



**AGC**

# Technical Data Sheet

## Mirox MNGE

November 2024 – Version 3.0

Your Dreams, Our Challenge

## Table of Contents

<b>1 INTRODUCTION.....</b>	<b>3</b>
<b>2 NORMATIVE REFERENCES .....</b>	<b>3</b>
<b>3 SUSTAINABILITY .....</b>	<b>3</b>
<b>4 GLASS COMPOSITION AND PHYSICAL GLASS PROPERTIES .....</b>	<b>4</b>
4.1 CHEMICAL COMPOSITION.....	4
4.2 MECHANICAL PROPERTIES.....	4
4.3 THERMAL PROPERTIES.....	4
4.4 OPTICAL PROPERTIES.....	4
<b>5 DURABILITY OF MIROX .....</b>	<b>5</b>
<b>6 LIGHT PROPERTIES .....</b>	<b>5</b>
<b>7 TOLERANCES ON DIMENSIONS .....</b>	<b>6</b>
7.1 THICKNESS .....	6
7.2 LENGTH AND WIDTH.....	6
<b>8 QUALITY REQUIREMENTS .....</b>	<b>7</b>
8.1 INTRODUCTION.....	7
8.2 DEFINITIONS OF DEFECTS .....	7
8.3 GLASS FAULTS .....	7
8.4 REFLECTIVE SILVER COATING FAULTS.....	8
8.5 PROTECTIVE COATING FAULTS .....	9
8.6 OPTICAL QUALITY.....	9
8.7 ASPECT OF MIROX WITH SAFETY BACK VERSION .....	11
8.8 EDGE FAULTS .....	12
<b>9 ENVIRONMENTAL ASPECT .....</b>	<b>13</b>
<b>10 SAFETY.....</b>	<b>13</b>
10.1 SAFETY IN USE – PENDULUM BODY IMPACT RESISTANCE.....	13
<b>11 HEALTH ASPECT.....</b>	<b>13</b>
<b>12 OTHER RELATED DOCUMENTS .....</b>	<b>13</b>

# 1 INTRODUCTION

This Technical Datasheet provides information about the range of mirror glass 'Mirox', both with or without safety film.

# 2 NORMATIVE REFERENCES

Mirox products conform to:

- EN 1036-1 – Glass in building – Mirrors from silver-coated float glass for internal use – Part 1: Definitions, requirements, and test methods
- EN 1036-2 – Glass in building – Mirrors from silver-coated float glass for internal use – Part 2: Evaluation of conformity/Product standard

The substrate of Mirox is a float glass in accordance with SNI-15-0047-2005 (*clear and tinted float glass*).

All Mirox products are produced in factories ISO 9001 certified.

# 3 SUSTAINABILITY



Mirox MNGE has obtained EPD verification and other sustainability certifications.

- To read more on AGC Glass Asia's EPD, please visit [Embodied Carbon in Glass & EPD - AGC Glass Asia Pacific](#)
- To read more on our sustainability certifications, please visit [Sustainable Product Certifications - AGC Glass Asia Pacific](#)

# 4 GLASS COMPOSITION AND PHYSICAL GLASS PROPERTIES

## 4.1 CHEMICAL COMPOSITION

Mirox MNGE is produced with float glass substrate whose composition complies to:

SiO <sub>2</sub>	69 to 74 %
Na <sub>2</sub> O	10 to 16 %
CaO	5 to 14 %
MgO	0 to 7 %
Al <sub>2</sub> O <sub>3</sub>	0 to 3 %
Others	0 to 5 %

## 4.2 MECHANICAL PROPERTIES

- Weight (at 18°C):  $r = 2\,500 \text{ kg/m}^3$
- Density: 2,5
- Young's Modulus (modulus of Elasticity):  $E = 70\,000 \text{ N/mm}^2$
- Poisson Ratio:  $\nu = 0,2$
- Shear Modulus:  $G = E/[2(1+\nu)] \gg 28\,500 \text{ N/mm}^2$

## 4.3 THERMAL PROPERTIES

- Softening point: 700 - 740 °C
- Distortion point: 500 - 540 °C
- Linear expansion coefficient:  $\alpha = 85 - 95 \text{ (} \times 10^{-7} / ^\circ\text{C)}$

## 4.4 OPTICAL PROPERTIES

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

## 5 DURABILITY OF MIROX

Mirox products are tested following the durability method described in EN 1036-1.  
Mirox products resist to more severe requirements than the requirements of EN 1036-1.

	Criteria EN 1036-1	Performances of Mirox MNGE
<b>Neutral Salt Spray Test:</b> <ul style="list-style-type: none"> <li>Maximum corrosion around the edge</li> </ul>	1,0 mm	0,05 mm
<b>Copper Accelerated Acetic Acid Salt Spray Test:</b> <ul style="list-style-type: none"> <li>Maximum corrosion around the edge</li> <li>Maximum number of spots (diameter between 0,2 and 3 mm)</li> </ul>	1,5 mm	0,25 mm
	2 (accepted provided $\leq 0,2\text{mm}$ )	$\leq 1$ (accepted provided $\leq 0,2\text{mm}$ )
<b>Condensation Water Test:</b> <ul style="list-style-type: none"> <li>Maximum corrosion around the edge</li> <li>Maximum number of spots (diameter <math>\leq 0,3</math> mm)</li> </ul>	0,2 mm	0,05 mm
	1	0

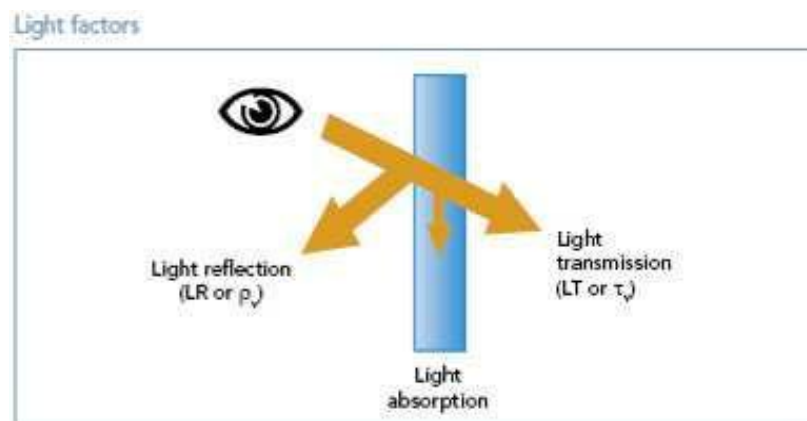
Product shipments may be advanced when good indicative examination results are observed.

## 6 LIGHT PROPERTIES

The light properties are calculated using spectral measurement that conforms with standard EN 410.

The light reflection (LR - $\rho_v$ ) measured in accordance with EN 410 shall be at least:

- 86% for mirrors made from clear float with a thickness between 2 mm and 6 mm.



## 7 TOLERANCES ON DIMENSIONS

The same tolerances used for the float supporting the mirrors apply here.  
This information is related to stock sheets only.

### 7.1 THICKNESS

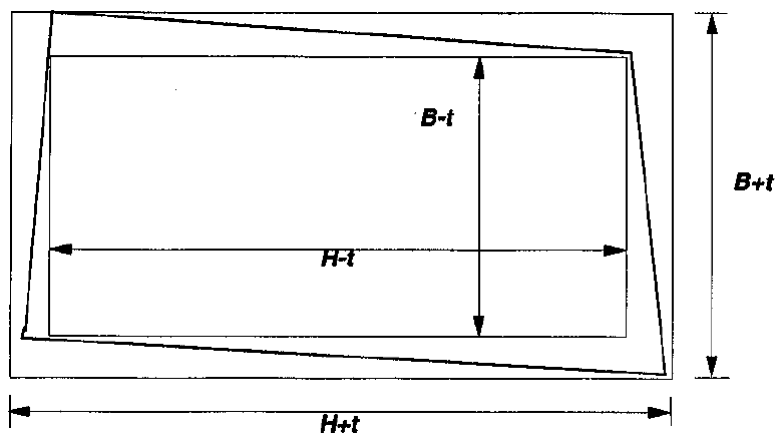
The actual thickness shall be the average of four measurements, taken to the nearest 0,01 mm, one taken at the center of each side.

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)
<b>2</b>	1,8	2,1
<b>3</b>	2,8	3,1
<b>4</b>	3,8	4,2
<b>5</b>	4,8	5,2
<b>6</b>	5,8	6,2

### 7.2 LENGTH AND WIDTH

The tolerances on nominal dimensions length H and width B are respectively  $\pm 3$  mm and  $\pm 2$  mm.



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

## 8 QUALITY REQUIREMENTS

### 8.1 INTRODUCTION

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

### 8.2 DEFINITIONS OF DEFECTS

The following definitions apply:

- **Optical faults:** Faults directly associated with the distortion of the reflected image.
- **Glass appearance faults:** Faults which alter the visual quality of the mirror from silver-coated float glass. They can be spot and/or linear and/or enlarged area faults.
- **Spot faults:** Nuclei (solid or gaseous inclusions), deposits, crush marks etc.. In certain instances, spot faults are accompanied by a distortion zone called a 'halo'. The nucleus of the spot fault is measurable.
- **Linear defects:** Scratches, extended spot faults etc..
- **Brush marks:** Very fine circular scratches that can hardly be seen and are associated with glass cleaning techniques.
- **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 characterised by a more or less brownish, yellowish or greyish colouration of zones which can sometimes cover the whole reflective surface.
- **Color 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.

### 8.3 GLASS FAULTS

#### 8.3.1 INSPECTION METHOD

The silvered mirror 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 silvered mirror), from distance of minimum 1 m. The direction of observation is normal, i.e. at right angles, to the silvered mirror. The use of an additional lighting source, e.g. spotlight, is not allowed.

The dimension and number of brush marks, scratches and spot faults which cause disturbance to vision shall be noted.

### 8.3.2 ACCEPTANCE LEVELS

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

#### Acceptance level for linear defects in standard sizes

	Mirrors with <b>clear and tinted</b> glass substrate	
	Big Size (defects/sheets of 3,66 m x 2,44 m)	Other Sizes (defects/m <sup>2</sup> )
Brush marks (≤ 50 mm)	3	0,375
Scratches (≤ 50 mm)	1	0,139

#### Acceptance level for spot faults<sup>a</sup> in standard sizes

	Mirrors with <b>clear</b> glass substrate			
	Big Size (defects/sheets of 3,66 m x 2,44 m)		Other Sizes (defects/m <sup>2</sup> )	
	Max/sheet	Average/sheet	Max/sheet	Average/sheet <sup>b</sup>
≤ 0,2 mm	Accepted <sup>c</sup>	Accepted <sup>c</sup>	Accepted <sup>c</sup>	Accepted <sup>c</sup>
> 0,2 mm and ≤ 0,5 mm	12	8	1,35	0,93
> 0,5 mm	1	1	0,16	0,11
	Mirrors with <b>tinted</b> glass substrate			
	Big Size (defects/sheets of 3,66 m x 2,44 m)		Other Sizes (defects/m <sup>2</sup> )	
	Max/sheet	Average/sheet	Max/sheet	Average/sheet <sup>b</sup>
≤ 0,2 mm	Accepted <sup>c</sup>	Accepted <sup>c</sup>	Accepted <sup>c</sup>	Accepted <sup>c</sup>
> 0,2 mm and ≤ 0,5 mm	14	13	1,55	1,50
> 0,5 mm	2	1	0,21	0,16

<sup>a</sup> The dimensions stated are without the effect of halo and relate to the largest of the fault dimensions.

<sup>b</sup> The average shall be calculated taking into account the total individual pack area (m<sup>2</sup>).

<sup>c</sup> Accepted, providing they do not form a cluster.

## 8.4 REFLECTIVE SILVER COATING FAULTS

### 8.4.1 INSPECTION METHOD

Same as Section 8.3.1

### 8.4.2 ACCEPTANCE LEVELS

The reflective silver coating faults are not allowed if they are visible under the condition of Section 8.3.1.



## 8.5 PROTECTIVE COATING FAULTS

### 8.5.1 INSPECTION METHOD

Same as Section 8.3.1

### 8.5.2 ACCEPTANCE LEVELS

Using the method in Section 8.3.1, 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.

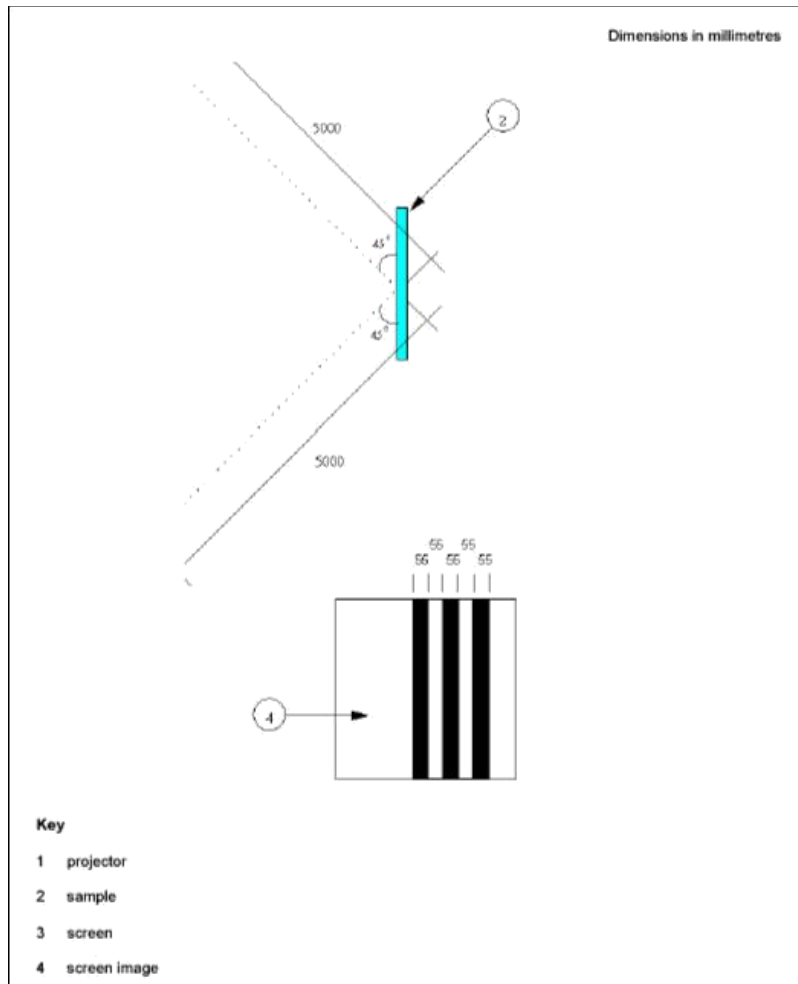
## 8.6 OPTICAL QUALITY

### 8.6.1 QUALITATIVE VISUAL INSPECTION METHOD

A silvered mirror shall be examined in areas of 500 mm × 500 mm at a time. The observer shall be located at distance of 2 m in front of and normal to the area being examined. Behind the observer shall be an irregular background. The reflected image shall not be optically disturbed, e.g. by another reflective surface, windows. The observed distortions can be quantified using the method in Section 8.6.2.

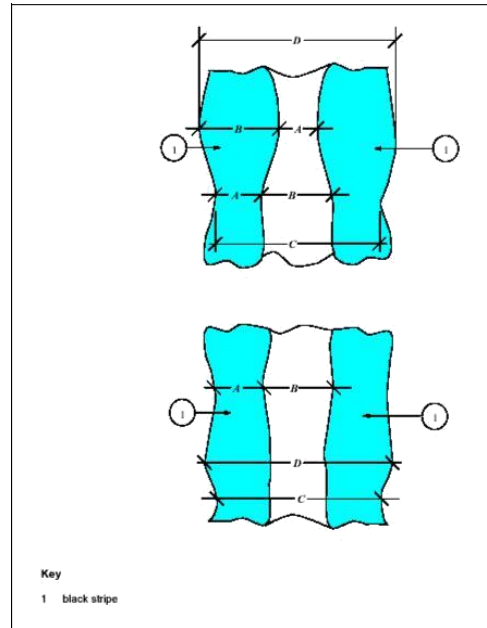
### 8.6.2 OPTIONAL QUANTITATIVE TEST METHOD

A projector having a focus distance between 80 mm and 100 mm and an aperture of 8 mm shall be positioned at distance of 5 m from the specimen being examined, at an angle of 45° to the specimen, which is positioned vertically. A screen shall be located 5 000 mm from the center of the mirror at right angles to the reflected beam (see figure below).



A grid pattern slide, when projected onto the screen shall give dark and clear stripes of 55 mm width. Calibration of the stripe width is achieved by using a non-distorted front surfaced mirror in place of the specimen.

The difference in width of each projected stripe, or of three neighbouring stripes shall be measured.



### 8.6.3 ACCEPTANCE LEVELS

The mirror meets the requirements if it does not exhibit any disturbing optical variation of the image following the visual inspection described in Section 8.6.1.

In case of doubt, the method given in Section 8.6.2 can be used. The measured deviations shall remain within the following limits (see figure above):

- A = 55 mm – a
- B = 55 mm + a
- C = 165 mm – b
- D = 165 mm + b

where a = 10 mm and b = 15 mm.

If the pane includes an original edge of the basic glass production width B, the following values for a and b apply in the corresponding 165 mm wide border band:

- Nominal glass thickness < 4 mm:
  - a = 30 mm
  - b = 40 mm
- Nominal glass thickness ≥ 4 mm:
  - a = 20 mm
  - b = 30 mm

### 8.7 ASPECT OF MIROX WITH SAFETY BACK VERSION

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

## 8.8 EDGE FAULTS

### 8.8.1 INSPECTION METHOD

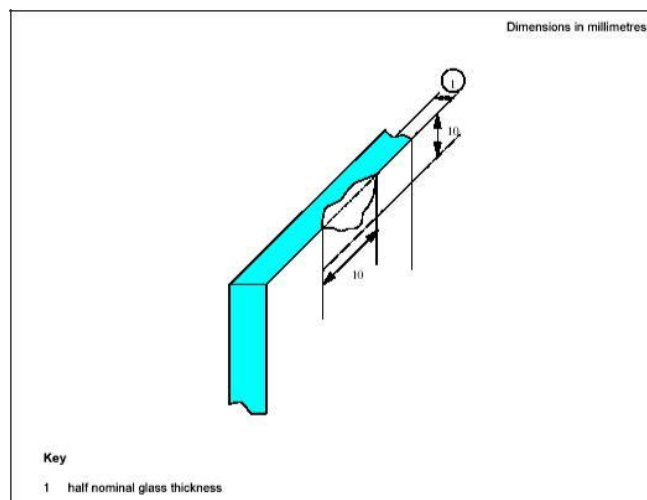
Same as Section 8.3.1.

### 8.8.2 ACCEPTANCE LEVELS

The edge quality of stock sizes mirrors can be affected by the presence of entrant/emergent faults and shelling. Using the method of Section 8.3.1, the edges of the mirrors shall be checked for the presence of shells, corners on/off and edge vents.

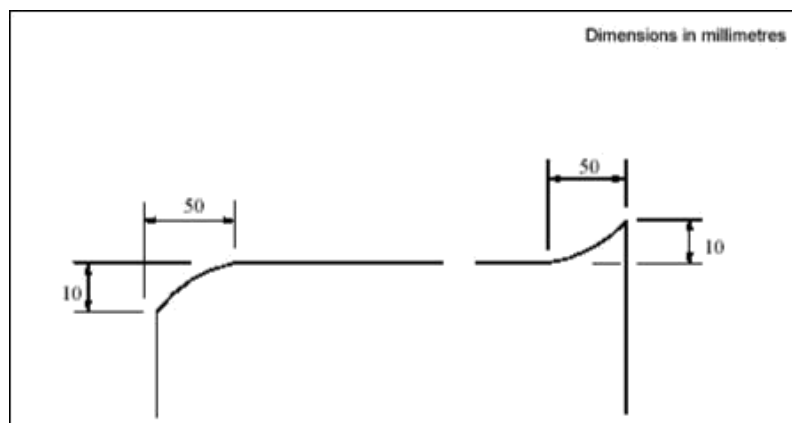
#### 8.8.2.1 CHIPS OR SHELLS

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.



#### 8.8.2.2 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.



### 8.8.2.3 VENTED (CRACKED) EDGES

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

### 8.8.2.4 SHARK TEETH

For stock sizes, shark teeth width is to be no more than 2 mm.

## 9 ENVIRONMENTAL ASPECT

Mirox has been developed to be environmentally-friendly mirrors.

The current production line for Mirox MNGE has, amongst other things, made it possible to:

- Eliminate the copper layer
- Reduce lead content to < 0,3 % (<3000ppm) for Mirox MNGE

## 10 SAFETY

### 10.1 SAFETY IN USE – PENDULUM BODY IMPACT RESISTANCE

Shatter properties (safe breakability) and pendulum body impact resistance are determined and classified in accordance with AS/NZS 2208:1996, Grade A.

Mirox mirrors show a mode of breakage typical of annealed glass (AS/NZS 2208:1996).

Mirox with safety film comprise of polymer film applied to the back of the glass. This safety backing film ensures safety in case of soft body impact.

Mirox with safety film show a mode of breakage typical of laminated glass (AS/NZS 2208:1996, Grade A). Numerous cracks appear under soft body impact, but the fragments hold together and do not separate.

## 11 HEALTH ASPECT

AGC puts great effort in developing products that preserve our indoor air quality.

Mirox products show very little indoor emissions of Volatile Organic Compounds (VOCs), including very low levels of formaldehyde.

## 12 OTHER RELATED DOCUMENTS

Following documents are also available from [agc-glassasia.com](http://agc-glassasia.com)

- Installation Guide
- Processing Guide
- Cleaning and Maintenance Guide