



GLASS UNLIMITED

**Technical Data Sheet
Lacobel T**

08/2014

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1 INTRODUCTION

This Technical Datasheet gives information about the range of toughenable painted glass Lacobel T. Lacobel T is obtained by the application of enamel paint on a glass substrate. This substrate is in accordance with EN 572-2.

2 NORMATIVE REFERENCES

Lacobel T is a toughenable product and must be heat treated before use.

No standards apply for the basis product before heat treatment.

After heat treatment, Lacobel T should conform to the following EN standards (in EU):

- Heat strengthened glass must comply with EN 1863-1*
- Thermally toughened glass must comply with EN 12150-1*
- Where performed, Heat Soak Tests (HST) must comply with EN 14179-1*

** Or equivalent local standards for countries outside the EU.*

Annealed (i.e. non-heat treated) sheets of Lacobel T are produced in factories being ISO 9001 certified.

Annealed (i.e. non-heat treated) sheets of Lacobel T delivered by AGC do not need to bear the CE marking.

For the EU, heat treated Lacobel T must be CE marked in accordance with EN 1863-2, 12150-2 or EN14179-2. In accordance with EU-regulations, all the requirements set out by these standards (ITT, FPC, etc.) must be met by the processor.

3 COMPOSITION AND PROPERTIES OF THE GLASS

The basis glass used for Lacobel T 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 ₂ O	10 to 16 %
CaO	5 to 14 %
MgO	0 to 6 %
Al ₂ O ₃	0 to 3 %
Others	0 to 5 %

3.2 MECHANICAL PROPERTIES

- Weight (at 18°C): $\rho = 2\,500 \text{ kg/m}^3$
- Density: 2,5
- Young's Modulus (modulus of Elasticity): $E = 70\,000 \text{ N/mm}^2$
- Poisson Ratio: $\mu = 0,2$
- Shear Modulus: $G = E / [2 (1+\nu)] \approx 29\,166 \text{ N/mm}^2$
- Knoop Hardness: 6 GPa
- Mohs Hardness: 6
- Characteristic bending strength: 45 N/mm^2

3.3 THERMAL PROPERTIES

- Softening point: $\approx 600 \text{ }^\circ\text{C}$
- Fusion temperature: $\approx 1500 \text{ }^\circ\text{C}$
- Linear expansion coefficient: $\alpha = 9 \cdot 10^{-6} / \text{K}$ (between 20° and 300°)
- Specific heat capacity: $C = 720 \text{ J/(kg.K)}$

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: $5 \cdot 10^7 \text{ } \Omega \cdot \text{m}$ at 1 000 Hz and 25°C
- Dielectric constant: 7,6 at 1 000 Hz and 25°C

4 TOLERANCES ON DIMENSIONS

The same tolerances as for the float used as support of the painted glass apply. This information is related to stock sizes (PLF and DLF).

4.1 THICKNESS

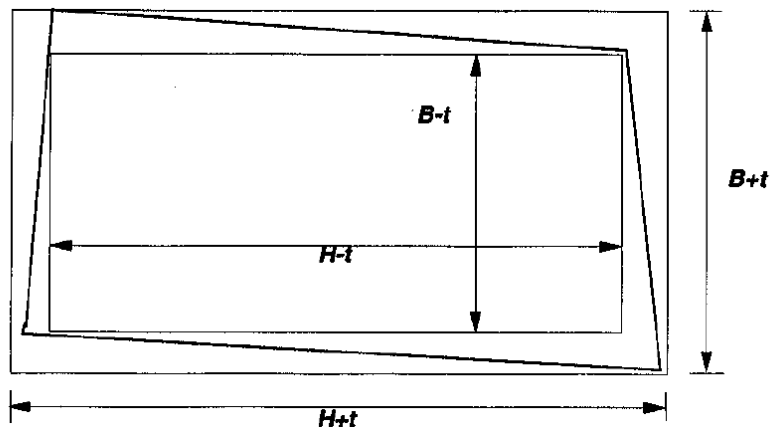
The actual thickness shall be the average of four measurements, taken to the nearest 0,01 mm, one taken at the center of each side.

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.

	Minimum (mm)	Maximum (mm)
4	3,8	4,2
5	4,8	5,2
6	5,8	6,2
8	7,7	8,3
10	9,7	10,3
12	11,7	12,3

4.2 LENGTH AND WIDTH

The tolerances 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.

5 QUALITY REQUIREMENTS

5.1 INTRODUCTION

The quality of a painted glass can be affected by faults resulting from faults in the paint and faults in the glass.

5.2 DEFINITIONS OF DEFECTS

The following definitions apply:

- Glass appearance faults: faults which alter the visual quality of the painted glass. They can be spot and/or linear and/or enlarged area faults
- Paint coating(s) faults: faults where the glass may be exposed or not. They can be scratches, spot faults, and change of colour or lack of adhesion of the paint coating
- Spot faults: punctual disturbance that may come from a glass defect e.g. nuclei (solid or gaseous inclusions), deposits, crush marks... or from a paint coating defect e.g. dust, pin-hole, de-wetting...and observed from the glass side
- Lack of adhesion point: spot fault where the paint is not sticking anymore on the glass, detected in reflection as a more brilliant point
- Cluster: a group of not less than 3 spot faults, separated by not more than 50 mm.
- Linear faults: scratches, extended spot faults etc. on the glass surface or on the paint, seen from the glass surface side
- Glass brush marks: very fine circular scratches that can hardly be seen and are associated with glass cleaning techniques
- Change of colour: fading or change of colour that may occur after an ageing test.

5.3 GLASS AND PAINT FAULTS

5.3.1 INSPECTION METHOD

The painted glass shall be observed in a vertical position against a non lighted background, glass side, with the naked eye and under normal diffused lighting conditions, (natural daylight or simulated daylight illuminant D65, observer 10°, between 300 Lux and 600 Lux at the painted glass), from a distance of 1 m. The direction of observation is normal, i.e. at right angle, to the painted glass. The use of an additional lighting source, e.g. spotlight, is not allowed. Defects on painted side are acceptable as long as they are not visible on glass side.

Defects are observed after heat treatment.

5.3.2 ACCEPTANCE LEVELS

The tables give the acceptance level for glass faults respectively for PLF. The average shall be calculated taking into account the total individual pack area (m²).

Acceptance level for stock size (defects / 20 m ²)	
Linear faults (mm)	Max/sheet
Brush marks (≤ 50 mm)	8
Scratches (≤ 50 mm)	3
Spot faults (mm)	Max/sheet
≤ 0,5	Accepted ^b
>0,5 and ≤ 1	10
>1 and ≤ 3	1
> 3	0
^a The dimensions stated are without the effect of halo and relate to the largest of the fault dimensions	
^b Accepted, providing they do not form a cluster (minimum distance 50 mm).	

Note: Defects on painted side are allowed if they are not visible at the glass side.

5.4 ASPECT AND COLOUR OF THE PAINTING

5.4.1 INTRODUCTION

The aspect of the painting 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

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

5.4.2 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.

5.4.3 ACCEPTANCE LEVELS

The allowable variation of the colorimetric measurements, measured on the glass side, after tempering, between panes (of 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.

Note 2: The final color of the product is obtained only after heat treatment; the color changes by the heat treatment.

5.4.4 OPACITY

Lacobel T is designed to be opaque after heat treatment (except Lacobel T Crisp White, which is not fully opaque; objects behind Lacobel T Crisp White could be visible).

5.5 EDGE FAULTS

5.5.1 INSPECTION METHOD

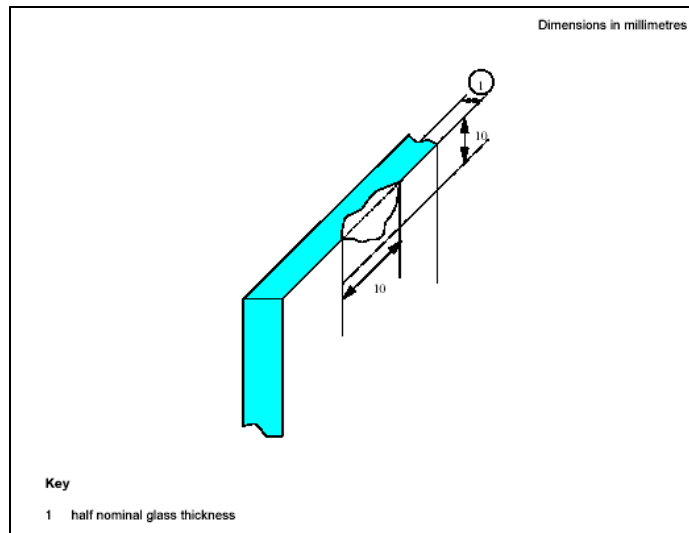
Same as §5.3.1.

5.5.2 ACCEPTANCE LEVELS

The edge quality of stock sizes painted glass can be affected by the presence of entrant/emergent faults and shelling. Using the method of §5.3.1, the edges of the painted glass panes shall be checked for the presence of shells, corners on/off and edge vents.

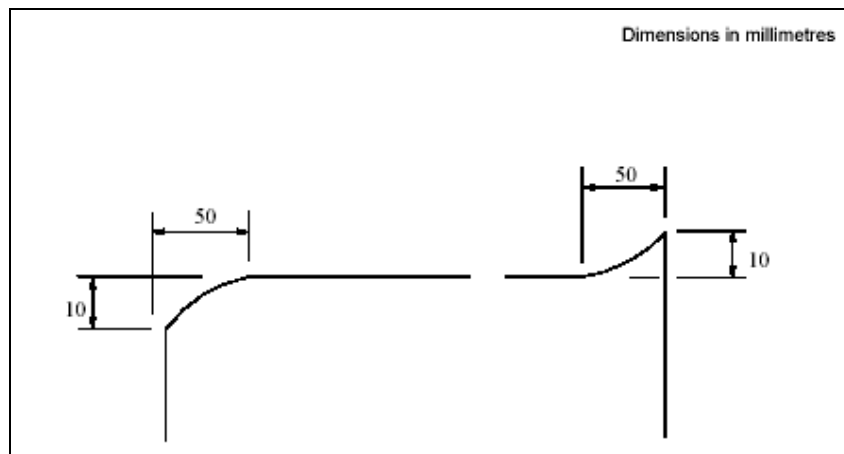
5.5.2.1 CHIPS OR SHELLS

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.



5.5.2.2 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.



5.5.2.3 VENTED (CRACKED) EDGES

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

6 ENVIRONMENTAL ASPECT

Lacobel T meet the criteria stipulated by the European Directive on Restriction of Hazardous Substances (RoHS Directive 2011/65/EU) that aims to reduce the use of certain harmful substances, including lead, in production processes.

None of the substances identified as Substances of Very High Concern (SVHC) in the REACH Candidate list* is present above 0.1% in Lacobel T products. (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.yourglass.com, product section “Lacobel T”, or look in the “Tools” section under “Regulatory Documents”.

7 SAFETY

7.1 SAFETY IN USE

Thermally toughened Lacobel T show a mode of breakage typical of toughened glass (EN 12600, type C).

Disintegration occurs under impact, leading to a large number of small particles that are relatively harmless.

CE-Marking declarations are available from www.yourglass.com/CE.

7.2 SAFETY IN THE CASE OF FIRE - REACTION TO FIRE

Reaction to fire is determined and classified in accordance with EN 13501-1.

Thermally toughened soda lime silicate safety 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.*

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

CE-Marking declarations are available from www.yourglass.com/CE.

8 HEALTH ASPECT

Heat treated Lacobel T show very little indoor emissions of Volatile Organic Compounds (VOCs).

9 OTHER RELATED DOCUMENTS

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

- Installation Guide
- Processing Guide
- Cleaning and Maintenance Guide for Decorative Glazing
- Cleaning and Maintenance Guide for Facade Glazing
- Glazing Instructions – Traditional Setting
- CE-Marking declarations