difference of color between 2 samples is calculated by

$$\Delta E^* = \sqrt{(L_1^* - L_2^*)^2 + (a_1^* - a_2^*)^2 + (b_1^* - b_2^*)^2}$$

7.5.2 MEASUREMENT OF THE ΔE*

The ΔE* should be measured on the glass side, according to CIE Publication N° 15: DELTA E CIE LAB D65 10° SCI.

7.5.3 ACCEPTANCE LEVELS

The allowable variation of the colorimetric measurements, measured on the acid etched side, between panes (from the same thickness) shall be:

$$\Delta E^* \leq 2$$

Note 1: In order to avoid color difference coming from deviation from batch to batch, panes placed next to each other should come from the same production batch.

7.6 REFLECTIVE SILVER COATING FAULTS

7.6.1 INSPECTION METHOD

Same as §7.3.1

7.6.2 ACCEPTANCE LEVELS

The reflective silver coating faults are not allowed if they are visible under the condition of § 7.3.1.

7.7 PROTECTIVE COATING FAULTS

7.7.1 INSPECTION METHOD

Same as §7.3.1.

7.7.2 ACCEPTANCE LEVELS

Using the method in §7.3.1, the presence of pinholes, burst bubbles, flaking of the protective coating along the edges or other faults in the protective coating(s) shall not be allowed.

7.8 ASPECT OF THE " SAFE+" VERSION

Matelac Silver can be delivered with SAFE+ safety backing film on the painted side. The aspect of this film is not perfect and some bubbles can appear. Visual imperfections in the SAFE+ safety backing film do not have a negative impact on soft body impact resistance according to EN 12600.

7.9 EDGE FAULTS

7.9.1 INSPECTION METHOD

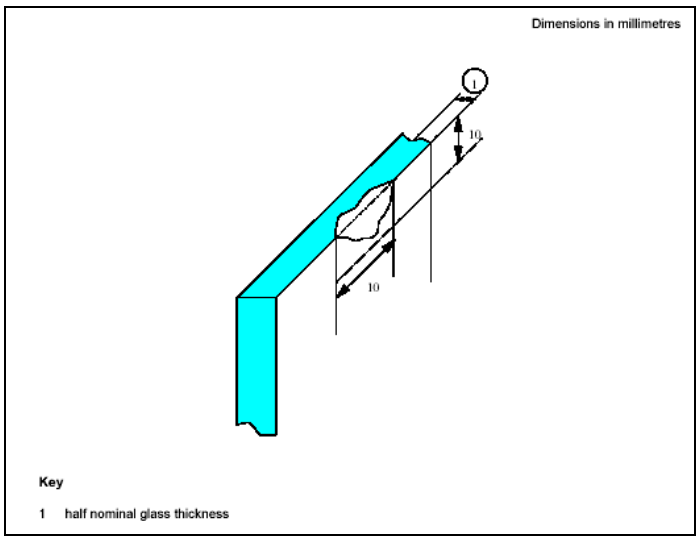
Same as §7.3.1.

7.9.2 ACCEPTANCE LEVELS

The edge quality of stock sizes Matelac Silver can be affected by the presence of entrant/emergent faults and shelling. Using the method of §7.3.1, the edges of the processed glass shall be checked for the presence of shells, corners on/off and edge vents.

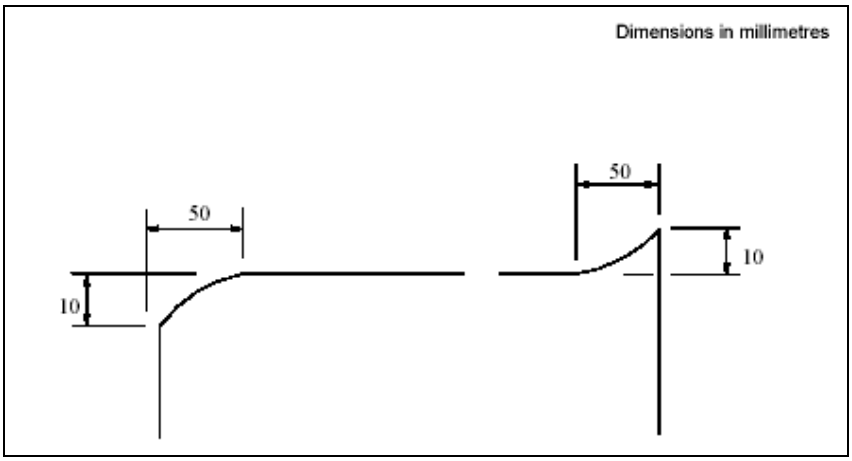
7.9.2.1 CHIPS OR SHELLS

For stock sizes, entrant or emergent chips or shells shall be accepted provided they do not exceed a maximum length and depth of 10 mm and half the nominal glass thickness.



7.9.2.2 CORNERS ON/OFF

For stock sizes occasional corners on/off shall be allowed. No more than 5 % of the sheets on a delivery shall be affected.



7.9.2.3 VENTED (CRACKED) EDGES

Vented (cracked) edges shall not be allowed for stock sizes.

8 ENVIRONMENTAL ASPECT

Matelac Silver colour options have been developed to be environmentally-friendly decorative glass products. Matelac Silver products are available with MNGE coating technology.
The current production line for Matelac Silver, comprising the MNGE coating technology, has, amongst other things, made it possible to:

- eliminate the copper layer
- reduce lead content to < 0,3 % (<3000ppm) for MNGE produced in Europe and to < 0,5 % (<5000ppm) for Mirox MNGE produced in Russia
- reduce ammonia waste by 90%.

AGC Glass Europe has achieved Cradle to Cradle Certified™ Silver for the Matelac Silver product range, including SAFE+ version.

None of the substances identified as Substances of Very High Concern (SVHC) in the REACH Candidate list* is present above 0.1% in Matelac Silver products, including SAFE/SAFE+ versions (REACH Regulation 1907/2006/EC concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals).
* http://echa.europa.eu/web/guest/candidate-list-table

For specific product details, visit www.agc-yourglass.com, product section “Matelac”, or look in the “Tools” section under “Regulatory Documents”.

9 SAFETY

9.1 SAFETY IN USE - PENDULUM BODY IMPACT RESISTANCE

Shatter properties (safe breakability) and pendulum body impact resistance are determined and classified in accordance with EN 12600.

Matelac Silver show a mode of breakage typical of annealed glass (EN 12600, type A).

Matelac Silver SAFE+ comprise polymer film applied to the back of the glass. This safety backing film ensures safety in case of soft body impact.
Matelac Silver SAFE+ show a mode of breakage typical of laminated glass (EN 12600, type B). Numerous cracks appear under soft body impact, but the fragments hold together and do not separate.

For specific product details, visit www.agc-yourglass.com, register and log-in under the restricted area, and go to “certificates” in the product section “Matelac”.

9.2 SAFETY IN THE CASE OF FIRE - REACTION TO FIRE

Reaction to fire is determined and classified in accordance with EN 13501-1.
Some glass products are products/materials that do not require to be tested for reaction to fire (e.g. Products/materials of Classes* A1 according to Commission Decision 96/603/EC, as amended 2000/605/EC).

> ** Contribution to fire growth ranges from class A1 (best, not contributing to fire growth nor to the fully developed fire) to class E (worst, quickly leading to a flashover situation). In addition to the main classification for contribution to fire growth, additional classification parameters are assigned to a product for smoke production, and flaming droplets and particles.*

Matelac Silver (SAFE+) show a reaction to fire behavior ranging from class A1 to class B, depending on paint colour, glass thickness, safety backing or not, and type of installation.
For specific product details, visit www.agc-yourglass.com, register and log-in under the restricted area, and go to “certificates” in the product section “Matelac”.

10 HEALTH ASPECT

AGC puts great effort in developing products that preserve our indoor air quality.
Matelac Silver products show very little indoor emissions of Volatile Organic Compounds (VOCs), including very low levels of formaldehyde.
Following the publication of French Decree No. 2011-321 of March 23, 2011, as supplemented by the French Decree of 19 April 2011, regarding the labeling on their emissions of volatile pollutants of construction products, or wall cladding, or floor and paintings and varnish, the Matelac Silver product range (including SAFE+ version) has achieved the A+ level *.

** Information on the emission level of volatile substances in indoor air, presenting a risk of toxicity by inhalation, on a scale from A+ (very weak emissions) to C (high emissions).*

11 OTHER RELATED DOCUMENTS

Following documents are also available from www.agc-yourglass.com:

- Installation Guide, see Mirox Installation Guide
- Processing Guide, see Mirox Processing Guide
- Cleaning and Maintenance Guide for Decorative Glazing
- Glazing Instructions – Traditional Setting