Specialty Glass
Technical Capabilities
10/12

Web: www.abrisatechnologies.com - E-mail: info@abrisatechnologies.com - Tel: (877) 622-7472
It all starts with the basic element, the glass. Each substrate has unique and specific qualities which are matched to the application and specifications that your unique project requires. Abrisa Technologies offers:

**High Ion-Exchange (HIE) Thin Glass**
- High Ion-Exchange (HIE) Aluminosilicate Thin Glass - (Page 3)
  - Asahi Dragontrail™ - (Pages 4 & 5)
  - Corning® Gorilla® Glass - (Pages 6 & 7)
  - SCHOTT Xensation™ Cover Glass - (Page 8)

**Soda-Lime**
- Soda-Lime (Clear & Tinted) - (Page 9)
- Soda-Lime (Low Iron) - (Page 10)
- Soda-Lime (Anti-Glare Reducing Etched Glass) - (Page 11)
- Patterned Glass for Light Control - (Page 12 & 13)
- Soda-Lime Low Emissivity (Low-E) Glass - (Page 14)
- Soda-Lime (Heat Absorbing Float Glass) - (Page 15)

**Borosilicate**
- SCHOTT BOROFLOAT® 33 Multi-functional Float Glass - (Pages 16 & 17)
- SCHOTT BOROFLOAT Infrared (IRR) - (Page 18)
- SCHOTT SUPREMAX® Rolled Borosilicate - (Pages 19 & 20)
- SCHOTT D263 Colorless Thin Glass - (Pages 21 & 22)
- SCHOTT AF45 Alkali Free Thin Glass - (Pages 23 & 24)
- SCHOTT Duran® Lab Glass - (Pages 25 & 26)

**Ceramic/Glass**
- SCHOTT Robax® Transparent Ceramic Glass - (Page 27)
- SCHOTT Pyran® Fire Rated Glass Ceramic - (Page 28)

**Quartz/Fused Silica**
- Corning® 7980 Fused Silica - (Page 29)
- GE 124 Fused Quartz - (Page 30)

**Specialty Glass**
- Corning® Eagle XG LCD Glass Free of Heavy Metals - (Page 31 & 32)
- Laminated Glass - Safety Glass - (Page 33)
- SCHOTT Superwhite B270® Flat Glass - (Page 34)
- Weld Shield - (Page 35)
- White Flash Opal - (Page 36)
- X-Ray Glass (Radiation Shielding Glass) - (Page 37)
High Ion-Exchange (HIE)

High Ion-Exchange (HIE) Chemically Strengthened Aluminosilicate Thin Glass

High Ion-Exchange (HIE) thin glass is strong, lightweight and flexible. It is a high quality aluminosilicate glass that is chemically strengthened to achieve incredible scratch, break/impact, and shock resistance. HIE glass is thinner than standard soda lime, yet significantly stronger.

Specially designed material and unique salt bath processes combine to achieve a very high depth of layer during the chemical strengthening process, the end result of which is increased strength… making HIE glass the ideal solution for all cover and touch applications for the display industry.

Features

- Thin, lightweight
- Superior strength, scratch and shock resistant
- Excellent optical transmission
- High compression layer

Applications

- Display & Touch Screen Cover & Back Plate Glass
  - Projected Capacitive (PCAP)
  - Surface Acoustic Wave (SAW)
  - Acoustic Pulse recognition (APR)
  - Multi-touch
  - Optical Touch
  - Micro-displays

- Optical Components

Abrisa Technologies can supply the following HIE glass substrates to meet your application-specific requirements.

- Asahi (AGC) Dragontrai™
- Corning® Gorilla® Glass
- SCHOTT Xensation™

Dimensions

- Thicknesses: 0.55mm - 2mm stocked. For other thicknesses, consult factory at (877) 622-7472.
- Sizes: Up to 32” x 24”
High Ion-Exchange (HIE)

Glass produced using a High Ion Exchange (HIE) process is stronger and more durable than non HIE glass substrates. Abrisa Technologies currently distributes, fabricates and can apply coatings to three major manufactured HIE brands of glass; Asahi Dragontrail™, Corning® Gorilla® and Glass, Schott Xensation.

**Asahi Glass Corporation (AGC) Dragontrail™** - Is an ideal glass for chemical strengthening via High Ion-Exchange process for use as cover glass for portable equipment such as smart phones, tablet PCs, and more.

**Characteristics in comparison to Soda-lime glass**

- Scratch resistant
- Scratches are less noticeable
- Crack resistant should scratches occur
  (Chemically strengthened Dragontrail™ is much stronger than conventional soda-lime glass)
- Dragontrail™ is manufactured using the float process, ideal for mass-production insuring stable supply

**Dimensional Availability**

- Thicknesses — ranging from 0.55 to over 5.0 mm, sizes stocked are 0.8 and 1.1 mm - consult factory for other thickness requirements. (877) 622-7472
- Sheet size — 48” x 29” standard, custom sizes may be available upon request

**Properties**

<table>
<thead>
<tr>
<th>Property</th>
<th>Dragontrail™</th>
<th>Soda Lime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density (g/cm³)</td>
<td>2.48</td>
<td>2.50</td>
</tr>
<tr>
<td>Young’s Modulus (GPa)</td>
<td>74</td>
<td>73</td>
</tr>
<tr>
<td>Shear Modulus (GPa)</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Poisson’s Ratio</td>
<td>0.23</td>
<td>0.21</td>
</tr>
<tr>
<td>Vickers hardness (before CT)</td>
<td>595</td>
<td>533</td>
</tr>
<tr>
<td>Vickers hardness (after CT)</td>
<td>673</td>
<td>580</td>
</tr>
<tr>
<td>CTE (50-350°C x 10⁻⁷/°C)</td>
<td>98</td>
<td>85</td>
</tr>
<tr>
<td>Tg (°C)</td>
<td>604</td>
<td>550</td>
</tr>
<tr>
<td>Softening Point (°C)</td>
<td>831</td>
<td>733</td>
</tr>
<tr>
<td>Annealing Point (°C)</td>
<td>606</td>
<td>554</td>
</tr>
<tr>
<td>Strain Point (°C)</td>
<td>556</td>
<td>511</td>
</tr>
<tr>
<td>Refraction Index (Nd)</td>
<td>1.51</td>
<td>1.52</td>
</tr>
<tr>
<td>Photoelastic constant (nm/cm Mpa)</td>
<td>28.3</td>
<td>25.6</td>
</tr>
<tr>
<td>Volume Resistivity (Ω·cm)</td>
<td>8.4</td>
<td>8.5</td>
</tr>
</tbody>
</table>
Asahi Glass Corporation (AGC) Dragontrail™ (cont.)

C/S Characteristics

Optical Transmittance

Three-Point Bending Result
High Ion Exchange (HIE) Cont.

**Corning® Gorilla® Glass** - Is an environmentally friendly alkali-aluminosilicate thin sheet glass. Its superior composition allows a deeper layer of chemical strengthening than is possible with most other chemically strengthened glasses, making it durable and damage resistant.

**Benefits:**
- Glass designed for a high degree of chemical strengthening
  - High compression
  - Deep compression layer
- High retained strength after use
- High resistance to scratch damage
- Pristine surface quality

**Applications:**
- Ideal protective cover for electronic displays in:
  - Smartphones
  - Laptops and tablet computer screens
  - Mobile devices
- Touchscreen devices
- Optical components
- High strength glass articles

**Dimensions:**
- Available thicknesses 0.55 mm - 2.0 mm
  (consult factory at 877-622-7472 for other thickness requirements)
- Available in Gen 5 (1250 mm x 900 mm) sheets

**Viscosity:**
- Softening Point (107.6 poises) 852 °C
- Annealing Point (1013.2poises) 613 °C
- Strain Point (1014.7 poises) 563 °C

**Properties:**
- Density 2 0.44 g/cm³
- Young's Modulus 71.7 GPa
- Poisson's Ratio 0.21
- Shear Modulus 29.7 GPa
- Vickers Hardness (200 g load) Un-strengthened 625 kgf/mm²
  Strengthened 674 kgf/mm²
- Fracture Toughness 0.7 MPa m0.5
- Coefficient of Expansion 84.5 x 10-7/°C

**Chemical Strengthening**
- Compressive Stress Capable ≥800 MPa
- Depth of Layer Capable ≥40μm

*A key aspect of the design of the strengthened glass article includes proper selection of the magnitude of compressive stress and the depth of compression layer appropriate for the application.

**Optical:**
- Refractive Index (633nm)
  Core Glass 1.5094
  Compression layer 1.5116
- Photo-elastic constant 29.4 nm/cm/MPa

**Chemical Durability** - Durability is measure via weight loss per surface area after immersion. Values are highly dependent upon actual testing conditions. Data is reported for Code 2318 glass. Unless otherwise noted, concentrations refer to weight percent.
High Ion-Exchange (HIE) - Corning Gorilla Glass (cont.)

Enables Greater Design Strength:

<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
<th>Dielectric Constant</th>
<th>Loss Tangent</th>
</tr>
</thead>
<tbody>
<tr>
<td>54</td>
<td>7.38</td>
<td>0.013</td>
</tr>
<tr>
<td>490</td>
<td>7.26</td>
<td>0.013</td>
</tr>
<tr>
<td>912</td>
<td>7.30</td>
<td>0.014</td>
</tr>
<tr>
<td>1977</td>
<td>7.22</td>
<td>0.015</td>
</tr>
<tr>
<td>2986</td>
<td>7.19</td>
<td>0.016</td>
</tr>
</tbody>
</table>

Greater Damage Resistance:

Corning Gorilla Glass exhibits tighter strength distribution.

Greater Retained Strength:

There is less strength degradation after scratching.

Scratches are Less Visible:

Ion-Exchanged Soda Lime Silicate
8 mm scratches made with load ramped from 20 g to 100 g

Ion-Exchanged Corning Gorilla Glass
Scratches on Corning Gorilla Glass are visible only under a microscope

Corning Gorilla Glass suppresses damage zone and lateral cracking that make scratches less visible.
High Ion-Exchange (HIE) (cont.)

SCHOTT Xensation™ - Is a high-quality alumino-silicate glass with outstanding resistance to breakage and scratches for all cover and touch applications, including capacitive, resistive, optical, and acoustic.

- **Xensation™ Cover** - Alumino-Silicate Glass for capacitive touch technologies

Xensation™ Cover is a high-quality Alumino-silicate glass with outstanding resistance to breakage and scratches for capacitive touch technologies.

**Key-Benefits of Xensation™ Cover:**

- SCHOTT’s unique microfloat manufacturing process gives the Xensation™ Cover alumino-silicate glass its excellent sheet quality.
- Due to the impressively high Compressive Stress (CS) and Depth of Layer (DoL), Xensation™ Cover offers outstanding strength.
- The robust nature of Xensation™ Cover results in very stable CS, DoL and overall strength even under varying chemical strengthening conditions. This enables a broad process window.
- Xensation™ Cover maintains its high strength even when process optimization calls for shorter ion exchange. Xensation™ Cover is available in a wide range of thicknesses with tight tolerances.

**Thermal Properties:**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal Conductivity λ (25 °C)</td>
<td>0.96 W/(m·K)</td>
</tr>
<tr>
<td>Specific Heat Capacity C_p (20 °C, 100 °C)</td>
<td>0.84 KJ/(Kg·K)</td>
</tr>
<tr>
<td>Coefficient of Mean Linear Thermal Expansion α (20 °C, 300 °C)</td>
<td>8.8 × 10^{-6} K^{-1}</td>
</tr>
<tr>
<td>Transformation Point Tg</td>
<td>615 °C</td>
</tr>
<tr>
<td>Annealing Point (10^{13} dPas)</td>
<td>635 °C</td>
</tr>
<tr>
<td>Softening Point (10^{7.6} dPas)</td>
<td>880 °C</td>
</tr>
<tr>
<td>Working Point (10^{6} dPas)</td>
<td>1265 °C</td>
</tr>
</tbody>
</table>

*cooled according to DIN

**Chemical Properties:**

<table>
<thead>
<tr>
<th>Property</th>
<th>Standard</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrolytic Resistance</td>
<td>DIN ISO 719</td>
<td>Class HGB 1</td>
</tr>
<tr>
<td>Acid Resistance</td>
<td>DIN 12116</td>
<td>Class S 4</td>
</tr>
<tr>
<td>Alkali Resistance</td>
<td>DIN ISO 695</td>
<td>Class A 1</td>
</tr>
</tbody>
</table>

**Optical Properties:**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refractive Index at 588 nm (n(588))</td>
<td>1.508</td>
</tr>
<tr>
<td>Core Glass</td>
<td>1.506</td>
</tr>
<tr>
<td>Compression Layer KNO3 pure</td>
<td>1.516</td>
</tr>
<tr>
<td>Transmittance ± (Glass Thickness 0.7mm)</td>
<td>1.514 ± 1.510</td>
</tr>
<tr>
<td>840 nm</td>
<td>&gt; 91.5 %</td>
</tr>
<tr>
<td>560 nm</td>
<td>&gt; 91.5 %</td>
</tr>
<tr>
<td>380 nm</td>
<td>&gt; 90 %</td>
</tr>
<tr>
<td>Photoelastic Constant</td>
<td>29.2 nm/cm³/MPa</td>
</tr>
</tbody>
</table>

*cooled according to DIN

**Sheet Dimensions:**

- Sheet Size*: 1150 x 950 mm
- 475 x 575 mm
- Thickness Range: 0.55 to 2 mm stocked - call (877) 622-7472 for other requirements

**Electrical Properties:**

<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
<th>Dielectric Constant ε’</th>
<th>Loss Tangent tanδ</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7.74</td>
<td>0.011</td>
</tr>
<tr>
<td>54</td>
<td>7.49</td>
<td>0.008</td>
</tr>
<tr>
<td>480</td>
<td>7.40</td>
<td>0.009</td>
</tr>
<tr>
<td>825</td>
<td>7.38</td>
<td>0.010</td>
</tr>
<tr>
<td>912</td>
<td>7.38</td>
<td>0.010</td>
</tr>
<tr>
<td>1977</td>
<td>7.35</td>
<td>0.012</td>
</tr>
<tr>
<td>2170</td>
<td>7.35</td>
<td>0.012</td>
</tr>
<tr>
<td>2996</td>
<td>7.34</td>
<td>0.012</td>
</tr>
</tbody>
</table>

Electric Volume Resistivity \(\rho_v\) for A.C. at 50Hz
\[ v = 250 \text{ °C} \]
\[ v = 350 \text{ °C} \]

|                               | 1.5 × 10^{6} Ω·cm        |
|                               | 8.9 × 10^{6} Ω·cm         |

*These values are guaranteed for customer orientation only

**Mechanical Properties:**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>2.477 g/cm³</td>
</tr>
<tr>
<td>Young’s Modulus E</td>
<td>74 kN/mm²</td>
</tr>
<tr>
<td>Poisson’s Ratio</td>
<td>0.215</td>
</tr>
<tr>
<td>Shear Modulus</td>
<td>30 kN/mm²</td>
</tr>
<tr>
<td>Knoop Hardness HK (0.1/20)</td>
<td></td>
</tr>
<tr>
<td>Non-strengthened</td>
<td>534</td>
</tr>
<tr>
<td>Strengthened</td>
<td>639</td>
</tr>
<tr>
<td>Vickers Hardness HV (0.2/20)</td>
<td></td>
</tr>
<tr>
<td>Non-strengthened</td>
<td>617</td>
</tr>
<tr>
<td>Strengthened</td>
<td>681</td>
</tr>
</tbody>
</table>

**Chemical Strengthening:**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressive Stress</td>
<td>capable &gt; 900 MPa</td>
</tr>
<tr>
<td>Depth of Layer</td>
<td>capable &gt; 50 μm</td>
</tr>
<tr>
<td>4-Point Bending Strength</td>
<td>cap. &gt; 800 MPa</td>
</tr>
</tbody>
</table>

*cooled according to DIN

Web: www.abrisatechnologies.com - E-mail: info@abrisatechnologies.com - Tel: (877) 622-7472
Soda-Lime

Soda Lime Float Glass (Clear & Tinted)

Description
Soda lime glass is the most prevalent type of glass. Soda lime glass is prepared by melting the raw materials, such as soda, lime, silica, alumina, and small quantities of fining agents in a glass furnace at temperatures locally up to 1675°C. Soda lime sheet glass is made by floating molten glass on a bed of molten tin. This method gives the sheet uniform thickness and very flat surfaces. Soda lime glass is the base material for most clear, colored and patterned glass types.

Features
- Can be chemically strengthened to increase mechanical strength
- Can be heat strengthened or heat tempered to increase thermal shock resistance and mechanical strength
- Can be machined, optically coated, chemically etched, sandblasted, colored, or laminated
- Good flatness and surface quality due to float process
- Economically priced

Physical Properties
- Modulus of Elasticity (Young’s) $7.2 \times 10^{10}$ Pa $(10.4 \times 10^6$ psi)$
- Modulus of Rigidity (Shear) $3.0 \times 10^{10}$ Pa $(4.3 \times 10^6$ psi)$
- Bulk Modulus $4.3 \times 10^{10}$ Pa $(6.18 \times 10^8$ psi)$
- Poisson’s Ration 0.23
- Specific Gravity 2.53
- Density $2530$ kg/m$^3$ $(158$ lb/ft$^3)$
- Coefficient of Thermal Stress $0.62$ mPa/°C $(50$ psi/°F)$
- Thermal Conductivity $0.937$ W/m/°C $(6.5$ btu/in/hr.°F/ft$^2)$
- Specific Heat 0.21
- Coefficient of Linear Expansion $8.9 \times 10^{-6}$ strain/°C $(4.9 \times 10^{-6}$ strain/°F)$
- Hardness (Moh’s Scale) 5 to 6
- Refractive Index (Sodium D line) $1.523$
- (1 μm) 1.511
- (2 μm) 1.499
- Softening Point $340°F$ $(726°C)$
- Annealing Point $1015°F$ $(546°C)$
- Strain Point $957°F$ $(514°C)$
- Emissivity (Hemispherical) at 75°F 0.84

Dimensions
- Thicknesses: 0.02” - 1” (0.55mm - 25.4mm)
- Sizes: Up to 96” x 72” (2440mm x 1830mm)
Soda-Lime - Low Iron

Description
Low iron soda lime is created by using high quality grades of silica sand that are virtually free of iron oxides. This results in a transparent, “water white” glass that has higher transmission characteristics compared to normal soda lime. The difference is usually 2-3% at smaller thicknesses (3-9mm), and up to 8% greater transmission with ½” thick low iron glass. Low iron glass can be AR coated to achieve even higher transmission (up to 98-99% total transmission).

Features
- Higher light transmission
- Can be AR coated for super high transmission
- Can be chemically strengthened
- Good flatness
- No green tint

Applications
- Port projection
- Display
- Lighting
- Optical
- Architectural

Physical Properties
- Density: 2530 kg/m³ (158 lb/ft³)
- Modulus of Elasticity (Young’s): 7.2 x 10¹⁰ Pa (10.4 x 10⁶ psi)
- Modulus of Rigidity (Shear): 3.0 x 10¹⁰ Pa (4.3 x 10⁶ psi)
- Bulk Modulus: 4.3 x 10¹⁰ Pa (6.18 x 10⁸ psi)
- Poisson’s Ratio: 0.23
- Specific Gravity: 2.53
- Coefficient of Thermal Stress: 0.62 mPa/°C (50 psi/°F)
- Thermal Conductivity: 0.937 W.m/m²°C (6.5 btu.in/hr.°F.ft²)
- Specific Heat: 0.21
- Coefficient of Linear Expansion: 8.9 x 10⁻⁶ strain/°C (4.9 x 10⁻⁶ strain/°F)
- Hardness (Moh’s Scale): 5 to 6
- Refractive Index (Sodium D line):
  - (1 μm): 1.511
  - (2 μm): 1.499
- Softening Point: 726°C (1340°F)
- Annealing Point: 546°C (1015°F)
- Strain Point: 514°C (957°F)
- Emissivity (Hemispherical) at 75°F: 0.84

Dimensions
- Thicknesses: 1mm-12mm thick
- Sizes: Up to 130” x 96”
Soda-Lime

Anti-Glare Reducing Etched Glass

Abrisa Technologies’ anti-glare glass breaks up incident light reflected images, allowing the user to focus on the display image versus the reflected images. Unlike anti-reflection coated or untreated surfaces, anti-glare etched glass does not become highly reflective as a result of oily finger prints.

Our anti-glare glass is manufactured by a controlled acid etch process yielding uniform diffused surfaces for anti-glare, high resolution, anti-Newton ring applications.

Varying levels of diffusion specified as gloss yield different levels of anti-reflection. A lower gloss reading denotes a more diffuse panel. The more diffuse the panel surface, the more glare reduction it provides. However, an inverse relationship exists between the degree of diffusion and the panel’s resolution.

Anti-glare glass can be laminated, tempered or chemically strengthened. Stock sizes, thicknesses and gloss as listed are in stock and can be readily shaped to your specifications.

Custom thickness, sizes and gloss ranges from 50° to 120° are available upon request.

Typical Applications

- Monitor Face Plates
- Electronic Displays
- Medical Instruments
- Video Game Screens
- Touch Panels
- LED Displays

Features

- Glare Reduction
- High Resolution
- Superior Durability
- Anti-Newton Ring

- Gloss: 60 - 130 (US Gloss, measured at 60° by a BYK Gardner Glossmeter, model 4501)
- Thickness: 0.7mm - 4.75 mm
- Sheet Size: Up to 62” x 39”
Soda-Lime
Patterned Glass for Diffusion & Light Control

Abrisa Technologies offers a number of patterned glass products and hexagon louvers for diffusion and light control. These products can be fabricated onto virtually any shape, and can be drilled, sandblasted, screen printed, polished, UV coated, dichroic coated, heat tempered (to increase thermal shock resistance and mechanical strength), and more, meeting each customer’s application-specific criteria.

Crystal 73® (Prismatic)

- **Maximum Size:** 48” x 102” or 1219.2 x 2590.8 mm
- **Thickness:** 5/32” or 4 mm
- **Features:** Pebble effect for blending, spreading, and diffusing transmitted light. Low iron optically clear glass offering maximum transmission and minimal absorption. Does not yellow over time, retains optical clarity. Widens beam spread by approx. 55 degrees.

Solite® (Softening)

- **Maximum Size:** 48” x 102” or 1219.2 x 2590.8 mm
- **Thickness:** 1/8”, 3/16” and 5/32” or 4 mm, 5 mm and
- **Features:** Stipple effect provides obscurity while retaining high transmission values. Low iron optically clear glass offering maximum transmission and minimal absorption. Does not yellow over time, retains optical clarity.

Industrex® (Diffusion)

- **Maximum Size:** 60” x 132” or x mm
- **Thickness:** 5/32” and 3/16” or 4 mm and 5 mm
- **Features:** Provides obscurity while retaining a high level of transmission. Low iron optically clear glass offering maximum transmission and minimal absorption. Does not yellow over time, retains optical clarity.

Pattern 62™ (Obscures)

- **Maximum Size:** 60” x 132” or x mm
- **Thickness:** 1/8”, 5/32” and 3/16” or XXXX, 4 mm and 5 mm
- **Features:** Acts as a diffuser and can be used to project an obscure or uneven pattern. Can be backlit to diffuse light.

Skytex (Linear)

- **Maximum Size:** 85” x 65”
- **Thickness:** 5/32” or 4 mm
- **Features:** Ribbed linear diffusion glass used to spread light horizontally or Vertically. Ideal for diffusing and elongating a beam of light to structures such as columns. Has a 1/8” wide linear fluted pattern on one surface with a 55 degree spread either horizontally or vertically.

Blue color of glass is for viewing purposes only — glass is actually clear.
Soda-Lime
Patterned Glass for Diffusion & Light Control (cont.)

Frosted Glass (Sandblasted)
- Maximum Size: 60” x 132”
- Thickness: 3.3 mm Std.
- Features: Used to soften a beam of light. Available in soda lime or low iron soda lime, and sandblasted in any shape, size, or thickness.

Hexagon Louver
- Maximum Size: 12” x 12” or x mm
- Thickness: 1/8” or 3 mm
- Features: Used in conjunction with a standard diffusion, colored and dichroic products to reduce glare brightness from a variety of light sources. Made from low density, high strength material originally used for structural use in the aircraft industry. Available in aluminum color or black and can withstand temperatures up to 350°F.

White Flashed Opal
- Maximum Size: 32.5” x 27.875” or
- Thickness: 3 mm and 6 mm
- Features: Colorless base soda lime glass which is fused to a thin white flashed layer. Creates an ambience in diffused lighting similar to daylight with very little shadow. (skylight effect) Average transmission of approx. 35%. Scratch-resistant, non-deforming, and non-combustible.

Mislite
- Maximum Size: 72” x 42”
- Thickness: 3 mm (1/8”)
- Features: Figured glass that is translucent yet provided obscurity for decorative purposes.

Croco Droplet
- Maximum Size: 85” x 65”
- Thickness: 6 mm (1/4”)
- Features: Decorative Glass —see image

Ice Block
- Maximum Size: 89” x 52”
- Thickness: 4mm (5/32”)
- Features: Decorative glass. Can be heat strengthened

Rain
- Maximum Size: 84” x 60”
- Thickness: 5mm (3/16”)
- Features: Decorative glass. Can be heat strengthened.

Blue color of glass is for viewing purposes only — glass is actually clear
Soda-Lime

Low Emissivity (Low-E) Glass

Description
Low Emissivity (Low-E) glass provides excellent performance in situations where temperature separation is desired. Low-E is used to help meet energy efficiency requirements by blocking UV light and providing heat insulation. This is done with a special thin-film metallic or oxide coating which prevents the passage of short-wave solar energy into a building and also prevents long-wave energy produced by heating systems and lighting from escaping outside.

Features
- Higher window U-value
- Increased insulation performance
- Energy savings
- Decreases color fade on interior furniture by blocking UV light

Applications
- Architecture
- Grocery store refrigerators
- Deli food windows

Physical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visible Light Transmission</td>
<td>76%</td>
</tr>
<tr>
<td>SHGC (Solar Heat Gain Coefficient)</td>
<td>0.71</td>
</tr>
<tr>
<td>LSG (Laminated Safety Glass)</td>
<td>1.07</td>
</tr>
<tr>
<td>U-Factor (Btu/hr/ft²/^°F)</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td>0.31</td>
</tr>
<tr>
<td>Indoor glass temp (^°F)</td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td>52</td>
</tr>
<tr>
<td>Summer</td>
<td>99</td>
</tr>
<tr>
<td>UV Transmission</td>
<td>49%</td>
</tr>
</tbody>
</table>

Dimensions
- Thicknesses: 3.2 mm, 5.0mm
- Sizes: Up to 96” x 60” and Up to 130” x 72”
Soda-Lime

Heat Absorbing Float Glass

**Product Description**
Heat Absorbing Float Glass (HAFG) provides superior performance in reducing solar heat gain while maintaining desirable high visible light transmission. The light blue/green color subdues brightness while providing the highest visible light transmittance (77% for 6.0 mm thickness) of all tinted glass substrates currently available.

**Features**
- Absorbs IR

**Applications**
- Shortpass (SP) filter

### Physical Properties

**Optical Properties**
- Refractive index at sodium D Line (ND) 1.5184
- CIE Illuminate “C” data chromaticity coordinates x=0.301, y=0.323
- Dominant wavelength 501 nm
- Excitation purity 2.9%

**Thermal Properties**
- Expansion coefficient (25°C to 300°C) $8.6 \times 10^{-6}/°C$
- Specific Heat at 0° - 100°C (32° - 212°F) 0.205
- Softening point 719°C 1327°F
- Annealing point 540°C 1004°F
- Strain point 503°C 937°F

### Dimensions
- Thicknesses: 1/8” & 1/4”
- Sizes: Up to 60” x 84”
Borosilicate

SCHOTT Borofloat® 33 - Multi-Functional Float Glass

Description
SCHOTT Borofloat® 33 is a versatile borosilicate glass with excellent light transmission, thermal properties, and chemical resistance. Its unique properties make it desirable in many different applications, from high temperature lighting windows, view ports in extreme conditions, to the medical and semiconductor industry. Borofloat wafers are an excellent substrate for MEMS (micro-electro-mechanical systems), as its coefficient of thermal expansion is very similar to silicon and allows for anodic bonding between the two. The low density of Borofloat also makes it an excellent choice for lighter weight laminated glass systems (bulletproof glass).

Features
- Excellent flatness and surface quality
- Very good optical properties
- Low thermal expansion
- High chemical durability
- Low density

Applications
- High temperature windows for lighting
- Photovoltaics
- Optical windows, filters, and mirrors
- MEMS devices
- Chemically resistant view ports
- Bulletproof glass systems

Physical Properties

**Mechanical**
- Density (25°C) ρ: 2.2 g/cm³, 137.3 lb/ft³
- Young’s Modulus E: 64 kN/mm², 9.28 Mpsi
- Poisson’s Ratio μ: 0.2
- Knoop Hardness HK₀,1/2₀: 480
- Bending strength σ: 25 MPa, 3.63 x 10³ psi

**Viscosity**
- Working Point (10⁴ poises): 1270 °C, 2318 °F
- Softening Point (10¹⁶ poises): 820 °C, 1508 °F
- Annealing Point (10¹³ poises): 560 °C, 1040 °F
- Strain Point (10¹⁴.₅ poises): 518 °C, 964 °F

**Thermal Expansion**
- 0 – 300 °C (32 – 572 °F): 3.25 x 10⁻⁶/K

**Optical**
- Index of Refraction @ 435.8nm: 1.4802
- 479.9nm: 1.4768
- 546.1nm: 1.4731
- 589.3nm: 1.4713
- 643.8nm: 1.4695
- 656.3.3nm: 1.4692

**Electrical**
- Log10 Volume Resistivity: (250°C, 482°F) 8.0
  (350°C, 932°F) 6.5

**Dimensions**
- Thicknesses: 0.7mm – 25.4mm
- Sizes: Up to 90” x 67”
Borosilicate

SCHOTTBorofloat® 33 - Multi-Functional Float Glass (cont.)
Borosilicate

SCHOTT Borofloat® Infrared Reflective (IRR)

Description
Heat reflective glass is specifically designed to be placed where high radiant heat conditions exist. This special glass will effectively reflect long wave length infrared radiation, while providing a high grade of transparency. That percentage which is absorbed by the glass will seldom create a problem due to the thermal shock quality of the glass. Note: the small percentage of radiant heat that is permitted to pass through the heat reflective glass is illustrated in the chart below. Other types of glass such as heat absorbing float glass reflect only 4% infrared, while heat absorbing (IRR) glass reflects both radiant and convected heat. This reflective property is a metallic film bonded permanently to the glass surface. Install so that the coated side, as marked is toward the heat surface.

Applications
Used primarily within the steel industry
- Crane service: ladle, slab handling, furnace charging, soaking pit, teeming, mixing and other hot metal handling
- Control stations & Pulpits: located physically near furnaces, red hot or molten metal
- Foundries: can use heat shields to protect hot metal carriers, pouring operators and sand movers
- Furnaces: viewing windows to reduce heat loss and protect the instruments of operating personnel that are looking inside.

Radiation Control
Radiant heat is transmitted through space by wave motion, the intensity and wave length distribution depending on the nature and temperature of the surface. This heat can only be controlled by insulator screening and not by general ventilation, according to Mr. GF Haines, Jr, Mellon Institute. Regular glass can not properly insulate direct radiation, but, reflective glass makes the most efficient transparent screen. This screening of radiation can reduce fatigue and protect against eye injury of personnel and improve work conditions in “hot Spots”

Radiation Control
Double glazing is suggested for most situations. This is especially true when air conditioning is provided. Many times more air conditioning capacity is required for ordinary double glazed window areas compared to insulated walls, therefore, it is necessary to control the BTU/sq.ft. and the direct rays through the glass area. The cooling requirement can be reduced when using heat reflective glass for window areas on high radiant applications. The approach to a heat problem in a radiant environment is substantially different than when ambient air is the major consideration. This includes open control stations and enclosed cabs and pulpits without air conditioning.

Electrical Conductivity
For applications such as static shielding and refrigeration units to prevent fogging Ohm/square typically 20 ohms or better.
Borosilicate

SCHOTT Supremax® Rolled Borosilicate

Description
SCHOTT Supremax® 33 is identical in its properties to Borofloat 33, the only difference being slightly lower surface quality due to the rolled process. It is a versatile borosilicate glass with excellent thermal properties, chemical resistance, and good light transmission material of this thickness. Its unique properties make it desirable in many different applications. Supremax® 33 also maintains a low density compared to that of soda lime glass.

Features
- Large thickness range
- Very good optical properties
- Low thermal expansion
- High chemical durability
- Low density

Applications
- High temperature windows for lighting
- Photovoltaics
- Optical windows, filters, and mirrors
- Chemically resistant view ports
- Bulletproof glass systems

Physical Properties

Mechanical
- Density (25°C) \( \rho \): 2.2 g/cm\(^3\) 137.3 lb/ft\(^3\)
- Young’s Modulus \( \epsilon \): 64 kN/mm\(^2\) 9.28 Mpsi
- Poisson’s Ratio \( \mu \): 0.2
- Knoop Hardness HK\(_{0.1/20}\): 480
- Bending strength \( \sigma \): 25 MPa 3.63 x 10\(^3\) psi

Viscosity
- Working Point (10\(^{4}\) poises): 1270 °C 2318 °F
- Softening Point (10\(^{1.6}\) poises): 820 °C 1508 °F
- Annealing Point (10\(^{13}\) poises): 560 °C 1040 °F
- Strain Point (10\(^{14.5}\) poises): 518 °C 964 °F

Thermal Expansion
- 0 – 300 °C (32 – 572 °F): 3.25 x 10\(^{-6}\)/K

Optical
- Index of Refraction @ 435.8nm: 1.4802
- 479.9nm: 1.4768
- 546.1nm: 1.4731
- 589.3nm: 1.4713
- 643.8nm: 1.4695
- 656.3.3nm: 1.4692

Electrical
- Log10 Volume Resistivity: (250°C, 482°F) 8.0
- (350°C, 932°F) 6.5

Dimensions
- Thicknesses: 28.6mm – 66.7mm
- (1 ⅛” – 2 ⅜”)
- Sizes: Up to 90" x 67"
Borosilicate

SCHOTT Supremax® Rolled Borosilicate (cont.)

*Spectral Transmittance*
Borosilicate

SCHOTT D263 Colorless Thin Glass

Description
SCHOTT D263 is a borosilicate glass with low alkali content and produced with extremely pure raw materials and is produced in a large range of very small thicknesses. The use of these high quality materials results in high chemical resistance. D263 is produced in a special draw process that results in excellent surface quality that can be coated without any post-process surface work. The combination of these traits makes D263 highly versatile.

Features
- Extremely flat surfaces
- Large range of thicknesses (0.030mm – 1.1mm)
- Very good substrate for coatings
- Excellent transmission over a large spectrum
- Low level mobility of alkali ions
- Coefficient of thermal expansion close to ceramic
- High chemical resistance
- Smooth fire polished surface
- High transmission

Applications
- Liquid crystal displays (LCD’s)
- Touch screens
- Optoelectronics (opto-caps in laser diodes)
- Solar cells

Physical Properties

Mechanical
- Density (25°C) \( \rho \)
  \[ 2.51 \text{ g/cm}^3 \]
- Young’s Modulus \( E \)
  \[ 72.9 \text{ kN/mm}^2 \]
- Poisson’s Ratio \( \mu \)
  \[ 0.208 \]
- Knoop Hardness \( HK_{0.1/20} \)
  \[ 590 \]
- Bending strength \( \sigma \)
  \[ 30.1 \text{ kN/mm}^2 \]

Viscosity
- Softening Point \( (10^{7.6} \text{ poises}) \)
  \[ 736 \text{ °C} \]
- Annealing Point \( (10^{13} \text{ poises}) \)
  \[ 557 \text{ °C} \]
- Strain Point \( (10^{14.5} \text{ poises}) \)
  \[ 529 \text{ °C} \]

Thermal Expansion
- 0 – 300 °C (32 – 572 °F)
  \[ 7.2 \times 10^{-6}/\text{K} \]

Optical
- Index of Refraction @ \( n_e \) 546 nm
  \[ 1.5255 \]
- Index of Refraction @ \( n_d \) 588 nm
  \[ 1.5231 \]

Electrical
- Log10 Volume Resistivity:(250°C, 482°F)
  \[ 1.6 \times 10^8 \]
- (350°C, 932°F)
  \[ 3.5 \times 10^6 \]

Dimensions
- Thicknesses: 0.030mm – 1.1mm
- Sizes: Up to 17” x 14”
Borosilicate

SCHOTT D263 Colorless Thin Glass (cont.)
Borosilicate
SCHOTT AF45 Alkali free Thin Glass

Description
SCHOTT AF45 is a modified borosilicate glass that features an alkali-free composition. The draw process used to produce AF45 results in excellent surface quality, while its alkali-free borosilicate makeup creates exceptional thermal resistance. AF45 is a thin glass that comes in a wide range of thicknesses with tight tolerances.

Features
- Excellent transmission characteristics
- Very good thermal properties (resistance up to 600 °C)
- Extremely flat surfaces (without grinding/polishing)
- Broad thickness range (0.05mm – 0.50mm)

Applications
- CCD covers
- AMLCD (Active Matrix displays)
- Solar cells
- Hybrid circuits
- Display and sensor technology

Physical Properties

Mechanical
- Density (25°C) $\rho$: 2.72 g/cm$^3$ 169.8 lb/ft$^3$
- Young’s Modulus $E$: 66.0 kN/mm$^2$ 9.57 Mpsi
- Poisson’s Ratio $\mu$: 0.235 0.235
- Knoop Hardness HK$_{0.1/20}$: 555 555
- Bending strength $\sigma$: 26.7 kN/mm$^2$ 3.87 Mpsi

Viscosity
- Softening Point ($10^{7.6}$ poises): 883 °C 1621 °F
- Annealing Point ($10^{13}$ poises): 663 °C 1225 °F
- Strain Point ($10^{14.5}$ poises): 627 °C 1161 °F

Thermal Expansion
- 0 – 300 °C (32 – 572 °F): $4.5 \times 10^{-6}$/K

 Optical
- Index of Refraction @
  - 436nm: 1.5359
  - 480nm: 1.5318
  - 546nm: 1.5275
  - 589.3nm: 1.5254
  - 644nm: 1.5233
  - 656nm: 1.5229

Electrical
- Log10 Volume Resistivity:
  - (250°C, 482°F): $6 \times 10^{13}$
  - (350°C, 662°F): $3.2 \times 10^{11}$
  - (500°C, 932°F): $1.6 \times 10^{9}$

Dimensions
- Thicknesses: 0.05mm – 0.50mm
- Sizes: Up to 17” x 14”
Borosilicate

SCHOTT AF45 Alkali free Thin Glass (Cont.)

TRANSMISSION CURVE (0.5mm)
Borosilicate

SCHOTT Duran® Lab Glass (Tubed)

Description
SCHOTT Duran® is general-purpose borosilicate glass tubing. Duran® has identical chemical and thermal properties as SCHOTT Borofloat® 33, as it is made from the same material. Duran’s high resistance to chemicals and heat makes it ideal for laboratory glassware.

Features
- Excellent thermal properties
- Highly resistant to chemicals
- Very good transmission properties

Applications
- Lab glassware
- Pipelines
- Chemical industry
- Flameproof tubes
- Flowmeters

Physical Properties

Mechanical
- Density (25°C) \( \rho \) 2.2 g/cm\(^3\) 137.3 lb/ft\(^3\)
- Young’s Modulus \( E \) 64 kN/mm\(^2\) 9.28 Mpsi
- Poisson’s Ratio \( \mu \) 0.2 0.2
- Knoop Hardness \( HK_{0.1/20} \) 480 480
- Bending strength \( \sigma \) 25 MPa 3.63 x 10\(^3\) psi

Viscosity
- Working Point (10\(^4\) poises) 1260 °C 2300 °F
- Softening Point (10\(^7.6\) poises) 825 °C 1517 °F
- Annealing Point (10\(^13\) poises) 560 °C 1040 °F
- Strain Point (10\(^14.5\) poises) 518 °C 964 °F

Thermal Expansion
- 0 – 300 °C (32 – 572 °F) 3.25 x 10\(^{-6}\)/K

Optical
- Index of Refraction @
  - 435.8nm 1.4802
  - 479.9nm 1.4768
  - 546.1nm 1.4731
  - 589.3nm 1.4713
  - 643.8nm 1.4695
  - 656.3.3nm 1.4692

Electrical
- Log10 Volume Resistivity:
  - (250°C, 482°F) 8.0
  - (350°C, 932°F) 6.5

Dimensions
- Smallest size: 3mm (0.118") 0.7mm (0.028") 17mm (0.669")
- Largest size: 325mm (12.795") 10mm (0.394") 33085mm (1300")
Borosilicate

SCHOTT Duran® Lab Glass - Tubed (cont.)

Transmission

![Graph showing transmission vs. wavelength for different wall thicknesses.](image-url)
Ceramic/Glass

SCHOTT Robax® Transparent Ceramic Glass

**Description**

SCHOTT Robax® is a transparent ceramic glass that is extremely heat resistant. The combination of good optical transmission (including infrared, which we perceive as heat) and low thermal expansion make Robax® an excellent choice for windows in heating devices. Robax also has good UV blocking characteristics. The most common uses are fireplaces, stoves, and other types of heating systems.

**Features**

- High resistance to heat (up to 700°C)
- Good transmission
- Excellent resistance to thermal shock
- Blocks UV

**Applications**

- Windows in room heaters and stoves
- Cover panels for heating radiators
- UV blocking shields
- Cover panels for high powered flood lights
- Cover panels for IR drying appliances

**Physical Properties**

**Mechanical**

- Density (25°C) $\rho$: 2.58 g/cm³
- Young’s Modulus $E$: 92 Gpa
- Poisson’s Ratio $\mu$: 0.25

**Thermal Expansion**

- 20 – 700 °C (68 – 1292 °F) 
  \[(0 +/- 0.5) \times 10^{-6}/K\]

**Maximum Operating Temperatures**

- Usage Temp: 560°C 5000 hours
- Usage Temp: 610°C 1000 hours
- Usage Temp: 660°C 100 hours
- Usage Temp: 710°C 10 hours
- Usage Temp: 760°C 5 hours

**Dimensions**

- Thicknesses: 3mm – 5mm
- Sizes: Up to 62” x 33”
Ceramic/Glass

SCHOTT Pyran® Fire Rated Ceramic Glass

Description
SCHOTT Pyran® is a transparent glass ceramic that is fire-protection rated. It works with fire rated frames of the same rating. Pyran® fits applications with non-impact, safety rated requirements of up to 90 minutes.

Features
- Fire rated up to 90 minutes
- Environmentally friendly
- Transparent and wireless

Applications
- Safety rated windows
- Insulated glazing units

Transmission Properties:
Visible spectrum: ~80% transmission

Dimensions
- Thicknesses: 5mm (3/16”)
- Sizes: Up to 77” x 43”

<table>
<thead>
<tr>
<th>Rating in minutes</th>
<th>Location</th>
<th>Max. exposed area of glazing (in²)</th>
<th>Max. width of exposed glazing (in)</th>
<th>Max. height of exposed glazing (in)</th>
<th>Min. depth of groove (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 90 min</td>
<td>Other than Doors</td>
<td>3,422 (23.7 ft²)</td>
<td>76</td>
<td>76</td>
<td>5/8</td>
</tr>
</tbody>
</table>
Quartz/Fused Silica

Corning® 7980 Fused Silica

Description
Corning 7980 is a very pure, non-crystalline silica glass. It features very low thermal expansion and excellent optical qualities, including very high transmission in the UV spectrum.

Features
- Excellent optical properties
- Low thermal expansion
- High UV transmission

Applications
- Optical windows
- High temperature view ports

Physical Properties

Mechanical
- Density (25°C) \( \rho \) 2.201 g/cm\(^3\) 137.4 lb/ft\(^3\)
- Young’s Modulus \( E \) 72.7 GPa 10.5 Mpsi
- Poisson’s Ratio \( \mu \) 0.16 0.16
- Knoop Hardness HK\(_{0.1/20}\) 522 kg/mm\(^2\)
- Shear Modulus 31.4 GPa 4.55 Mpsi

Viscosity
- Softening Point (10\(^{7.6}\) poises) 1585 °C 2885 °F
- Annealing Point (10\(^{13}\) poises) 1042 °C 1908 °F
- Strain Point (10\(^{14.5}\) poises) 893 °C 1639 °F

Thermal Expansion
- 0 – 200 °C (32 – 392 °F) 5.7 x 10\(^{-7}\)/°C

Optical
- Index of Refraction @ 589.3nm 1.45840

Electrical
- Log10 Volume Resistivity: (250°C, 482°F) 11.8 ohm*cm

Dimensions
- Thicknesses: 1.6 m
- Sizes: Up to 6.5” x 6.5”
Quartz/Fused Silica

GE 124 Fused Silica

Description
GE 124 is a very pure fused quartz, made from crystalline silica. GE 124 is very similar to fused silica, with the exception of less transmission in the UV spectrum and much lower OH content. Other features besides its purity include excellent thermal properties and high resistance to chemicals.

Features
- Excellent Thermal Properties
- Stain (chemical) resistant
- Very Good Optical Transmission

Applications
- Water Carriers
- Flanges
- Optical Plates
- Test Plates
- Pressure Windows

Physical Properties

Mechanical
- Density (25°C) \( \rho \) 2.21 g/cm\(^3\) 38.0 lb/ft\(^3\)
- Young’s Modulus \( \varepsilon \) 70 kN/mm\(^2\) 10.5 Mpsi
- Poisson’s Ratio \( \mu \) 0.17
- Knoop Hardness HK \( 600 \text{ kg/mm}^2 \) \( 600 \text{ kg/mm}^2 \)

Viscosity
- Softening Point (10\(^{7.6}\) poises) \( 1683 \degree C \) \( 3061 \degree F \)
- Annealing Point (10\(^{13}\) poises) \( 1214 \degree C \) \( 2217 \degree F \)
- Strain Point (10\(^{14.5}\) poises) \( 1122 \degree C \) \( 2052 \degree F \)

Thermal Expansion
- 0 – 300 °C (32 – 572 °F) \( 5.5 \times 10^{-7}/\degree C \)

Optical
- Index of Refraction 1.4585

Electrical
- Log10 Volume Resistivity:
  - (250°C, 482°F) \( 7 \times 10^{7} \)
  - (350°C, 662°F) \( 7 \times 10^{7} \)

Dimensions
- Thicknesses: Up to 4” thick
- Sizes: Up to 36” diameter
Corning® Eagle XG LCD Glass Free of Heavy Metals

Description
Corning Eagle XG is specifically designed for high performance LCD’s. It is also considered environmentally friendly as it contains no heavy metals (arsenic, antimony, barium, or halides). The lack of heavy metals helps this glass meet existing and future environmental regulations, thus providing a long term solution. The glass also features high surface quality, excellent thermal properties, low density, and high resistance to chemicals.

Features
- Environmentally friendly (no heavy metals)
- Excellent surface quality
- Good thermal properties
- Low density
- Chemical durability

Applications
- Liquid crystal displays
- Lightweight optical windows

Physical Properties

Mechanical
- Density (20 °C, 68 °F) 2.38 g/cm³ 148.5 lb/ft³
- Young’s Modulus 73.6 GPa 10.7Mpsi
- Poisson’s Ratio 0.23 0.23
- Shear Modulus 0.1 GPa 4.4 Mpsi
- Vickers Hardness (200 gm load, 25 sec dwell) 640

Viscosity
- Working Point (10⁴ poises) 1293 °C 2359 °F
- Softening Point (10⁷.6 poises) 971 °C 1780 °F
- Annealing Point (10¹³ poises) 722 °C 1332 °F
- Strain Point (10¹⁴.5 poises) 669 °C 1236 °F

Thermal Expansion
- 0 – 300 °C (32 – 572 °F) 31.7 x 10⁻⁷/°C 17.7 x 10⁻⁷/°F
- Room Temperature to Setting Point 25 – 675 °C (77 – 1247 °F) 35.5 x 10⁻⁷/°C 19.7 x 10⁻⁷/°F

Optical
- Index of Refraction @ 435.8nm 1.5198
- 467.8nm 1.5169
- 480.0nm 1.5160
- 508.6nm 1.5141
- 546.1nm 1.5119
- 589.3nm 1.5099
- 643.8nm 1.5078
- Birefringence Constant: (331 nm/cm)/(kg/mm²)

Electrical
- Log10 Volume Resistivity: (250°C, 482°F) 12.9
- (500°C, 932°F) 8.8

Dimensions
- Thicknesses: 0.7mm, 1.1mm
- Sizes: Up to 61” x 52”
Borosilicate

Corning® Eagle XG LCD Glass Free of Heavy Metals (cont.)

Transmittance

![UV Transmission Graph](image1)

![Optical Transmission Graph](image2)
Specialty Glass Products
Technical Reference Document

Specialty Glass
Laminated Glass — Safety Glass

Description
Laminated glass is created by layering two or more pieces of glass together with an interlayer, such as PVB (polyvinyl butyral). When broken the interlayer holds the glass together, providing increased strength and safety. Laminated glass is used in automobiles, architecture, and bulletproofing. Abrisa can fabricate the laminated glass to custom sizes for a wide variety of applications.

For more information about this product please contact us at:

- info@abrisatechnologies.com
- (877) 622-7472
Specialty Glass

SCHOTT Superwhite B 270® Flat Glass

Description
SCHOTT B 270® Superwhite is an ultra clear crown glass. It is produced by melting high purity raw materials and then made using the continuous draw process. This results in excellent transmission in the ultraviolet, visible, and infrared spectrums, and high surface quality without the need for post processing.

Features
• High transmission
• Excellent surface quality
• Can be thermally or chemically strengthened

Applications
• Large area LCD covers
• Cover panes for copying machines
• Front covers for oscillograph tubes
• Optical elements for light sensors
• Signal optics

Physical Properties

Mechanical
• Density (25°C) ρ: 2.55 g/cm³, 159.2 lb/ft³
• Young’s Modulus E: 71.5 kN/mm², 10.4 Mpsi
• Poisson’s Ratio μ: 0.219
• Knoop Hardness HK: 542
• Bending strength σ: 29.3 kN/mm², 4.2 Mpsi

Viscosity
• Softening Point (10⁷ poises): 724 °C, 1335 °F
• Annealing Point (10¹³ poises): 541 °C, 1006 °F
• Strain Point (10¹⁴.⁵ poises): 511 °C, 991 °F

Thermal Expansion
• 0 – 300 °C (32 – 572 °F): 9.4 x 10⁻⁶/K

Optical
• Index of Refraction @ 546nm: 1.5252
• Index of Refraction @ 588nm: 1.5231

Electrical
• Log10 Volume Resistivity:
  (250°C, 482°F): 1 x 10⁹ ohm*cm
  (350°C, 662°F): 1.6 x 10⁷ ohm*cm

Dimensions
• Thicknesses: 0.9mm – 10mm
• Sizes: Up to 66" x 28"

Web: www.abrisatechnologies.com - E-mail: info@abrisatechnologies.com - Tel: (877) 622-7472
Specialty Glass Products
Technical Reference Document

Specialty Glass
Weld Shield

Description
Weld shield is a leaded glass specifically designed for welding masks and other eye protection equipment. The glass blocks out harmful ultraviolet light and can cause “arc eye”. It is available in different shades for varying degrees of protection, and can be cut to size as ordered.

For more information about this product please contact us at:

- info@abrisatechnologies.com
- (877) 622-7472
Specialty Glass - White Flash Opal

Description
White Flash Opal consists of a colorless base soda-lime glass which is fused to a thin white flashed layer. Using white flashed opal, one can create an ambiance in diffused lighting similar to daylight with very little shadow. Flashed opal is perfect for creating a pleasant atmosphere in professional or residential areas.

Features
- Average transmission of approximately 35%
- Can be heat strengthened or tempered if required
- Helps create a similar effect as a skylight
- Scratch resistant, non-deforming, and non-combustible
- Readily available off the shelf in (MR11) - 1.370" diameter and (MR16) - 1.965" diameter sizes

Dimensions
- Thicknesses: 2.7mm to 3.3mm & 4.0mm to 5.0mm
- Sizes: 55” x 67” Max

Transmission
The transmission properties of White Flash Opal glass are for the most part dependent solely upon the white layer, the thickness of which varies over the manufacturing width and is generally in the order of 0.45 ± 0.2mm. The visual light transmission in the case of standard illuminant A is on average $\tau_{vA} = 35\%$ ($\pm 10\%$).

Light Diffusion
In the visible spectrum of the DESAG, White Flash Opal glass provides almost ideal diffusion. In the near infrared range a directed component is superimposed which appears on the diffusion indicatrix (fig. 2) as a small “nose”. From $\lambda = 800\text{nm}$, the proportion of the directed transmission increases relatively sharply and where $\lambda = 2000\text{ nm}$, values of 50 % may be reached.

Chemical Properties
White Flash Opal glass is largely insensitive to the action of water acids, alkalis, and salt solutions (with the exception of hydrofluoric acid).

Electrical Properties
Specific electrical resistivity $> 10^{10} \Omega/\text{cm}$

Thermal Properties
Thermal conductivity at 90 °C
$\lambda = 1.06 \text{ W/(m \cdot K)}$
Transformation temperature $T_g = 521 \degree C$
Mean linear thermal coefficient of expansion $\alpha$
(20-300 °C): $9.5 \times 10^{-6} \text{ K}^{-1}$

Mechanical Properties
Compressive strength 800-930 N/mm²
Bending tensile strength 30 N/mm² (characteristic value)
Density $\rho = 2.6 \text{ g/cm}^2$
Specialty Glass Products
Technical Reference Document

Specialty Glass
X-Ray Glass or Radiation Shielding Glass

Description
X-Ray leaded glass is a radiation shielding glass that contains a high content of heavy metallic oxides. The heavy metallic oxides, most notably the lead oxide (PbO), provides the protective qualities against X-rays and Y-rays for use in the medical and technical fields. Despite the high metallic oxide content, Radiation Shielding Glass features high optical transmission, which makes it a perfect fit for view windows for X-ray rooms.

Features
- Protection from X-rays and Y-rays
- Good optical transmission (~85%)

Applications
- Control windows for X-ray rooms
- Protection windows in materials testing houses, baggage control units, and laboratories

Physical Properties
- Optical Transmission in Visible Spectrum: 86-88%

Dimensions
- Thicknesses: 8 mm
- Sizes: Up to 31” x 29”