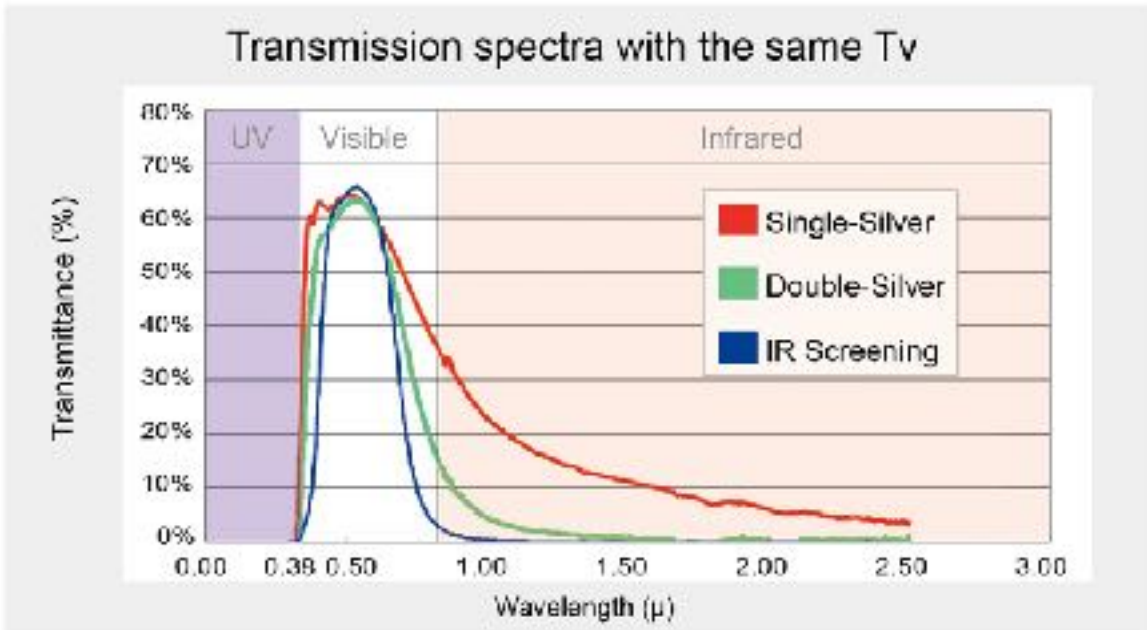


SGC Architectural Glass



INFRARED SCREENING GLASS (Triple-Silver Low-e Glass)

Comparison of different glass products with the same visible light transmittance

About half of the energy consumption of buildings comes from windows. Improving energy efficiency of window glass contributes a lot in reduction of electrical bill. Application of high performance energy efficient glass plays a key role in green building development and energy saving for the society. As the leading energy efficient glass manufacturer in China, SGC USA and CSG China developed a brand new crystal series of glass products, namely infrared screening glass, with the latest coating technology, outstanding performance and a range of amazing colors, providing architects with exceptional options to meet the developing trend of architectures. The remarkable energy efficient infrared screening glass has the following specials:

- 1、 Direct solar infrared transmittance below 2%, extraordinarily cool in summer ;
- 2、 Emissivity approaching zero, about 0.02, better warm keeping in winter;
- 3、 Higher visible light transmittance, better daylight.

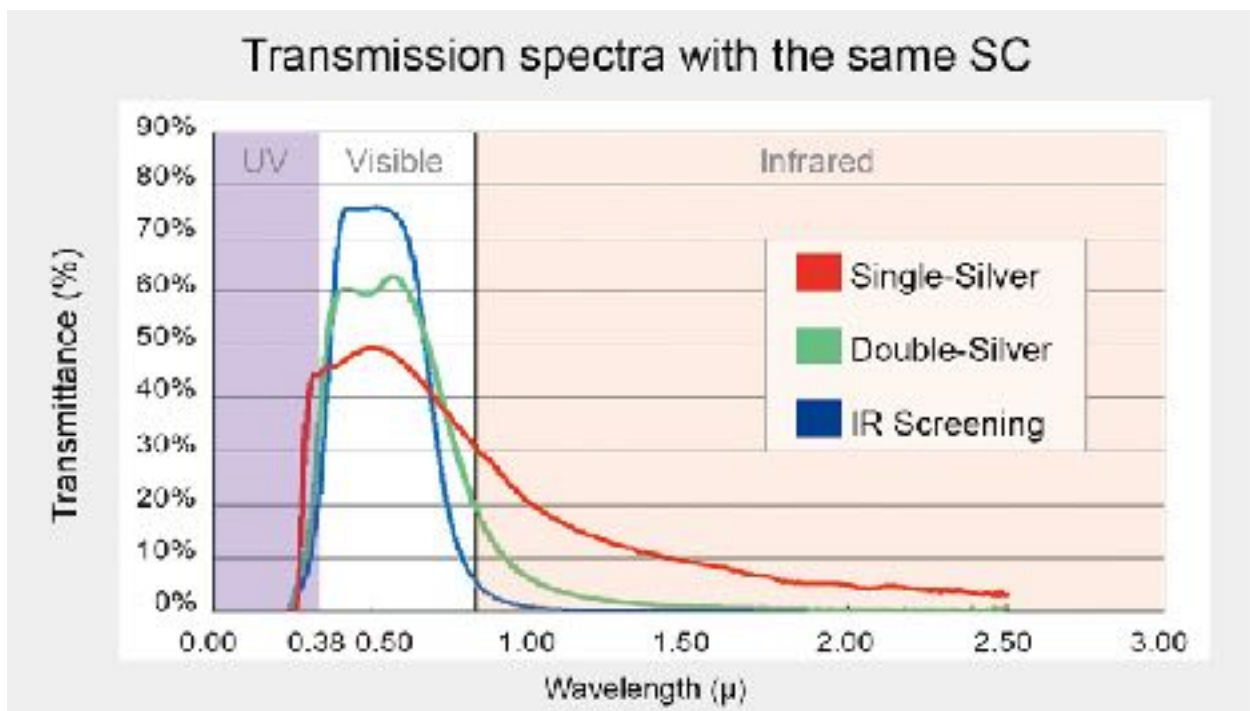
Advantages of Infrared Screening Glass

In the solar radiation, about 47% is visible light and 51% is infrared radiation (IR). The incoming solar IR through window glass causes heat accumulation and temperature rise, which is the major heat source of cooling load.

The above figure shows transmission spectra of single silver low-e, double silver low-e and infrared screening glass with the same visible light transmittance. Within the infrared region (780nm – 2500nm), the area under the transmission curve reflects direct

SGC Architectural Glass

solar IR transmittance. The overall transmittance in the solar IR region is the sum of direct solar IR transmittance plus secondary transfer, defined as total solar IR transmittance (SIR) which quantitatively describes glass characteristics against solar IR. Much better than single and double silver low-e glass as shown, all the infrared screening glass products have a direct solar IR transmittance below 2%, and a total solar IR transmittance around 3%, which indicates an extraordinary performance in reducing cooling load and creating comfortable working and living environment in hot season



Comparison of different glass products with the same shading coefficient

Shading coefficient (SC) is determined by integration over the whole solar spectra from 300nm to 2500nm, which is often used to evaluate glass performance against solar heat in design practice and building codes. As a matter of fact, visible light acts differently from solar infrared radiation in energy efficiency of buildings. The figure on the right shows a comparison of different glass products with the same SC. Obviously, infrared screening glass has the lowest solar IR transmittance and in return the best performance against solar IR and in reduction of cooling load. In view of all infrared screening glass products having a direct solar IR transmittance below 2%, they should be better selected following visible light transmittance and aesthetic appearance requirements rather than shading coefficient SC to optimize energy efficiency of buildings.

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Various options

The infrared screening glass products have a wide range of visible light transmittance (from around 45% to 70%), different brightness (reflectivity from about 10% to 30%), and various colors (neutral, light grey, silver grey, silver, light blue, blue grey etc.). Exhibiting crystal clear look of satisfied colors at different viewing angles, the infrared screening glass products are incredible combinations of best performance and outstanding aesthetic effect, providing architects with idea options for various design concepts.

Series	Glass Makeup	Substrate	Appearance	Visible Light (%)			NFRG				Total Solar IR Transmittance S_{IR} (%)
				Trans	Reflect		U_{water} ($W/m^2 \cdot K$)	U_{summer} ($W/m^2 \cdot K$)	GC	LSG	
					Outdoor	Indoor					
Crystal	6S.J89s+12A+8LI	Low-iron	Neutral	69	12	12	1.84	1.69	0.35	2.3	2.9
	6S.J65s+12A+8LI	Low-iron	Neutral	64	12	12	1.83	1.55	0.33	2.2	3.1
	6S.J52s+12A+8LI	Low-iron	Light grey	51	15	12	1.65	1.60	0.28	2.1	3.7
	6S.J50s+12A+8LI	Low-iron	Light grey	53	11	11	1.63	1.56	0.27	2.3	2.3
Sapphire	6LD52s+12A+6LI	Low-iron	Light blue	61	18	15	1.63	1.57	0.27	2.2	3.0
	6LD49s+12A+6LI	Low-iron	Blue grey	47	27	22	1.63	1.53	0.24	2.3	2.6
Platinum	6B.J52s+12A+8LI	Low-iron	Silver grey	50	21	16	1.63	1.55	0.26	2.2	3.0
	6B.J49s+12A+8LI	Low-iron	Silver	46	26	22	1.63	1.53	0.23	2.3	2.7



SGC Architectural Glass

SGC can manufacture and supply all categories of architectural glass products including high quality clear float glass, tinted float glass, Low-E glass, solar reflective glass, insulating glass, laminated glass, spandrel glass, silkscreened glass, tempered glass, bent tempered glass, fire-proof glass, as well as composite glass products. The glass coating lines can handle size as large as 3300mm x 7000mm.

The glass production lines and processing equipments are supplied by world famous manufacturers to ensure the glass products can meet the high quality requirements. The current major manufacturing facilities includes:

Glass Fabricating Facilities

Twelve Low-E and solar reflective glass coating lines with an annual production capacity of 35 million square meters

Manufacturers: Leybold of Germany and BOC of USA

Thirty nine insulating glass processing lines with an annual production capacity of 15 million square meters

Manufacturer: Lisec and Bystronic

Thirty one glass tempering lines with an annual production capacity of 22 million square meters

Manufacturer: Tamglass of Finland

Five glass curving and tempering lines with an annual production capacity of 1.3 million square meters

Manufacturer: North Glass

Nine enameled glass decoration lines with an annual production capacity of 75 hundred thousand square meters

Manufacturer: Casso-Solar of USA

Nine laminated glass processing lines with an annual production capacity of 3.8 million square.

Manufacturer: lanua of Italy

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Glass Fabricated Products:

- Insulating
- High-Performance Coatings
- Insulating Laminated
- Edge work

- Laminated
- Triple Insulating
- Spandrel
- Acoustical
- Holes / Notches

- Silk-Screened
- Heat-Treated (Heat Strengthened, Flat & Bent Tempered, Heat Soaked)
- Digital Printing



Tianjin CSG Architectural Glass Production Facility :

1. The most advanced production technologies and equipments in the world.
2. More than 20 years experience, this production facility is one of the largest glass processing facility in Asia.
3. Annual output up to 5 million square meters of low-e insulating glass units.
4. Products cover low-e glass , solar reflective glass, tempered glass, heat strengthened glass, silkscreen glass, spandrel glass, laminated glass, insulating glass, hot bending glass, curved tempered glass, curved laminated glass, bulletproof glass, fire-proof glass and composite glass products.

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Dongguan CSG Architectural Glass Facility

1. The most advanced production technologies and equipments in the world.
2. More than 20 years experience, this production facility is one of the largest glass processing facility in Asia.
3. The research & development on coating technology of CSG is synchronous with the world level.
4. Products cover low-e glass , solar reflective glass, tempered glass, heat strengthened glass, silkscreen glass, spandrel glass, laminated glass, insulating glass, hot bending glass, curved tempered glass, curved laminated glass, bulletproof glass, fire-proof glass and composite glass products.
5. Annual output is over 3 million square meters of insulating glass units.



Wujiang CSG Architectural Glass Facility

1. The most advanced production technologies and equipments in the world.

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2. More than 20 years experience, this production facility adopted the most advanced coating technologies and production equipments in the world to ensure the best quality glass products with outstanding performance.
3. Products cover single silver low-e, double silver low-e, triple silver low-e, solar reflective, insulating glass, tempered glass, laminated glass, ceramic fritted glass, as well as composite glass products.

Float Glass Manufacturing Facilities

Twelve float glass production lines with an annual production capacity of 2.6 million tons. Every float glass manufacturing line has a stable and reliable quality assurance system, advanced online automated defect detection and optimization system and comprehensive quality control system.



Float Glass Facility

Hebei CSG Float Glass Manufacturing Facility

- Two world class industry-leading production lines
- Equipped with the latest advanced technology and the Cold End System of GRENZEBACH, Germany, Raute Precision of Finland, Stein Beurty of France and Seaco Inc. of USA
- Capacity: Daily melting capacity of 600 tons/d and 900 tons/d, the annual capacity of 480,000 tons high quality float glass.
- Products: Clear float glass, Mirror quality glass, Coating quality glass.

Wujiang CSG Float Glass Manufacturing Facility

- Three high-grade float glass production lines
- Equipped with the latest advanced technology and the Cold End System of GRENZEBACH, Germany, Raute Precision of Finland, Stein Beurty of France and Seaco Inc. of USA
- Capacity: Daily melting capacity of 600 tons/d, 900 tons/d and 650 tons/d, the annual capacity of 680,000 tons high quality float glass.
- Products: Clear float glass, Mirror quality glass, Coating quality glass.

Chengdu CSG Float Glass Manufacturing Facility

- Three world class industry-leading production lines

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- Equipped with the latest advanced technology and the Cold End System of GRENZE-BACH, Germany, Raute Precision of Finland, Stein Beurty of France and Seaco Inc. of USA
- Capacity: Daily melting capacity of 550 tons/d, 700 ton/d and 1000 tons/d, the annual capacity of 700,000 tons high quality float glass.
- Products: Clear float glass, Mirror quality glass, Coating quality glass.

Xianning CSG Float Glass Manufacturing Facility

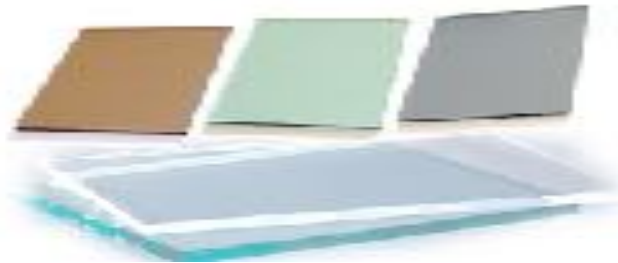
- Two world class industry-leading production lines
- Equipped with the latest advanced technology and the Cold End System of GRENZE-BACH, Germany, Raute Precision of Finland, Stein Beurty of France and Seaco Inc. of USA
- Capacity: Daily melting capacity of 700 tons/d and 700 tons/d, the annual capacity of 500,000 tons high quality float glass.
- Products: Clear float glass, Mirror quality glass, Coating quality glass.

Dongguan CSG Float Glass Manufacturing Facility

- One special glass production lines
- Equipped with the latest advanced technology and the Cold End System of GRENZE-BACH, Germany, Raute Precision of Finland, Stein Beurty of France and Seaco Inc. of USA
- Capacity: Daily melting capacity of 650 tons/d. the annual capacity of 220,000 tons high quality special float glass.
- Products: Thin Clear float glass, solar low iron glass, on line coated glass, mirror quality glass and coating quality glass for solar and electronic industries.

Qingyuan CSG Float Glass Manufacturing Facility

- One special glass production lines
- Ultra-thin glass for electronic glass



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ISO9001-2008 Certificate

SGCC Certificate

IGCC Certificate

Standardsmark Licence

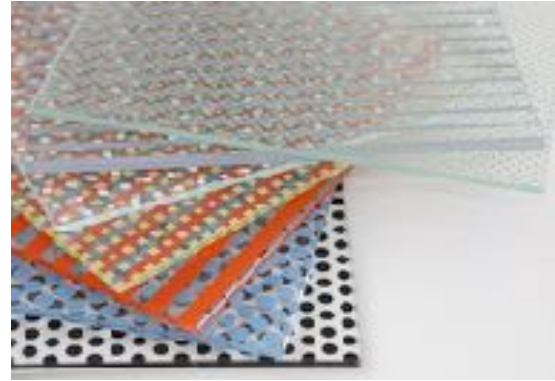


BSi Certificate for IGU

EN12600 Pendulum Test Report

EN1279 Test Report

SGC Architectural Glass



Spandrel and Silk-Screened Glass

Ceramic frit glass is produced by silk-screen (or roller) printing ceramic frit paints onto glass followed by drying and heat-treating to form a permanent coating. With a variety of durable colors and patterns, ceramic frit glass has optimal concealing and solar control performance in addition to decoration, and has been widely used in building decoration industry etc.

New Environment-Friendly Ceramic Frit Glass

While progressively stressing low carbon and environment protection, building materials need to be environment-friendly. As the leader in China glass industry, SGC adopts the latest lead free ceramic frit paints to make the environment-friendly frit glass. Monitored by experienced frit experts and engineers, and following the world advanced standard, the ceramic frit glass has assured quality for durability, consistency and so on.

Applications of the new environment-friendly ceramic frit glass together with high performance low-e glass of SGC exhibit combined effect of the natural color of frit with the dynamic reflective color of low-e coating, not only creating added aesthetic effect to building facade but also improving solar control performance, which are surely additional options for architectural design of green buildings.

Features:

1. Various colors and patterns (customizable), durable outstanding effect;
2. Absorbing and reflecting solar energy, improving solar control;
3. Optimal concealing effect, protecting privacy;
4. Heat treated, improved strength
5. Can be low-e coated, laminated, IGU assembled for multiple functions.

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Specification:

1. Thickness: 4-19mm
2. Maximum size: silk screening 2200mm×4500mm
roller printing 2000mm×4500mm
3. Minimum size:300mm×300mm

Quality:

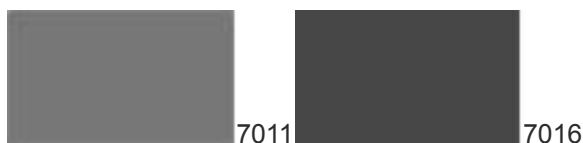
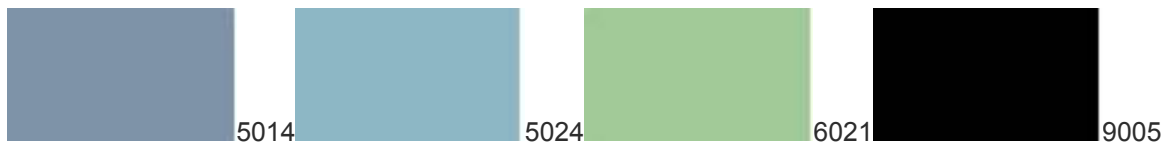
1. ASTM C 1048 Standard Specification for Heat-Treated Flat Glass-Kind HS,kind FT Coated and Uncoated Glass1
2. Q/12W4650-2008 <Enameled Tempered and Heat-Strengthened Glass>
3. JC/T1006-2006 <Enameled Tempered and Heat-Strengthened Glass>
4. Q/SNB002 <Tempered Glass>

Remarks:

1. Ceramic frit glass is tempered or heat strengthened, which may not be further cut, ground;
2. When used on external walls and windows, frit surface should be inward;
3. Ceramic frit glass is not recommended in any application where it can be viewed in transmission.

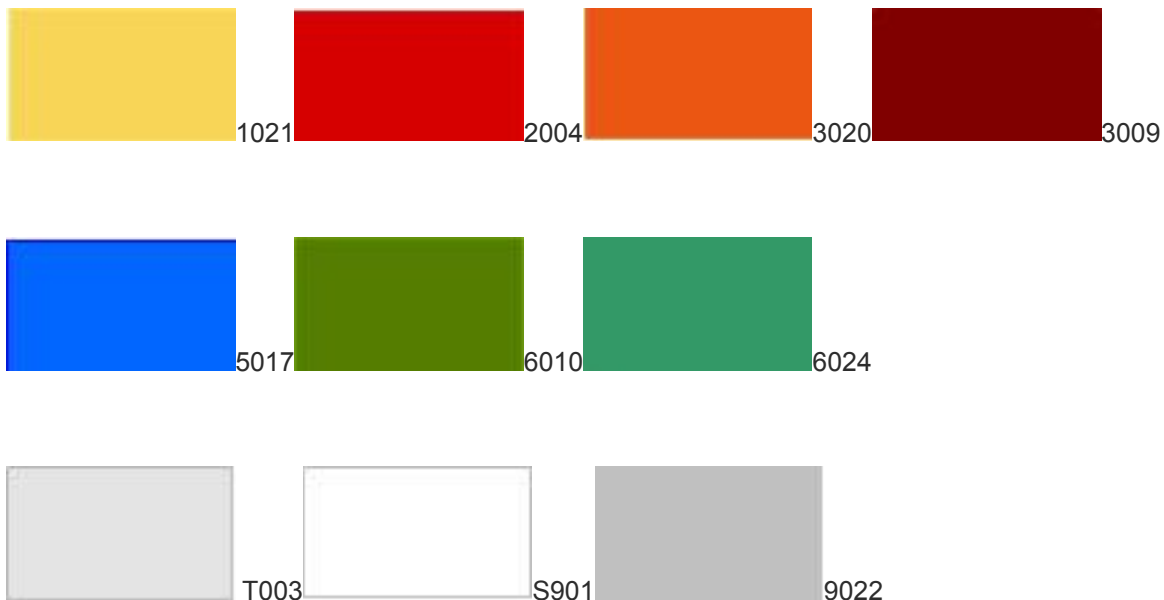
Ceramic Frit Colors

Based on experience of numerous projects and following aesthetic trend of architectures, selections of typical colors in accordance with RAL Classic are listed for recommendation.



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Variety of ceramic frit paints lets monotonous glass become colorful, exhibiting extraordinary aesthetic effect.



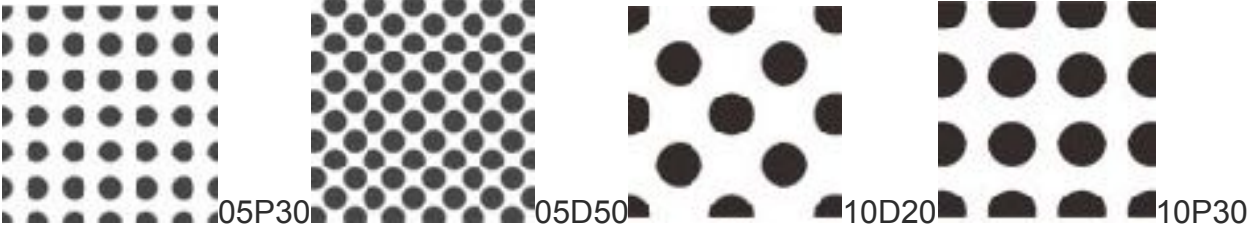
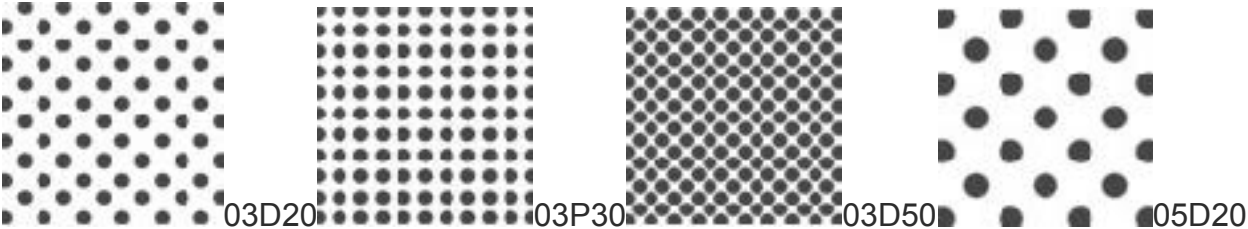
Remarks:

Remarks: 1.All ceramic frit paints are lead free complying with EN RoHS (a few Cd containing paints excepted)
2.Color of ceramic frit is affected by glass substrate thickness and color;
3.The color samples are for reference only, for actual colors please refer to real glass samples.

Ceramic Frit Patterns:

As a kind of architectural glass, ceramic frit glass has the major feature of decoration, not only improving architectural aesthetics of modern glass curtain wall, but also presenting buildings in colorful patterns changing in sunlight, moonlight, and lamplight with dynamic pictures. Based on years of experience in ceramic frit glass production and understanding of market demand, frequently used dot patterns and line patterns are recommended:

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INSULATING GLASS

Insulating glass comprises two or more plies of glass that are separated with aluminum spacer fully filled with desiccant, and the sides are sealed with high-strength sealant.

Glazed doors and windows are the major approach for communications between indoor and outdoor spaces. Daylight, sight and decoration are the basic functions of glass while energy efficiency and environmental protection are further additional requirements to glazed doors and windows. For a well-closed space, the indoor and outdoor thermal exchange is mainly achieved through glass. The thermal exchange in large volume between indoor and outdoor spaces means that, in summer, unneeded heat is introduced into the rooms while in winter, the valuable indoor heat flows outward, which worsens the indoor living environment and leads to enormous increase in energy consumption by air conditioners and/or heaters. Insulating glass, especially that combined with solar reflective glass and/or Low-E glass, provides a sound solution.

Insulating glass comprises two or more plies of glass that are separated with aluminum spacer fully filled with desiccant, and the sides are sealed with high-strength sealant. Annealed clear glass, tinted glass, solar reflective glass, Low-E glass, laminated glass,

SGC Architectural Glass

tempered glass, heat-strengthened glass and curved glass, etc. can be used to form insulating glass according to demands.

Specifications:

Maximum dimension (mm): 2500mm x 5000mm (except handmade)

Minimum dimension (mm): 300mm x 300mm

Width of aluminum spacer (mm): 6mm, 9mm, 12mm, 16mm, 19mm

Thickness (mm): various combinations of glasses between 3mm and 19mm thick

Quality:

IGCC international identification certificate obtained

Conforming to DIN 1286, the German standard

Features:

- 1、Optical Properties: the visible light transmittance of insulating glazing systems is normally in the range of 7-80% and the visible light reflectance is in the range of 10-48%;
- 2、Thermal Properties: the U-value is effectively lowered by insulating glazing and can be further reduced by filling of inert gases;
- 3、Acoustical Insulation: insulating glazing can reduce noise by more than 30 dB;
- 4、Condensation: the dew point of CSG insulating glazing systems is below -65°C which guarantees no condensation formation under normal applications;
- 5、Sealing: aluminum spacer is automatically curved and formed with the fewest joints and dual seals are applied, which ensures excellent sealing characteristics and long application life-time.



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Heat Treated Glass

Tempered and heat-strengthened glass is obtained by heating ordinary glass to its softening point and then suddenly cooling down to form compression in the surface layer of the glass, thus the mechanical strength is increased by times.

Tempered and Heat Strengthened Glass

Tempered and heat-strengthened glass is obtained by heating ordinary glass to its softening point and then suddenly cooling down to form compression in the surface layer of the glass, thus the mechanical strength is increased by times.

Features of tempered glass

Safety: when broken, tempered glass becomes small granules, which prevent substantial hurt to human body.

High strength: the strength of tempered glass is 4 to 5 times that of annealed glass.

Thermal stability: tempered glass has excellent thermal stability, which can withstand up to 300°C thermal shock.

Tempered glass is a kind of safety glass and is widely used in places which call for high mechanical strength and safety, such as glazed door, curtain wall, vertical window, partition wall, and partition screen close to heat source and subject to violent thermal shock.

Features of heat-strengthened glass

Heat-strengthened glass differs from tempered glass in its surface compression; its mechanical strength is about 1.6-2 times that of annealed glass. Heat-strengthened glass has outstanding thermal stability, and its flatness is close to that of annealed glass and better than that of tempered glass.

Specifications

Dimensions (mm): Maximum dimension: 2440 x 6000, Minimum dimension: 200 x 300

Thickness (mm): Tempered glass : 4 – 22, Heat-strengthened glass : 4 -12

Quality

Conforming to ASTM1048, the American standard

Conforming to BS6206, the British standard

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Heat Soak Test

Spontaneous breakage is an inherent nature of tempered glass due to volume change occurred during crystal form transformation of nickel sulfide inclusions and other defects present in the glass. Heat-soak test is an effective procedure for bringing about spontaneous breakage before exiting works, thus limiting the possibility of spontaneous breakage after installation. By placing tempered glass in heat-soak furnace, heating to a desired temperature, preserving for enough time and cooling down, the crystal form of nickel sulfide inclusions is stabilized and the internal stress is relaxed to a certain extent. During this process, tempered glass with large enough nickel sulfide inclusions and other defects will be broken by induced extra stresses. As a result, heat-soak treated tempered glass will have a much less likelihood of spontaneous breakage than normal tempered glass.

Specifications

Maximum size(mm): 2400x5000

Minimum size(mm): 300 x300

Thickness(mm): 4, 5, 6, 8, 10, 12, 15, 19

Quality

Conform to EN14179 standard.



Computer-controlled Heat-soak Furnaces

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Curved Tempered Glass

Curved tempered glass or curved heat-strengthened glass, is achieved by heating glass to softening temperature and then bending by weight or external force, followed by fast cooling with air blowing. CSG adopts advanced synchronized roller way formation technology, being able to produce various curved tempered glass products, such as round-shaped, J-shaped etc., with high formation precision and quality. If required by application, curved insulating glass, curved laminated glass, or curved tempered laminated coated insulating glass by use of bendable coated glass, can also be manufactured.

Specifications

Thickness (mm): 5 -19

Maximum dimension (mm): 2440 x 4200

Minimum dimension (mm): 600 x 400

Application

Round glass curtain wall, lighting ceiling, sight viewing elevator channel, indoor round shaped partition, glass guard-rail, decoration glass, furniture etc.

Quality

Curved tempered glass conforming to ASTM C 1464 Standard



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Laminated glass

Laminated glass is a kind of safety glass and is hard to break. The glass may be retained in its frame even if being broken.

Features

Security : installed laminated glass may not be easily broken. Therefore, laminated glass provides effective defense against malicious destroy, pilferage and violent invasion.

Prevention against hurricane and earthquake: for the reason that fragments of broken glass still retain in its original position, laminated glass is suitable for regions subject to hurricane and earthquake.

Noise reduction performance: PVB membrane has good sound wave hindering property and thus, laminated glass may effectively reduce transmission of noise.

UV shielding performance: laminated glass can substantially ward off ultraviolet (as much as over 99%), thus it helps to reduce the affect of ultraviolet on costly furniture, curtains, exhibits and other articles.

Specification

Product categories : ordinary clear, colored, coated laminated glass, laminated tempered glass, laminated heat-strengthened glass, curved laminated glass, aquarium glass, and bulletproof glass etc.

Maximum dimension (mm): 2500 x 7800

Color of PVB membrane: clear, milky white, gray, blue, green and pink etc.

Thickness of PVB membrane (mm): 0.38 - 3.04

Quality

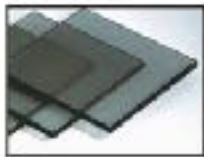
Conforming to BS952, the British standard

Conforming to ASTM C 1172 standard

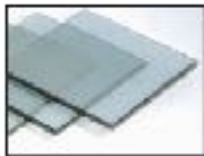
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Tinted Float Glass



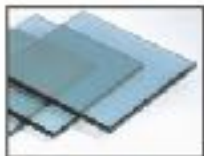
Euro Grey: with slightly light black, Euro Grey has the best anti-glaring effect and superior energy-saving efficiency. It has been widely used in landmark municipal works, top office building, hotel, metro subway station and furniture fields.



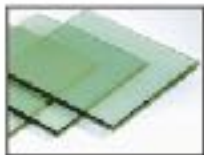
Crystal Grey: Light grey, perfectly clear, natural, with crystal texture. Optical and energy-saving performance are practically perfect. It has excellent light transmission and high thermal insulation. It has been widely used in energy-saving building, high grade furniture and mirror coating fields.



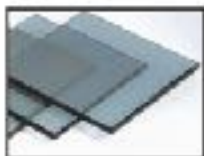
Golden Bronze: Calm brown with the color of gold. It has been widely used in mirror, construction, furniture, bathroom ware and so on.



Ocean Blue: Pure blue. It has been widely used in construction, furniture, sanitary ware and other fields.



French Green: Light green. It has been widely used in automotive, construction, furniture, bathroom ware and other fields.



Blue Grey: Elegant grey with blue. Blue grey has great anti-glaring effect, superior energy-saving efficiency and high light transmission. It has been extensively used in mirror, high-grade construction, subway, furniture, bathroom ware and other fields.

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Technical Information

SGC Architectural Glass tested and certified by the following Standards:

- ANSI Z 97.1 Glazing Materials Used in Buildings, Safety Performance Specifications and methods of Test
- ASTM C 1036 Standard Specification for Flat Glass
- ASTM C 1048 Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass
- ASTM C 1464 Standard Specification for Bent Glass
- ASTM C 1172 Standard Specification for Laminated Architectural Flat Glass
- ASTM C 1376 Standard Specification for Pyrolytic and Vacuum Deposition Coatings on flat Glass
- ASTM E 1300 Standard Practice for Determining Load Resistance of Glass in Buildings
- ASTM E 1886 Standard Test Method for Performance of Exterior Windows, Curtain Walls, doors, and Impact protective systems Impacted by missile(s) and exposed to cyclic pressure differentials
- ASTM E 1996 Standard Specification for Performance of Exterior Windows, Curtain Walls, doors, and Impact protective systems Impacted by Wind borne debris in Hurricanes
- ASTM E 2188 Standard Test Method for Insulating Glass Unit Performance
- ASTM E 2190 Standard Specification for Insulating Glass Unit Performance and Evaluation
- CPSC 16CFR-1201 Safety Standard for Architectural Glazing Materials

Warranty:

SGC provides a coated glass products warranty to our customer, for a period of 10 years. The laminated glass products are covered by a 5-year warranty. contact your SGC sales representative for a copy of specific product warranty documents.

Please visit www.sgc-usa.com or call us at 323 3182998 for more informations.

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Quality Inspection Guidelines of Coated Glass Products

The following quality standards are offered as suggested guidelines for the evaluation of coated glass products, based on ASTM 1376.

General:

- Normal viewing distance is 10 feet for vision glass and 15 feet for spandrel glass. The viewing angle should be 90 degree. Vision glass is viewed against a bright, uniform background.
- The area of most importance is the central viewing area, which is defined by 80% of the length and 80% of the width dimensions centered on a lite of glass. The remaining area is considered the outer area.

Pinholes and Clusters (viewed in transmission):

- Pinholes up to 1.5mm (1/16") are acceptable.
- A cluster is defined as two or more pinholes up to 1.5 mm (1/16") each
- that are readily apparent and located in an area of 75 mm (3") diameter.
- Clusters of pinholes within the central viewing area are not acceptable.
- Clusters greater than 0.82 mm (1/32") and visible from 3 meters (10 feet) are acceptable only outside the central viewing area.

Scratches (viewed in transmission):

- Scratches longer than 50 mm (2") within the central viewing area are not acceptable.

Color uniformity (viewed in reflection):

- Coated glass may exhibit slightly different hue or color that may not be apparent in hand samples.
- Color and reflectance may vary slightly overall and be considered acceptable.
- Due to the reflectivity of some glass coatings, distortion of reflected objects may be more apparent. This characteristic is more pronounced with heat- treated, laminated and insulated glass.

SGC Architectural Glass

Spandrel Glass (viewed in reflection):

- Coated glass may exhibit slightly different hue or color that may not be apparent in hand samples.
- Color and reflectance may vary slightly overall and be considered acceptable.
- Pinholes up to 3.0 mm (1/8”) are acceptable.
- Scratches up to 75 mm (3”) are acceptable.

COLOR RENDERING INDEX(CRI)

The ability of transmitted daylight through the glazing to portray a variety of colors compared

to those seen under daylight without the glazing. In illumination, general color rendering indices above 90 are very good and between 80 and 90 are good. For instance, a low CRI causes colors to appear washed out, while a high CRI causes colors to appear vibrant and natural. In commercial glass, CRI indicates the effect the specific glass configuration has on the appearance of objects viewed through the glass.

HEAT GAIN

Heat gain is heat added to a building interior by radiation, convection or conduction. Building heat gain can be caused by radiation from the sun or the heat in hot summer air convected/ conducted to the building interior.

INFRARED (LONG-WAVE) ENERGY

Energy generated by radiated heat sources such as electric coil heaters or natural gas-powered, forced-air furnaces. Also, any object that can absorb heat and radiate it is producing long-wave, infrared energy. *NOTE:* When short-wave energy from the sun is absorbed and radiated by glazing, it is converted to long-wave energy.

LIGHT-TO-SOLAR GAIN (LSG)

Ratio of the visible light transmittance to the solar Heat Gain coefficient. $LSG = T_{vis} / SGHC$. A higher LSG ratio means sunlight entering the room is more efficient for daylighting, especially for summer conditions where more light is desired with less solar gain. This ratio is the measurement used to determine whether the glazing is “spectrally selective,” which is defined by the U.S. Department of Energy as 1.25 or higher.

LOW-E COATING

Relatively neutral in appearance, low-e coatings reduce heat gain or loss by reflecting long-wave infrared energy (heat) and, therefore decrease the u-Value and improve energy efficiency. Current sputter-coated low-e coatings are multilayered, complex de-

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signs engineered to provide high visible light transmission, low visible light reflection and reduce heat transfer.

RELATIVE HEAT GAIN (RHG)

The total heat gain through glass for a specific set of conditions. This value considers indoor/ outdoor air temperature differences and the effect of solar radiation. The units are Btu/(hr.ft²). $RHG = [(89.6^{\circ}f - 75.2^{\circ}f)(\text{Summer U-Value}) + (200 \text{ Btu/hr.ft}^2)(\text{Shading Coefficient})]$

R-VALUE

A measure of the resistance of the glazing to heat flow. It is determined by dividing the U-Value into 1, (R-Value = 1/U-Value). A higher R-Value indicates better insulating properties of the glazing. R-Value is not typically used as a measurement for glazing products and is referenced here to help understand U-Value.

SHADING COEFFICIENT (SC)

An alternative measure of the heat gain through glass from solar radiation. Specifically, the shading coefficient is the ratio between the solar heat gain for a particular type of glass and that of double- strength clear glass. a lower shading coefficient indicates lower solar heat gain. for reference, 1/8" (3 mm) clear glass has a value of 1.0. (SC is an older term being replaced by the SHGC).

SOLAR CONVERSIONS

- *Direct Solar Transmittance*: Solar Energy Transmittance
- *Shading Coefficient*: Solar Heat Gain Coefficient/0.86
- *Indirect Solar Transmittance*: Solar Heat Gain Coefficient - Direct Solar Transmittance
- *Absorptance*: 1 - Direct Solar Transmittance - Solar Reflectance

SOLAR ENERGY

Radiant energy from the sun having a wavelength range of 300 to 4000 nm, which includes UV (300 to 380 nm), visible light (380 to 780 nm) and near infrared energy

(780 to 4000 nm).

- *% Reflectance Out* – percentage of incident solar energy directly reflected from the glass back outdoors.

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- *% Absorptance* – percentage of incident solar energy absorbed into the glass.
- *% Transmittance* – percentage of incident solar energy directly transmitted through the glass.

The sum of percent reflectance out + absorptance + transmittance = 100%. An additional consideration is emission, or emissivity. This refers to the reradiation of absorbed energy that can be emitted toward both the exterior and interior of the building. emissivity is controlled through the use of low-emissivity, or low-e coatings.

SOLAR HEAT GAIN COEFFICIENT (SHGC)

The percent of solar energy incident on the glass that is transferred indoors, both directly and indirectly through the glass. The direct gain portion equals the solar energy transmittance, while the indirect is the fraction of solar incident on the glass that is absorbed and re-radiated or convected indoors. for example, 1/8" (3 mm) uncoated clear glass has a SHGC of approximately 0.86, of which 0.84 is direct gain (solar transmittance) and 0.02 is indirect gain (convection/re-radiation).

SOLAR REFLECTIVE COATING

Typically, highly reflective coatings that reduce solar heat gain through reflection and absorption. Though very effective at reducing heat gain, visible light transmittance is generally low and U-Values are not as energy efficient as low-e coatings.

SPECTRALLY SELECTIVE GLAZING

High-performance glazing that admits as much daylight as possible, while preventing transmission of as much solar heat as possible. By controlling solar heat gain in summer, preventing loss of interior heat in winter, and allowing occupants to reduce electric lighting use by making maximum use of daylight, spectrally selective glazing significantly reduces building energy consumption. The United States Department of Energy has established a light-to-solar Gain ratio of 1.25 as the minimum measurement to be classified as a "Spectrally Selective Glazing." The calculation of spectrally selective glazing follows the formula described in the Light-to-Solar Gain definition as follows:

$$LSG = T_{vis} / SGHC$$

A higher LSG ratio means sunlight entering the room is more efficient for daylighting, especially for summer conditions where more light is desired with less solar gain.

TRANSMITTANCE PERCENT

Percentage of incident energy that directly passes through the glass.

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UV

Ultraviolet radiant energy from the sun having a wavelength range of 300 to 380 nm with air mass of 1.5. long-term exposure to UV light may result in fabric and pigment fading, plastic deterioration and changes to the appearance of many types of wood.

U-VALUE (U-FACTOR)

A measure of the heat gain or loss through glass due to the difference between indoor and outdoor air temperatures. It is also referred to as the overall coefficient of heat transfer. a lower U-Value indicates better insulating properties. The units are Btu/(hrft²·°f).

VISIBLE LIGHT

Radiant energy in the wavelength range of 380 nm to 780 nm with Ill. D65 and CIE 2° observer.

- *% Transmittance (T_{vis})* – percentage of incident visible light directly transmitted through the glass.
- *% Reflectance Indoors* – percentage of incident visible light directly reflected from the glass back indoors.
- *% Reflectance Outdoors* – percentage of incident visible light directly reflected from the glass back outdoors.

SGC Architectural Glass

Crystal Series Glass Products

SGC developed a brand new Crystal Series of glass products, with the latest advanced low iron glass technology, outstanding performance and a range of amazing colors, providing architects with exceptional options to meet the developing trend of architectures. all the products are created by using low iron crystal-like glass.



Characteristics

Ultra Clear Low iron glass is manufactured with a lower iron content, resulting in a clear, color- neutral glass. Reducing the iron and using new raw material formulas increases light transmission higher than than 91%. and reduces the greenish tint in clear glass. It is a new kind of high quality material which has super physical, mechanical and optical performance, such as lower spontaneous breakage in tempered glass. Moreover; it has the feature of crystal and elegancey.

Availability

Ultra Clear Low Iron Glass is available in thickness ranging from 2mm to 25mm, Tempered, Acid Etched, Silvered Mirror, Color Painted, Laminated and Low-e coated IGU etc. It is also available in a wide variety of product combinations, bringing color neutrality to almost any application.

Fabrication

Ultra Clear Low Iron Glass can be fabricated, laminated, painted, cut, and tempered just like ordinary oat glass.

Optical Performance Data

Thick- ness mm	Visi- ble light trans- m- it- tance	Visi- ble light re- flect- ance	Solar heat				Shading Coefficient			U- value W/ m2K	Soundproof- ing		UV trans- m- it- tance
			Direct- ly throug h	Ref- lectio n	Ab- sorb	The total penetra- tion	Sh ort wa ve	Long wave	Over all		Rm (d B)	Rw (d B)	
3	91.5 %	8%	91%	8%	1%	91%	1.0 5	0.01	1.05	5.8	26	30	76%
3.2	91.5 %	8%	91%	8%	2%	91%	1.0 3	0.01	1.05	5.8	26	30	75%
4	91.4 %	8%	90%	8%	2%	91%	1.0 3	0.01	1.05	5.8	27	30	73%
5	91%	8%	90%	8%	2%	90%	1.0 3	0.01	1.03	5.8	29	32	71%
6	91%	8%	89%	8%	3%	90%	1.0 2	0.01	1.03	5.7	29	32	70%
8	91%	8%	88%	8%	4%	89%	1.0 1	0.01	1.02	5.7	31	34	68%
10	91%	8%	88%	8%	4%	89%	1.0 1	0.02	1.02	5.6	33	36	66%
12	91%	8%	87%	8%	5%	88%	1	0.02	1.01	5.5	34	37	64%
15	90%	8%	86%	8%	6%	87%	0.9 9	0.02	1	5.5	35	38	61%
19	90%	8%	84%	8%	7%	86%	0.9 7	0.02	0.99	5.5	37	40	59%
22	89.6 %	8%	82%	8%	9%	85%	0.9 5	0.02	0.97	5.5	38	43	58%
25	89%	8%	81%	8%	9%	84%	0.9 3	0.02	0.95	5.5	39	45	56%

Physical parameters

SGC Architectural Glass

Elastic modulus	73.1Gpa
Break modulus (tensile ultimate strength)	41.4 Mpa
Knoop hardness	456kgf/mm2
Density	2.5076 g/cm3
Coefficient of linear expansion 20-300°C	9.28×10-6/°C
Coefficient of linear expansion 20-450°C	9.75×10-6/°C
Transition Temperature	556°C
Yield point or softening temperature	606°C
Softening Point	710°C
Annealing Point	547°C
Stress points	513°C
High temperature viscosity log2	1392°C
log3	1152°C
log4	996°C
Liquid temperature	1008°C

Application

1. Architectural interior and exterior (facade, lobby glass doors, skylights, glass ribs, glass ceiling, partitions, walls, rails, stairs, etc.): its unique high transparency so that the building has a natural, transparent, avant-garde artistic effect, more in line with modern design;
- 2, display showcase and window: as museums, galleries, jewelry and clothing stores display cabinets and windows, can truly reflect the quality and color display items;
3. appliances: You can make plasma TV screens, high-end visualization refrigerator door, high-grade microwave oven panel, freezer cover, range hood glass, etc., to improve product quality and beauty;
- 4, high-end crafts, lamps: crystal clear as crystal, gives excellent visual effects;
- 5, glass furniture and bathroom products: making furniture and bathroom more noble, avant-garde and stylish.

Products:

Ultra Clear Low Iron Glass

Ultra clear Low iron tempered glass/silk Screened Glass /Spandrel Glass

Low Iron Satin Etched Glass/ Etched painted Glass

Low Iron Matt Etched Glass

Low Iron Non-slip Pattern Glass

Low Iron Mirror

Low iron satin etched mirror

Low Iron Painted Glass

Low iron Low-e coated glass

Low Iron Laminated Glass/Swath Private Glass

Custom low iron laminated glass with SGP and Venceria interlayer

Low iron Low -E Insulated glass Units

Low iron Anti-reflective glass