



AGC

Technical Data Sheet

Stopray Vision and Smart

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Your Dreams, Our Challenge

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1 INTRODUCTION

This Technical Datasheet provides information about the range of Solar Control Low-E glass “Stopray Vision and Smart”. The information provided by this document are related to stock sizes only.

2 NORMATIVE REFERENCES

The following standards contain provisions for normative references of Stopray Vision and Smart products.

- EN 1096-1 – Glass in building – Coated glass – Part 1: Definitions and classification
- EN 1096-3 – Glass in building – Coated glass – Part 3: Requirements and test methods for class C and D coatings
- EN 1096-4 – Glass in building – Coated glass – Part 4: Evaluation of conformity/Product standard

And its glass substrate has been produced under a national standard of each factory as follows:

- TISI880 (*Clear float Glass*)
- SNI-15-0047-2005 (*Clear and tinted float glass*)

Stopray Vision and Smart are produced in factories being ISO 9001 certified and the factories have established their original QMS with high-performance QC methods of their own.

3 SUSTAINABILITY



Stopray Vision and Smart 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 EXAMPLE DATA OF GLASS COMPOSITION AND PROPERTIES

4.1 CHEMICAL COMPOSITION

Stopray Vision and Smart are produced with float glass substrate whose composition complies to

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

4.2 THERMAL PROPERTIES

- Softening point: 700-740 °C
- Distortion point: 500-540 °C
- Linear expansion coefficient: $\alpha = 85-92 \text{ (} \times 10^{-7}/^{\circ}\text{C)}$

4.3 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: $m = 0,2$
- Shear Modulus: $G = E / [2 (1+n)] \gg 28500 \text{ N/mm}^2$

4.4 OPTICAL PROPERTIES

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

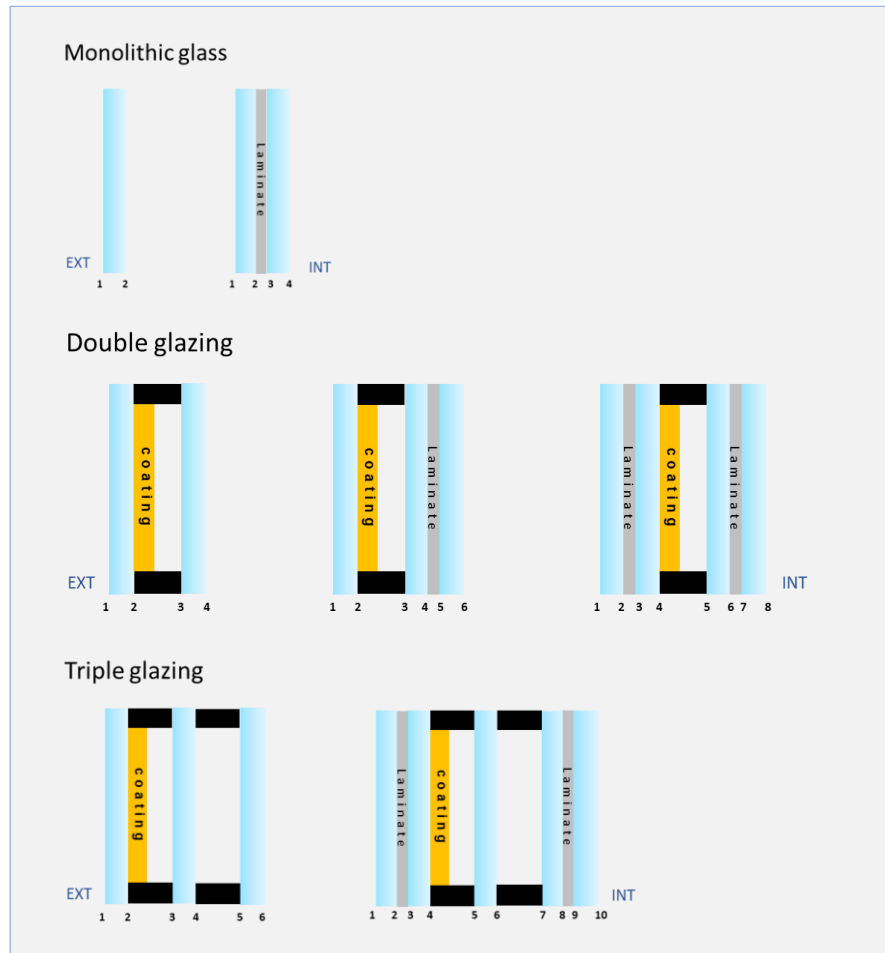
5 DURABILITY OF STOPRAY VISION AND SMART COATINGS

All Stopray Vision and Smart are class C following EN 1096-1. They succeeded a UV resistance test following EN 1096-3.

6 LIGHT, SOLAR AND THERMAL PROPERTIES

6.1 CONVENTION FOR COATING POSITION

The following conventions are used for the numbering of the glass faces and the position of the coating.



6.2 TOLERANCES ON LIGHT AND SOLAR PROPERTIES

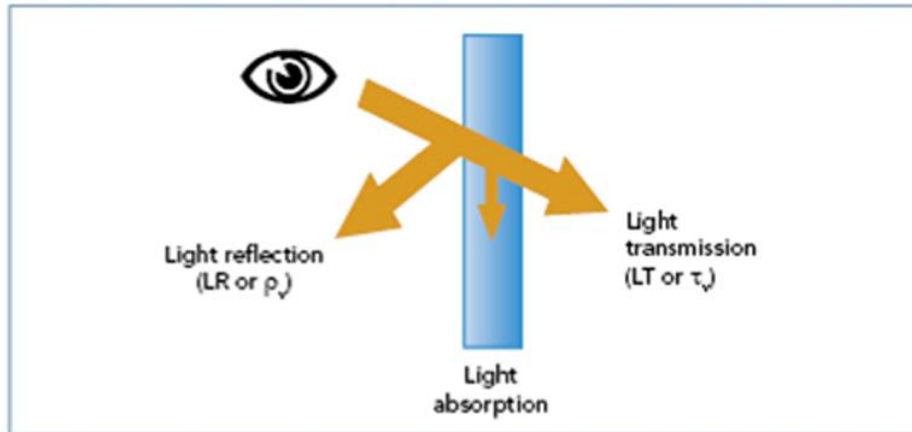
The light and solar properties are calculated using spectral measurement that conforms with standards EN 410 and WIS/WINDAT. The following properties are given:

- LT (τ_v): Light transmission
- LR (ρ_v): Light reflection on coating side
- LR' (ρ'_v): Light reflection on glass side
- DET (τ_e): Direct energy transmission
- ER (ρ_e): Energy reflection on coating side
- ER' (ρ'_e): Energy reflection on glass side
- EA (α_e): Energy absorption
- SF (g): Solar factor
- SC: Shading coefficient

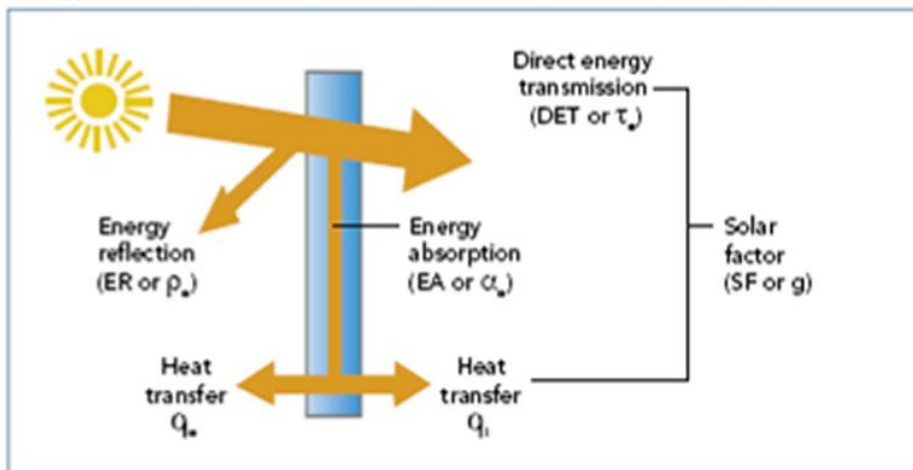
The tolerances on the values LT, LR, LR', DET, ER, ER' are +/- 3 %.

Note: They are no direct tolerances on SF, SC and EA as these values are calculated from the previous ones.

Light factors



Energy factors



6.3 TOLERANCES ON THERMAL PROPERTIES

The thermal transmittance U_g (W/m²K) is calculated according EN 673. The emissivity measurement complies with EN 673 and EN 12898.

The tolerance on the values of normal emissivity ϵ_n is + 0,01.

6.4 PERFORMANCES OF STOPRAY VISION AND SMART PRODUCTS

The table lists the light, solar and thermal properties of the Stopray products. For other thicknesses, see agc-glassasia.com.

6mm	LT	LR	LR'	DET	ER	ER'	ϵ_n
Stopray Smart 51/33	56	11	23	34	37	30	0.03
Stopray Smart 30/20	33	9	28	20	31	30	0.03
Stopray Vision 31T*	35	9	19	17	45	31	0.01
Stopray Vision 50	55	17	16	28	43	32	0.01
Stopray Vision 50T*	55	16	15	31	44	31	0.01
Stopray Vision 60	67	12	12	36	38	29	0.01
Stopray Vision 60T*	65	15	11	38	41	26	0.01
Stopray Vision 38T*	42	10	16	20	48	36	0.01
Stopray Vision 40/40T*	44	9	18	21	48	41	0.01
Stopray Vision 52/52T*	56	6	14	28	43	36	0.01
Stopray Vision 61/61T*	67	6	9	34	42	33	0.01
Stopray Vision 72A	78	7	8	40	43	31	0.01
Stopray Vision 72T *	79	8	8	40	43	35	0.01

*Temperable products. The coating will have achieved the performances indicated once its temperature reaches. 500°C. **Please refer to AGC processing manual.**

Stopray Smart coatings can be used with or without heat treatment and depending on the type of sealant used, the edge-deletion is not required¹.

¹ Reference to the prerequisites and the processing guidelines described in the "Stopray Processing Guide" and in the "Stopray Smart Sealant Compatibility Guide".

7 ACOUSTIC PROPERTIES

The table lists example data of the acoustic properties of glass products. The discrepancy of this property between coated and non-coated would be neglectable.

Thickness Designation(mm)	Rw (C, Ctr)	Rw + C	Rw + Ctr
4	30 (-2, -4)	28	26
5	30 (-1, -2)	29	28
6	31 (-2, -3)	29	28
8	32 (-1, -2)	31	30
10	34 (-2, -3)	32	31
12	35 (-2, -3)	33	32

8 TOLERANCES ON DIMENSIONS

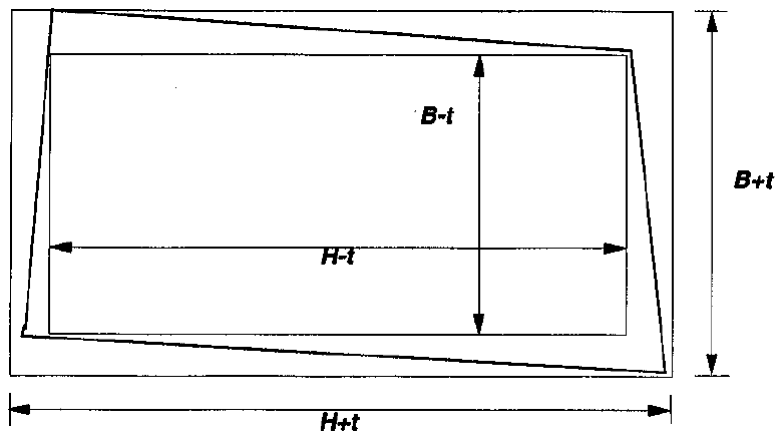
8.1 THICKNESS

The actual thickness of each designation(mm) are controlled in accordance with below Table.

Thickness Designation(mm)	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

8.2 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 should be 5mm or less.

9 QUALITY REQUIREMENTS

9.1 INTRODUCTION

The defect affecting appearances are:

- Specific to the coating: see hereunder.

If a defect specific to the glass substrate is more visible because of the coating, it will be treated as a coating punctual defect.

9.2 DEFINITIONS OF DEFECTS

The following definitions apply:

- **Uniformity defect:** Slight visible variation in colour, in transmission or reflection, within a coated glass pane or from pane to pane
- **Stain:** Defect in the coating larger than punctual defect, often irregularly shaped, partially of mottled structure.
- **Punctual defect:** Punctual disturbance of the visual transparency looking through the glass and of the visual reflectance looking at the glass
Note: Spot, pinhole and scratch are types of punctual defects.
- **Spot:** Defect that commonly looks dark against the surrounding coating, when viewed in transmission
- **Pinhole:** Punctual void in the coating with partial or total absence of coating and normally contrasts clear relative to the coating when viewed in transmission
- **Scratch:** Variety of linear marks, whose visibility depends on their length, depth, width, position and arrangement
- **Cluster:** Accumulation of very small defects giving the impression of stain.

9.3 DETECTION OF DEFECTS

9.3.1 GENERAL

The defects are detected and controlled by in-process inspection in each production factory. The method described in 9.3 is an example and the actual QC method in-process may be an equivalent system with higher performance. (i.e. not human eye but by an automatic defect detector)

9.3.2 INSPECTION ENVIRONMENT

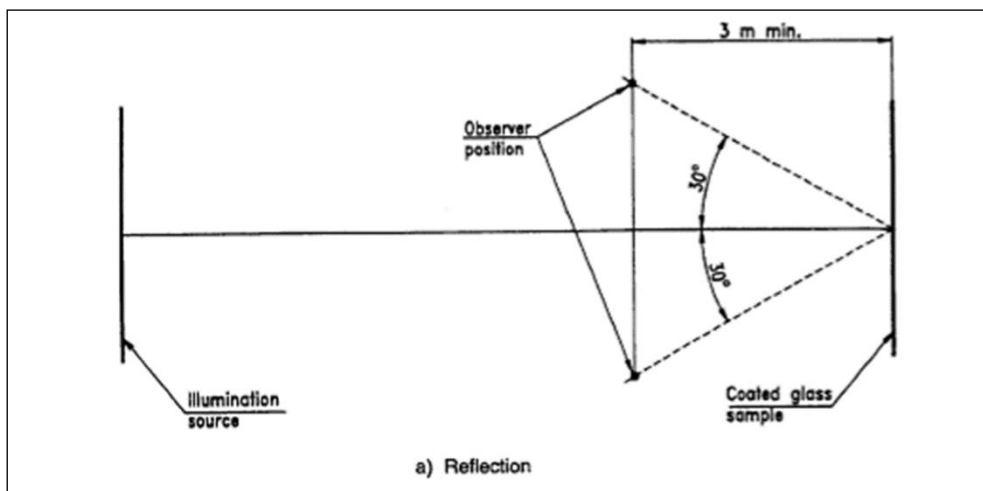
The appearance inspection should be performed under the control of the brightness of daylight or with lighting. If a Stopray Vision and Smart pane is inspected in a daylight environment, for example on a building site, a uniform overcast sky without direct sunlight is required. Or if in a closed area like an inspection booth of producing process, brightness control with emitting diffused light with uniform brightness and a general colouring index Ra higher than 70.

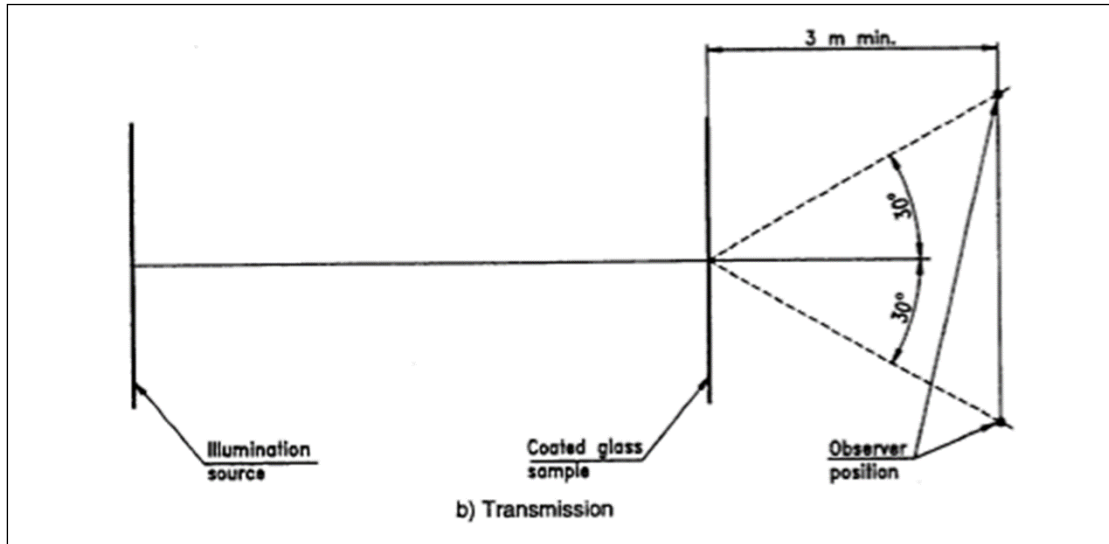
It is obtained by using a light source whose correlated colour temperature is in the range between 4000 K and 6000 K. In front of the arrangement of light sources is a light scattering panel, without spectral selectivity. The illuminance level, on the glass surface, shall be between 400 lx and 20000 lx.

9.3.3 CONDITION OF OBSERVATION OF DEFECTS

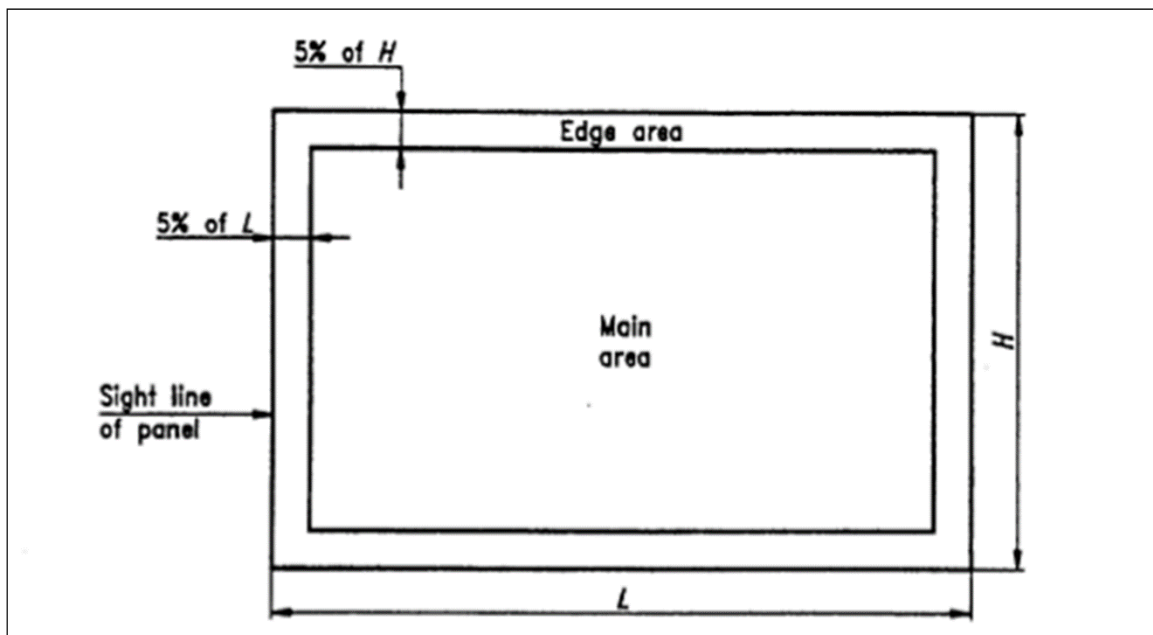
Coated glass may be examined in stock size or in finished sizes ready for installation. The examination may be undertaken in the production factory or at the installation site.

The pane of coated glass being examined is viewed from a minimum distance of 3 m. The examination of the coated glass in reflection is performed by the observer looking at the coated side of the glazing. During the examination, the angle between the normal to the surface of the coated glass and the light beam proceeding to the eyes of the observer after reflection or transmission by the coated glass shall not exceed 30° (see figure).





For panes of coated glass in finished sizes ready to be installed, both the main area and edge area of the pane shall be examined (see figure).



Each examination for detection in the initial by human's eye should take no more than 20 s for each pane. And only the defects detected within 20s per required condition should be controlled.

9.3.4 UNIFORMITY DEFECTS AND STAINS

Under the condition of examination given in 9.3.3, note any coating variations either within on pane or between neighboring panes which are visually disturbing.

9.3.5 PUNCTUAL DEFECTS

Under the conditions of examination given in 9.3.3, note any spots, pinholes and/or scratches that are visually disturbing.

For spots/pinholes, measure the size and note the number relative to the size of the pane. If there are any clusters found, their position relative to the through vision area shall be determined.

For scratches, determine whether or not they are in the main or edge area. Measure the length of any scratches noted. For scratches > 75 mm long, determine the distance between adjacent scratches. For scratches, ≤ 75 mm long, note any area where their density produces visual disturbances.

9.4 ACCEPTANCE CRITERIA OF COATING DEFECTS

The acceptance criteria for the defects of coating glass are given in the table.

Defect Types	Acceptance Criteria		
	Pane/Pane	Individual Pane	
UNIFORMITY/STAIN	Allowed as long not visually disturbing	Allowed as long not visually disturbing	
PUNCTUAL Spot/pinholes > 3 mm > 2 mm and ≤ 3 mm	Not applicable	Main Area	Edge Area
		Not allowed	Not allowed
		Max 1 by m ²	Max 1 by m ²
Clusters	Not applicable	Not allowed	Allowed as long as not in area of through vision
Scratches > 75 mm ≤ 75 mm	Not applicable	Not allowed	Allowed as long as they are separated by > 50 mm
		Allowed as long as local density is not visually disturbing	Allowed as long as local density is not visually disturbing

9.5 COLOUR DIFFERENCE IN FAÇADES

9.5.1 METHOD AND CONDITION OF OBSERVATION

When coated glasses are installed on façades, some variations of color can appear between the panes. The document of Glass for Europe "Code of practice for in-site measurement and evaluation of the color of coated glass used in façades" (available at Glass for Europe's [website](#)) describes the way to measure and evaluate these differences of color.

9.5.2 REQUIREMENTS

The values of ΔL^* , Δa^* and Δb^* determined in accordance with 9.5.1 shall meet the following requirement.

ΔL^*	$\leq 4,0$
Δa^*	$\leq 3,0$
Δb^*	$\leq 3,0$

10 OTHER RELATED DOCUMENTS

Following documents are also available from agc-glassasia.com

- Processing Guide
- Cleaning and Maintenance Guide for Façade glazing