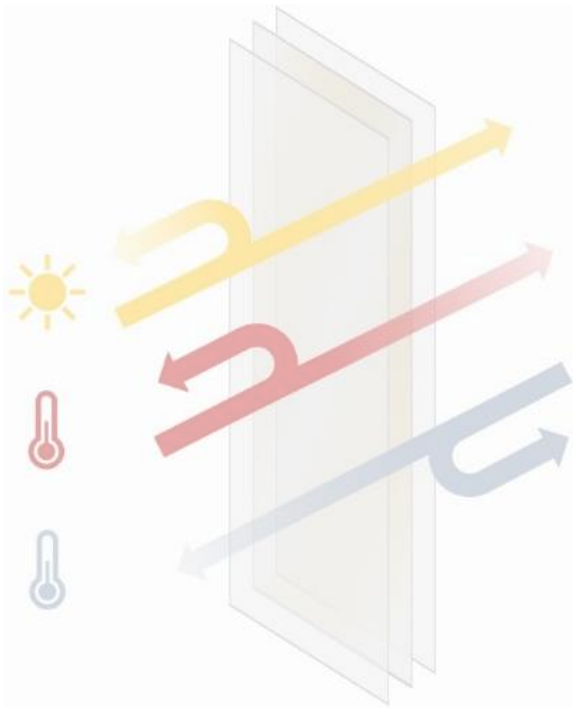
ChromoGenics Static Glass, Technical specification

OVERVIEW

ChromoGenics Static Glass is a static glass with good angular and spectral properties that improves indoor comfort and contributes to better energy efficiency in buildings, while always having access to daylight and view. In addition, Static Glass design freedoms make it easy to adapt shape and function to the conditions and requirements for the building or project.

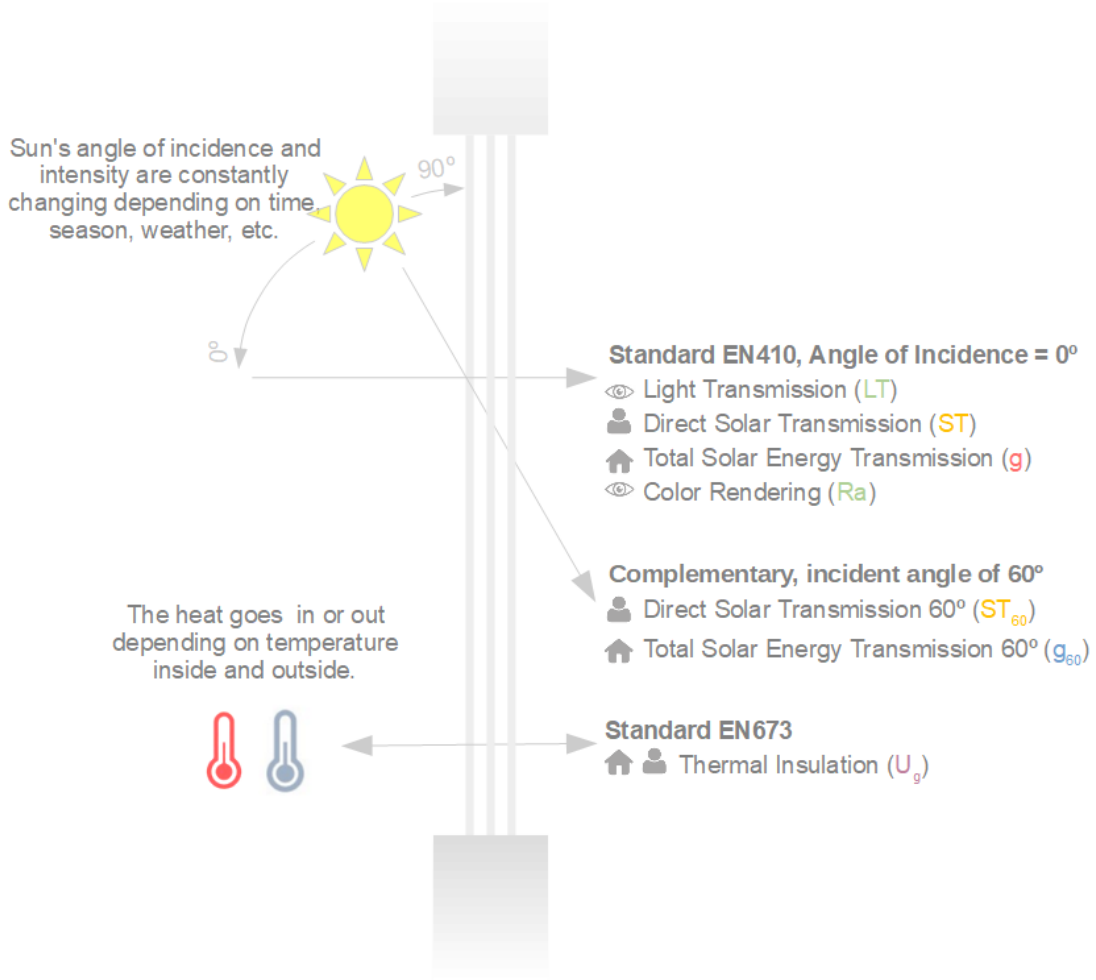
STATIC GLASS



Always good visual- and thermal comfort; and good energy properties.

ESTIMATING COMFORT AND ENERGY

In order to estimate a façade glass' actual comfort and energy performance, one should also take in to account its angular properties, since the solar angle of incidence rarely, or never, falls onto the glass at the standard angle (0 °).



Performance of glass according to the standard angle (0 °) and the 60° angle complement each other extremely well since the standard angle gives the performance of view, daylight for sunny or cloudy weather, and values in 60° angle provides the performance of thermal comfort and energy for sunny weather.

Property	Parameter	Desired Performance	Static Facade	Static Skylight
Visual Comfort 	Light Transmission (LT)	High (↑) to increase view and daylight	49%	33%
	Color Rendering (Ra)	High (↑) to increase the quality of the daylight	93	94
Thermal Comfort 	Direct Solar Transmission (ST)	Low (↓) to reduce thermal discomfort from the sun early spring, late autumn[1]	21%	15%
	Direct Solar Transmission 60° (ST_{60})	Low (↓) to reduce thermal discomfort from the sun's hot seasons.	12%	9%
	Thermal Insulation (U_g)	Low (↓) to reduce thermal discomfort at cold seasons	0.5W/m^2	0.5W/m^2
Energy 	Total Solar-Energy Transmission (g)	High (↑) to save heating-energy in cold seasons	30%	21%
	Total Solar-Energy Transmission 60° (g_{60})	Low (↓) to save cold energy hot seasons	21%	15%
	Thermal Insulation (U_g)	Low (↓) to both save heating-energy cold seasons and cooling-energy hot seasons	0.5 W/m^2	0.5 W/m^2

[1]In the cases where there is high solar intensity and low solar angle, which can occur, for example, short periods early spring, late autumn.

CLIMATE DATA

Regardless of the building's location, the glass' angular properties are always important to better reflect the glass's true performance.

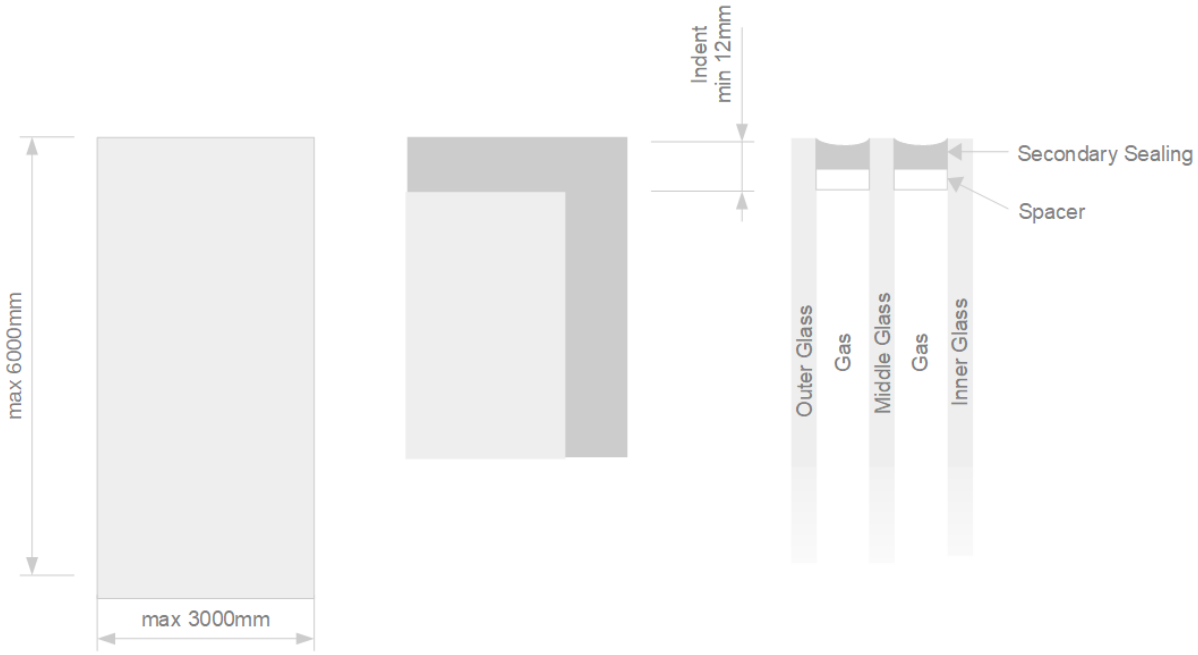
Location		Spring	Summer	Autumn	Winter
Kiruna, Narvik, Rovaniemi	Minimum Angle of incidence[1]	23°	45°	22°	1°
	Maximum Solar Intensity[2]	767 W/m^2	598 W/m^2	725 W/m^2	445 W/m^2
	Mean Outdoor Temp.[3]	-5°C	15°C	6°C	-9°C
Stockholm, Oslo, Helsinki	Minimum Angle of incidence[1]	31°	54°	30°	7°
	Maximum Solar Intensity[2]	678 W/m^2	493 W/m^2	656 W/m^2	370 W/m^2
	Mean Outdoor Temp.[3]	2°C	20°C	9°C	-1°C
London, Berlin, Paris	Minimum Angle of incidence[1]	39°	62°	38°	15°
	Maximum Solar Intensity[2]	600 W/m^2	385 W/m^2	614 W/m^2	567 W/m^2
	Mean Outdoor Temp.[3]	9°C	21°C	17°C	8°C
Rome, Madrid, Athens	Minimum Angle of incidence[1]	49°	71°	48°	25°
	Maximum Solar Intensity[2]	543 W/m^2	256 W/m^2	530 W/m^2	662 W/m^2
	Mean Outdoor Temp.[3]	14°C	28°C	25°C	13°C

[1] Angle of incidence south-façade, mid-day (12:00) when the solar intensity is at its highest.

[2] Sun-intensity south-façade, mid-day (12:00) on a facade glass, i.e. corrected direct-normal value for the current angle of incidence.

[3] Applies to first location.

DIMENSION & CONFIGURATIONS



	Static Facade	Static Skylight	+Clear	+Safety	+Security	+Silence	+Fire	+Other Options
Width x Height (mm)	3000x6000	3000x6000	3000x6000	3000x6000	3000x6000	3000x6000	1500x3000	
Indention[1]	12mm[2]	12mm[2]	12mm[2]	12mm[2]	12mm[2]	12mm[2]	12mm[2]	>12mm possible
Outer Glass[1]	4mm	6mm	6mm	4-6mm	44.2	4-6mm	4-6mm	>4mm[3]
Middle Glass[1]	4mm	4mm	4mm Iron-free	4mm	4mm	4mm	4mm	>4mm[3]
Inner Glass[1]	4mm	4mm	4mm Iron-free	44.2	4mm	44.2	Fire Glass	>4mm[3]
Gas	95% Argon	95% Argon	95% Argon	95% Argon	95% Argon	95% Argon	95% Argon	Krypton
Spacer	18mm Warm-edge Metal	18mm Warm-edge Metal	18mm Warm-edge Metal	18mm Warm-edge Metal	18mm Warm-edge Metal	18mm Warm-edge Metal	18mm Steel	6-20mm[4], and other type possible[5]
Secondary Sealing[2]	Polysulfide	Polysulfide	Polysulfide	Polysulfide	Polysulfide	Polysulfide	Polysulfide	Silicon
Anti-Condensation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	

[1] Size & loads can affect requirements on the glass thicknesses the indentation (spacer + secondary sealing)

[2] For UV exposure, silicone is required

[3] May affect glass performance such as LT, g, Ra, etc.

[4] May affect glass performance as Ug.

[5] Steel, Aluminum, etc, and color according to the desired RAL and NCS color. Can affect glass performance as Uw (total glass insulation value)

DETAILED SPECIFICATION

Below are some examples of possible solutions with Static Glass. Any special needs or questions, please contact ChromoGenics.

Static Facade

Features: Always access to daylight and view, excellent thermal insulation, good solar-control and anti-condensation

Suggested applications: Facade glass with high comfort requirements

	Light Transmission (%)	Light Reflection, outside (%)	Ra-index	Direct Solar Transmission (%)	Direct Solar Transmission, 60° angle (%)	Total Solar-Energy Transmission (%)	Total Solar-Energy Transmission, 60° angle (%)	Thermal Insulation, center of glass (W/m^2K)	Sound Reduction (dB)			Safety, inside	Protection	Fire Protection			Tjocklek (mm)	Weight (kg/m^2)
Glass Configuration	LT	LR	Ra	ST	ST60	g	g60	Ug	Rw	Rw+C	Rw+Ctr			E	EW	EI		
Static Facade	49	16	93	21	13	30	20	0,5	36	34	30	1(C)2[1]					48	30
+ Clear	51	16	94	22	13	30	21	0,5	36	34	30	1(C)2[1]					48	30
+ Safety	48	16	93	20	12	30	20	0,5	42	40	36	1(B)1					52	41
+ Security	48	16	93	20	12	30	20	0,5	42	40	36		P2A				52	41
+ Silence	48	16	93	20	12	30	20	0,5	44	42	37	1(B)1[2]	P2A[2]				52	41
+ Fire	54	17	94	24	16	32	23	0,6				1(B)1		30	30	20	55	

Possible to combine the different solutions, as well as choose other glass types for higher safety and security classes.

[1] With tempered/toughened interior glass, otherwise no security

[2] Is 1(B)1 if laminated sound glass is placed on the inside, P2A if laminated sound glass is placed on the outside

Static Skylight

Features: Always access to daylight and view, excellent thermal insulation, and excellent solar-control properties.
Suggested applications: Skylights with high demands on comfort **requirements**

Glass Configuration	Light Transmission (%) LT	Light Reflection, outside (%) LR	Ra-index Ra	Direct Solar Transmission (%) ST	Direct Solar Transmission, 60° angle (%) ST60	Total Solar-Energy Transmission (%) g	Total Solar-Energy Transmission, 60° angle (%) g60	Thermal Insulation, center of glass (W/m^2K) Ug	Sound Reduction (dB) Rw	Rw+C	Rw+Ctr	Safety, inside	Protection	Fire Protection E	EW	EI	Tjocklek (mm)	Weight (kg/m^2)
Static Skylight	33	19	94	15	9	21	15	0,5	39	37	32	1(C)2[1]					50	35
+ Clear	34	19	95	15	9	21	15	0,5	39	37	32	1(C)2[1]					50	35
+ Safety	32	19	94	14	8	21	15	0,5	44	43	39	1(B)1					52	46
+ Security	32	19	94	14	8	21	15	0,5	44	43	39		P2A				52	46
+ Silence	32	19	94	14	8	21	15	0,5	45	43	38	1(B)1[2]	P2A[2]				52	46
+ Fire	36	19	95	17	11	23	17	0,6				1(B)1		30	30	20	57	

Possible to combine the different solutions, as well as choose other glass types for higher safety and security classes.

[1] With tempered/toughened interior glass, otherwise no security

[2] Is 1(B)1 if laminated sound glass is placed on the inside, P2A if laminated sound glass is placed on the outside

MEASUREMENTS AND CALCULATIONS

Standard angle, 0° angle of incidence

Light transmission (LT), Light Reflection (LR), Ra-index, Direct Solar Transmission (ST) and g-value/SHGC (g) according to EN410 is measured according to standard procedure and calculated with LBNL Optics 6.0 & Windows 7.1.1. Measurements have been carried out by glass producers or by the Ångström Laboratory in Uppsala, calculations of ChromoGenics.

Complementary angle, 60 ° angle of incidence

Direct Solar Transmission at 60 ° angle (ST60), the g-value/SHGC at 60 ° angle (g60) is measured at angle and calculated according to EN410 with LBNL Optics 6.0 & Windows 7.1.1. Measurements have been carried out by the Ångström Laboratory in Uppsala, calculations of ChromoGenics.

Other

U_g for vertical facade glass (90 °) value according to EN673 calculated with LBNL Windows 7.1.1

Sound Reduction according to EN717-1

Safety according to EN12600

Security according to EN356

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For questions, please contact ChromoGenics