In January 2011, QUANTUM GLASS™ has carefully selected ELECTROCHROME SageGlass® technology to offer a first reliable electrochromic solution to architects. ELECTROCHROME SageGlass® is already installed into hundreds of homes and buildings.
**HOW IT WORKS**

ELECTROCHROME SageGlass® is an active insulating glazing which, under the effect of a low voltage electric current, can be switched from clear to darkly tinted (and reversibly) while always remaining transparent.

The exterior pane of the double or triple glazing unit is sputtered with layers of metal oxides (total thickness less than 1/50th of a human hair). The glass tints thanks to the principle of oxidation / reduction. When a low voltage is applied across the coating, ions travel from one layer to another layer causing the coating to tint and decrease the amount of light passing through. Reversing the polarity of the applied voltage causes the ions to migrate back to their original layer, and the glass returns to its clear state.

QUANTUM GLASS is delivering a complete system with its electronic controls, allowing manual, automatic control or both. This solution can be fully and easily integrated in building management systems.

**DIAGRAM**

This diagram is based on a double glazing unit with a standard assembly

**SIZE**

Minimal: 457 x 457 mm  
Maximal: 1016 x 1524 mm (available now)  
1500 x 3050 mm (available in 2013)

**THICKNESS**

Minimum thickness: 20 mm  
Standard double glazing

**GLASS CUTTING**

The glazings are delivered in the required dimension. No further cutting or drilling is possible.

**RANGE OF PRODUCT AND PERFORMANCE**

<table>
<thead>
<tr>
<th>Composition</th>
<th>State</th>
<th>According to D65</th>
<th>According to EN410</th>
<th>According to EN673</th>
</tr>
</thead>
<tbody>
<tr>
<td>Double glazing unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6mm toughened with coating SageGlass®</td>
<td>clear</td>
<td>63%</td>
<td>11%</td>
<td>12%</td>
</tr>
<tr>
<td>16mm Spacer - gap Argon filled 90%</td>
<td>intermediate 1</td>
<td>21%</td>
<td>6%</td>
<td>10%</td>
</tr>
<tr>
<td>6mm heat treated clear float glass</td>
<td>intermediate 2</td>
<td>6%</td>
<td>5%</td>
<td>9%</td>
</tr>
<tr>
<td></td>
<td>tinted</td>
<td>2%</td>
<td>5%</td>
<td>10%</td>
</tr>
</tbody>
</table>

| Triple glazing unit** | | | | |
| 6mm toughened with coating SageGlass® | clear | 55% | 10% | 9% | 0,39 | 1,1 |
| 16mm Spacer - gap Argon filled 90% | intermediate 1 | 19% | 6% | 7% | 0,14 | 1,1 |
| 6mm heat treated LowE glass (CEN272) | intermediate 2 | 5% | 5% | 7% | 0,07 | 1,1 |
| | tinted | 1% | 5% | 7% | 0,05 | 1,1 |

| | 6mm toughened with coating SageGlass® | clear | 54% | 14% | 18% | 0,4 | 0,8 |
| | 13mm Spacer - gap Argon filled 90% | intermediate 1 | 19% | 6% | 16% | 0,12 | 0,8 |
| | 6mm heat treated clear glass | intermediate 2 | 5% | 5% | 16% | 0,06 | 0,8 |
| | 6mm heat treated LowE glass (CEN180) | tinted | 1% | 5% | 16% | 0,04 | 0,8 |

* Applicable tolerances according to EN1096-4 ; values according to EN410 and EN673  
** By filling with Krypton gas instead of Argon, U=0,6W/m²K

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**CLAUSE OF PARTICULAR TECHNICAL SPECIFICATIONS**

- Electrochromic glazings that switch from clear to dark state (and reversibly), remaining transparent.
- Transition from transparent to dark state (and back) in around 5 min.
- Light transmittance range from 55% to 2%.
- Solar heat gain range from 0,39 to 0,06.
- Fully independent and integrable automatic control system managed according to the external light and solar heat level.
APPLICATIONS

Like a transparent skin, ELECTROCHROME SageGlass® excels at the functional optimisation of glazed surfaces which are exposed to light, most notably for façades, atria and lobbies. Particularly ideal for low-energy consumption buildings and in many cases in replacement of mechanical shading solutions. Depending on the application and requirements, QUANTUM GLASS is providing the most relevant glazing and control configurations adjusted to the geographical location, facade-orientation and usage of the building.

CUSTOMISATION OF THE GLAZING

COMPOSITION
Double or triple glazings. The external pane can’t be changed while the internal one can be customised to the project characteristics.

CUTTING
The glazings are delivered in the required dimension. No further cutting or drilling is possible.

TECHNICAL DATA

<table>
<thead>
<tr>
<th>Operating voltage</th>
<th>Power supply 100-240VAC 50/60Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Electronics (AT-410)</td>
</tr>
<tr>
<td>Typical Power Consumption</td>
<td>Power up to 200 m² of ELECTROCHROME SageGlass® for the equivalent of powering a 60 Watt light bulb.</td>
</tr>
<tr>
<td>Power per unit area in W/m²</td>
<td>Peak : 2.5 Watts</td>
</tr>
<tr>
<td>Standards and certification</td>
<td>Complies with US and EN standards</td>
</tr>
</tbody>
</table>

INSTALLATION

TYPE OF FRAME / FIXING
Fixed, opening or sliding frame. ELECTROCHROME SageGlass® is compatible with almost all window and facades frames (aluminum, uPVC, wood). The mechanical installation is the same as for a standard double or triple glazing. Rebate needed: 16 mm

MAIN PRECAUTIONS FOR USE AND IMPLEMENTATION
The installation has to comply with the local electrical regulations and must be performed by a certified electrician.

CONTROL SYSTEM

Designed specifically, the control system includes proprietary algorithms to manage manually or automatically using low voltage the tint of the ELECTROCHROME SageGlass® according to the light level based on light sensors. The system can be independent or fully integrated in a building management system (BMS). Quantum Glass offers a complete system including cables, glazings-electronics, manual wall-switches, intelligent control units, light sensor, etc.

INTERFACES
RS-232, RS-485, USB, Dry contacts inputs, LonWorks, BACnet (MS/TP or TCP/IP)

SWITCHING TIME
Transition takes typically 3 to 5mns to reach 90% of its range.

GUARANTEE

ELECTROCHROME SageGlass® IGUs have a standard 10 year warranty on the seals. The ELECTROCHROME SageGlass® control system and electronic functionality has a 5 year warranty.
ELECTROCHROME SageGlass® offers not only glare management, but also energy-efficiency, and a sensation of well-being (creating more comfortable and productive environment), reinforced by:

- Always transparent: preserve the view regardless of its tint
- Silent and smooth switching from one state to another
- Four different states of tints
- Fully automated system including glazing and electronic control
- Maintenance free and easy to integrate solution
- Energy savings optimized with each season.

ELECTROCHROME SageGlass® also has undeniable aesthetic and economic advantages:

- Exterior and interior mechanical solar protection no longer required
- Daylighting optimisation
- The integrity of the architectural project is respected
- Network energy optimisation (lighting, climate control, heating)
- Reliability of the system over time, low maintenance
- ‘Plug & Play’ and low voltage system.

DURABILITY

The inorganic, all-ceramic structure of the ELECTROCHROME SageGlass® System provides a superior level of durability that has passed ASTM E2141-06: High temperature cycling, intense solar exposure while being continuously cycled between clear and tinted states to test coating. Samples tested by the NREL have reached 100,000 cycles during 9924 hours, exceeding the test standard by 50,000 cycles (equivalent to switching a window 9 times/day for 30 years).

CERTIFICATIONS

EN 12150, EN 12600, EN 410, EN 1096, EN 1279

SELECTED REFERENCES

CHABOT COLLEGE, Hayward, California USA.
170m² of ELECTROCHROME SageGlass® installed in a façade on 12/2009 divided in 6 distinct zones of switching directly controlled by the building’s energy management system.

BALL STATE UNIVERSITY, Indiana, USA.
162m² of ELECTROCHROME SageGlass® was installed in 2010 into an existing skylight covering an open courtyard to create an indoor space for student activities. The glass is controlled automatically using feedback from light sensors to maintain a set light level in the space. Manual override allows the glass to be fully tinted as needed for visual presentations.

PUTNAM AVENUE, Greenwich, Connecticut, USA
232m² of ELECTROCHROME SageGlass® was installed in September 2008 to replace an existing skylight as part of an interior upgrade to manage glare issues. All the glazings are controlled over 8 zones by the ELECTROCHROME SageGlass® control system and powered by integrated photovoltaic panels.

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