SCHOTT® Flat Glass

Delivery Specification

SCHOTT
glass made of ideas


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1. General

1.1 Description

SCHOTT® Flat Glass is a thermally toughened soda-lime flat glass. It is produced via the Float glass process and is mainly clear but can also be tinted or coated.

1.2 Areas of Application

Due to its particular resistance to thermal shock, temperature gradients and mechanical loads (e.g. bending and impact) SCHOTT® Flat Glass are ideal components for many applications.

For example this includes; oven doors and control panels, lids for electric and gas cookers, hot-trays, sight windows for room heaters, glass panels or lighting, shower cabinets, screens and safety glass for slow moving vehicles (tractors, excavators), TV-front panels as well as furniture glass.

1.3 Availability

SCHOTT® Flat Glass are usually supplied as flat panels. In addition to right-angled panels, water-jet cutting can also produce other shapes. Within a wide range of products, edges can be worked, holes can be drilled and panels can be printed in accordance with a customer's wishes. Bent panels can also be supplied on special request.

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2. Technical Data

2.1 General

Data, for which no general measurement method exists and which are not generally defined (e.g. by a norm), are specified and explained in more detail in the appendix.

2.2 Thickness

Nominal Thickness (mm)	Tolerance (mm)
3.2	+ 0.2 / - 0.1
4	± 0.2
5	± 0.2
6	± 0.2
8	± 0.3
10	± 0.3

2.3 Maximum Stand. Width

1,200 mm

2.4 Maximum Stand. Length

2,000 mm

Other length and width on request.

2.5 Deviations

Length / width tolerances: ± 1.0 mm

2.6 Flatness

Maximum deviation from flatness of 1 mm per 300 mm length measured across the longest diagonal of the panel is permitted. The out-of-flatness will be measured as the greatest right angled distance between a fixed vertical reference level and the panels.

Roller waves are caused by the glass moving across rollers at high temperatures. This will give a slight waviness which varies with glass thickness and pitch of rollers.

2.7 Perpendicularity

Maximum deviation from perpendicularity is 0.1°.
This corresponds to a deviation of 1.7 mm per meter.

2.8 Edge work

The edges are typically ground but can be arised or polished on request.

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2.9 Holes and Cut-outs

2.9.1 Holes

Hole diameter: 3.5 to 300 mm.
Other dimensions on request.

Hole Diameter (mm)	Tolerance (mm)
= 3.5 to 100	± 0.5
> 100 to 300	± 1.0

	Hole Diameter up to 60 mm	Hole Diameter 60 to 300 mm
Minimum distance between edge of hole and edge of glass	Double glass thickness or 1.5 times diameter of the hole; the large value applies up to a maximum of 50 mm	= 50 mm (smaller distance on request)
Minimum distance between two holes	Four times glass thickness	= 50 mm (smaller distance on request)

2.9.2 Cut-outs

In addition to regular round drilled holes, other types of cut-outs (e.g. rectangular and oval) are also available.
Dimensions and tolerances on request.

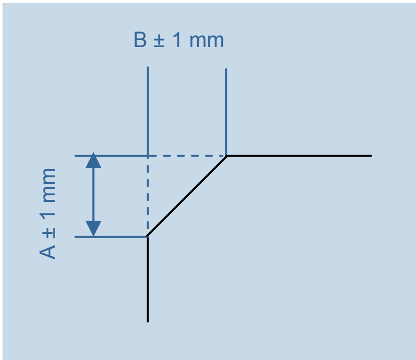
2.10 Corner Work

2.10.1 Dubbed Corners

A dubbed corner has a smooth surface and makes the handling and assembly of the panels safer and easier (dub = 0.5 to 2.0 mm of glass removed at an angle of approx. 45°). For dimensional tolerances, please refer to oblique corners.

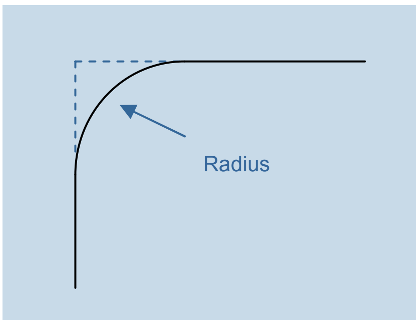
2.10.2 Oblique Corners

These are cut at a certain angle (e.g. 45°) in accordance with the customer requirements. Measurements are expressed in the sketch below.



2.10.3 Radius Corners

The smallest possible standard radius is 4 mm.
The tolerance is + 2 / - 0 (smaller radii on request).



2.11 Printing

2.11.1 Printing Process

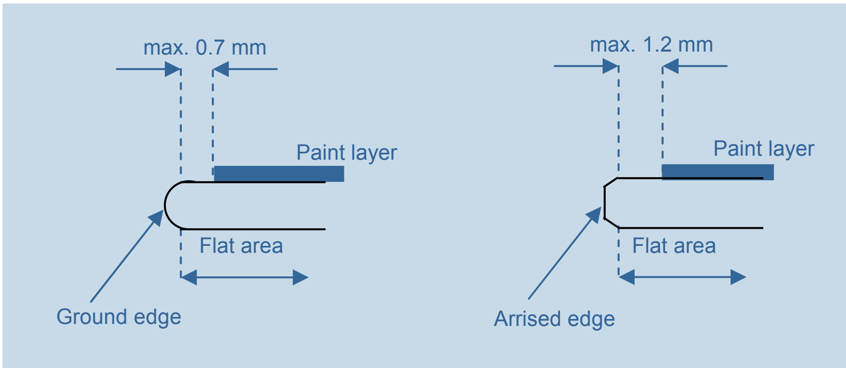
Two types of colors are available for printing on SCHOTT® Flat Glass:
- ceramic colors
- organic colors[1)]

Ceramic colors are suitable for high temperatures and are therefore applied when the temperature of the glass panels will exceed 150°C when in use. Organic colors may be used when the glass panel temperature is under 150°C when in use. These colors can also be used in a transparent form as “color filters” for lighting purposes (for example in control panels).

Both color types can be used in combination on the same panel and both are applied using the silk-screen printing process.

Almost all color shades are available[2)].

2.11.2 Printing Tolerances



Minimum thickness of a printed line:	0.5 mm
Minimum diameter of a printed dot:	1.0 mm
Tolerance between two printed operations:	0.5 to 1.0 mm

1) This type of color cannot be used on bent glass.

2) Bright red or yellow colors or blends with bright red or yellow colors have to be made of organic color dyes due to the ban of some hazardous substances by RoHS directive.

2.12 Thermal Load Capacity

2.12.1 Maximum Operating Temperature

Depending on the temperature in practical use, some of the original level of toughening can be reduced in (thermally toughened) glass.

To be certain that we meet the requirements of practical use, toughening in SCHOTT® Flat Glass is permitted to be reduced to no less than 80% of the original level of toughening.

This is ensured, if the temperature-time-load capacities in the following table are not exceeded:

Maximum admissible:

SCHOTT® Flat Glass temperature	Max. permitted total time
280 °C	10 000 hours
290 °C	1 000 hours
300 °C	100 hours
310 °C	30 hours

2.12.2 Resistance to Thermal Shock (RTS)

Glass panels shall not fracture when exposed to thermal shock.

Statements on the thermal shock resistance can only be made on the basis of information pertinent to the relevant application (mainly in association with applications-specific standards to be fulfilled).

Example: The thermal shock resistance as required in EN 60335-2-6, clause 21 is met by SCHOTT® Flat Glass assuming the product is properly assembled.

Since the fulfillment of the above-mentioned standard is heavily dependent on the assembly into which the panel is built (e.g. the frame), each individual construction must be tested.

2.13 Mechanical Impact- / Shock-Resistance

The impact resistance of SCHOTT® Flat Glass is a function of the manner of assembly, the size and thickness of the panel, the type of impact, the impact stress and many other parameters.

Consequently, statements on the impact resistance can only be made on the basis of information pertinent to the relevant application (mainly in association with application-specific standards to be fulfilled)[1].

Example: The impact resistance as required in EN 60355-2-6, clause 21 is met by SCHOTT® Flat Glass when properly assembled.

Since the fulfillment of the above mentioned standard is heavily dependent on the assembly of the panel into the frame, each individual construction must be tested by the manufacturer.

[1] See explanatory (Strength)

2.14 Assembly Guidelines

The general conditions, as defined for the assembly of glass panels also apply to SCHOTT® Flat Glass. The way in which the panels is fixed must not include additional stress on the glass panel. This is required because the thermal expansion coefficient is considerably lower than that of metal components which are mostly used to support SCHOTT® Flat Glass, it is important that this difference is absorbed.

We therefore recommend the use of a durable elastic seal. If required temperature resistant material that insulate SCHOTT® Flat Glass from metal or any other hard components such as silicone, mineral wool or aluminosilicate seals should be in place.

Dubbed corners as described under 2.10.1 may need protection, if mounted in an exposed position.

Appendix

A 1. Strength

All information given on the strength of glass must take into account its specific material characteristics.

Technologically, glasses are ideally elastic[1)] brittle materials, in which flow processes do not occur. If in contact with analogously hard materials, this causes the occurrence of surface defects in the form of fine score lines and cracks. In addition with mechanically loaded glasses, critical excess stresses at the tips of such score lines and cracks cannot be reduced by plastic flows, as in the case of metals.

As a result of this behavior, the high strength of glasses attributable to the structure is virtually without any significance; it is reduced to a practical tensile strength range of values from approx. 20 – 200 N / mm^2. This is by the action of inevitable surface defects (when the surface is unprotected) due to practical use and thus depending on the state of the surface and also the test conditions.

Consequently, the strength of glass is not a material constant (or the density) and depends on

- the state of machining
- the conditions of use (type and distribution of surface defects)
- the derivative trend with respect to time and the effective duration of tensile stress
- the surrounding medium
- the (tensile) stress surface / format

It is in line with the type and distribution of the surface defect and is subject to statistical distribution.

As for practice, the term “technical strength” has proved useful; it is understood to include the permanent and expected strength of a glass object, taking into consideration all surface injuries, which the said object may suffer from knocks or chafing in the course of its use.

1) “Ideally elastic” is a term referring to a material between stress and deformation. In the case of fracture, there is a linear interrelation. The “brittle” material does not exhibit the ability of toughened steel to reduce stress by plastic deformations.

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