LC SmartGlass™
SPD SmartGlass™

Electronically Switchable Glass Handbook

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We hope that you find this document useful and welcome any feedback.

CONTENTS

COMPANY

FOUNDED:	2003
DIRECTORS:	John Browne (Managing), Bob Hudson (Technical), Kevin Root (Commercial), Frank Bagnall (Operations) & Richard Blake (Chairman)
MANAGERS:	John O Gorman (Sales Manager) & Paul Murphy (Production)
AUDITORS:	O'Gorman Brannigan Purthill & Co.
LOCATIONS:	Ireland and United Kingdom & Worldwide sales offices
BUSINESS:	Design, manufacture, sale and installation of LC SmartGlass™ & SPD SmartGlass™
MAJOR PRODUCTS:	LC SmartGlass™ - Switchable Privacy Glass SPD SmartGlass™ - Light control Glass SLC SmartGlass – Privacy & Light control Ballistic SmartGlass
INVESTMENT:	In excess of €3 million
R&D Partners:	Enterprise Ireland, Dublin Institute of Technology, CREST & Cambridge university faculty of engineering
IN THE PRESS:	ITV Daybreak, Top Gear Live, Sunday Times, Channel 4 Grand Designs, About the House, Room to Improve, FT Weekend, Irish Times, RIBA Journal, Plan, Glass on web & Scientific American
AWARDS:	RIBA 100% Detail Innovative product of the show award 2008 & 2006. Plan Expo Product Best Innovation of the show award 2004


LC SmartGlass™
ELECTRONICALLY SWITCHABLE GLASS
SWITCHED ON (CLEAR)
SWITCHED OFF (PRIVATE)
SmartGlass International™


SPD SmartGlass®
Electronically Switchable Solar control Glazing
Switched On (Clear)
Switched Off (Tinted)
SmartGlass International™
www.smartglassinternational.com

Welcome to SmartGlass International Ltd, the leading worldwide manufacturer of electronically switchable glass supplied to the commercial, hospitality, healthcare, transport and security and industrial sectors.

Vision and Values

Our vision is to create, challenge and evolve through excellence, passion, quality, innovation and drive. Our no-compromise attitude to quality and customer focus is the foundation for our commitment to creating products and experiences of real and lasting value.

Intelligent technology, advanced features, innovative solutions and quality are what set us apart.

- LC SmartGlass™ - Privacy on demand – Internal partition screens, windows, security screens & doors
- SPD SmartGlass™ - Solar Control – Windows & Roof-lights

About SmartGlass International

SmartGlass International (SGI) is the dedicated manufacturer of Electronically Switchable Glass. Also known as privacy glass, switchable glass, intelligent glass and electric glass these technologically advanced glass products are fast breaking from being niche to becoming mainstream for use particularly in the hospitality, healthcare , commercial, retail, security and transport sectors. Our main products are LC SmartGlass™ offering Privacy on demand and SPD SmartGlass™ offering Solar-Control.

SmartGlass International has its head quarters, manufacturing, finance and R&D centres in Dublin, Ireland with commercial, sales and technical offices in the UK. With the intention of concentrating our products and markets we only produce electronically switchable glass products and through continued research and development initiatives are expanding our range of products to meet the needs of growing specialist markets in hotels, architecture, transport and medical fields. We have invested heavily in plant and machinery and have the capacity to fulfil large orders on short lead times. Each piece of SmartGlass is bespoke made to meet and exceed our client's needs, always with the client in mind.

We are an award winning company claiming such accolades as the RIBS (Royal Institute of British Architects) sponsored 100% Detail most innovative building product award.

The use of intelligent smart glass provides added value and increased flexibility in new building design, improves working environments and building ergonomics, saves energy, and increases the well being of occupants. We are dedicated to bringing environmentally friendly building products and unique design capabilities to our customers.

Through continued investment we have expanded to become World leader in the manufacture of electronically controlled smart glass products for the architectural market. We offer unique and bespoke services including technical, consultancy, design, installation, supply only service, control systems, service and maintenance through to complete design & build turnkey solutions.

Our no compromise attitude to quality is the foundation for our commitment to creating products and experiences of real and lasting value. The principles of these sentiments are enthusiasm, pride and passion for our company, our products and our roots. This spirit permeates all areas of the SmartGlass International organisation and provides the backing for the full scope of our operations.

LC SmartGlass™ is used for privacy purposes allowing instant privacy at the flick of a switch. Using a minute electrical current, users can immediately switch the LC SmartGlass from clear to private (opaque) and vice versa. LC SmartGlass is easily installed and various configurations can be supplied including colour tinted, fire rated, double glazed, ballistic, blast resistant, curved and shaped.

SPD-SmartGlass™ can be manually or automatically "tuned" to precisely control the amount of light, glare and heat passing through. Glass facades using patented SPD light-control technology reduce the need for air conditioning during the summer months and heating during winter. SPD SmartGlass windows give the ability to instantly switch a window to maximize daylight when it's really needed and to provide controllable solar shading during peak light conditions is unique.

Sample boxes can be sent to perspective clients anywhere in the World, each sample box contains a working SmartGlass samples with plug, switch and display stand. Please contact us for further details.

Our products foster innovative design opportunities never before available while offering unprecedented environmental benefits and protection to building inhabitants and contents.

SmartGlass is currently used in hotel room screens between bathroom and bedroom, partition screens, windows, roof-lights and doors, projection screens, security & teller screens and as architects and designers explore the boundaries and turn conventional perspectives of glass on their head it is expected that the markets will continue to grow and expand into new and innovative uses.

Evidence that the trend for increases in SmartGlass sales is visible in the range and locations of projects recently completed by SmartGlass International including the Rolls Royce engines, Kempinski hotels, Guinness Storehouse, Siemens, Golbach Kirchner, Top Gear live, ITV Daybreak, Royal College of Physicians, Aramco, various hospitals, Chevron Texaco HQ, Rolls Royce marine, Damico tankers, Royal Institution of GB, Emirates Airlines, Saudi Arabian National Guard, European Space Agency, Central Bank of Ireland, Tullow Oil, Chubb Custodial, SMI, Fairline boats, Zain Bahrain, Zeus Packaging & Pictet Bank.

Since 2003, our products have been sold into more than 45 countries throughout the World and we export approximately 99% of our production.

Our **Sales team** will travel throughout the World at short notice to meet with the client. Technical advice will be provided and every effort will be made to meet and exceed the client's needs.

Hotel room design is the area where LC SmartGlass is being most frequently used in the World wide market. We have developed a standard hotel design suite to assist clients in as far as possible when specifying SmartGlass for use in hotels. Please contact us to discuss your requirements further.

Why SmartGlass International?

We have successfully worked with and supplied to prestigious clients, World renowned architects and landmark projects throughout the World and have built an enviable reputation for:

- **Quality Products**. Our products are designed to be not only aesthetically pleasing but also essentially functional and easy to use. The expectations raised by a strikingly individual appearance must be completely fulfilled in terms of high quality performance in all areas when the SmartGlass system is used. Excellence in providing the consumer with the highest pleasure in both ownership and use rests on the highest quality standards employed through the design and manufacturing processes.

- **Innovation**. Through extensive investment in research and development SmartGlass International continually pushes the boundaries to bring new and innovative products to its customers.

- **Design**. Our design team will work with the client, their architects and design teams in order to guarantee the products supplied are fit for purpose and are optimally designed in terms of quality, regulatory compliance, safety, aesthetics and function.

- **Customer Focus**. We strive to offer our customer a level of service that matches the unprecedented focus on quality and finish of our products. Following design, delivery and installation of your purchase the SmartGlass International product and service guarantee ensures that service and support is always close at hand. Taking care of you and your products is our main ambition. Should you need support for your products, we will do our utmost to help you as quickly and efficiently as possible.

- **Flexibility**. We strive to be as flexible as possible in order to understand and enhance the customer experience. Frequently competitors cannot supply certain configurations which SmartGlass International will supply to exceed the clients requirements.

- **Beware of cheap imitations.** Our SmartGlass products set the standards.

- **Lead time**. Through in house control of the manufacturing and quality processes, lead times generally range from 4 to 6 weeks from receipt of order. Our goal is to deliver a quality product on time.

- **International Sales Network**. Through partnership with SCHOTT glass, we can service the requirements of a worldwide customer base.

- **Environmental Policy**. We work continuously to minimise the effects of greenhouse emissions on the environment. Equal priority is given to finding a balance between the needs of the environment and the consideration given to our products qualities, economic value, aesthetic value and life span. Our products ultimately reduce green house emissions by enabling users to reduce peak electrical demands on lighting and cooling. Our production processes are carried out in a sympathetic manner always with a view to maximising recycling and minimising energy consumption and waste.

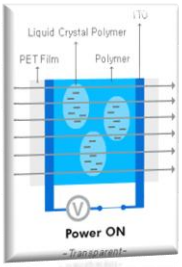
LC SmartGlass - Privacy on Demand

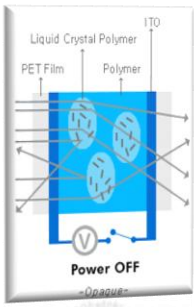
OVERVIEW

LC SmartGlass™ offers instant privacy at the flick of a switch. All LC SmartGlass panels are bespoke manufactured using a lamination process which encapsulates a PDLC film between 2 or more glass sheets. Using a minute electrical current, users can immediately switch the LC SmartGlass from clear to private (opaque) and vice versa. LC SmartGlass is easily installed and can be utilised in many applications. Various configurations can be supplied including colour tinted, fire rated, double glazed, curved and shaped.

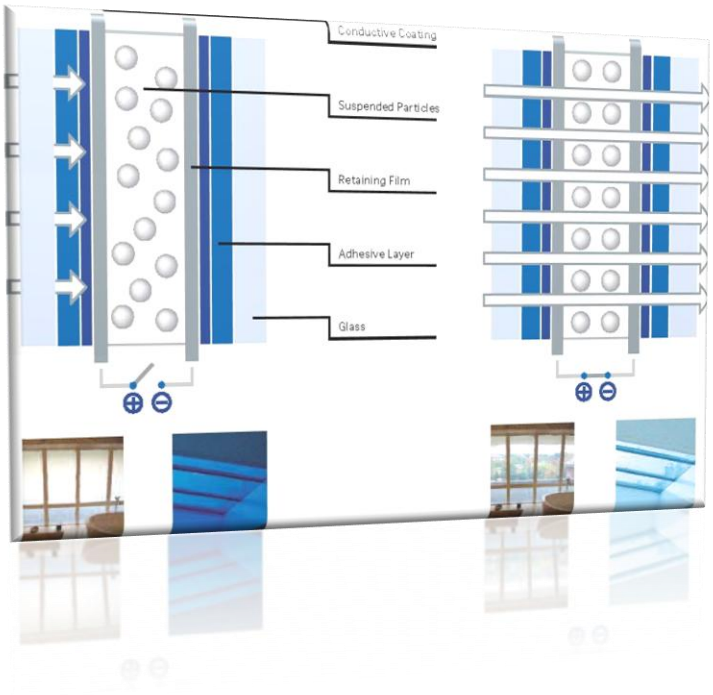
PRINCIPLE

When the electrical supply is switched **on**, the liquid crystal molecules align and incident light passes through and the LC SmartGlass panel instantly clears.





When the power is switched **off** the liquid crystal molecules are randomly oriented scattering light and the LC SmartGlass becomes opaque (private).



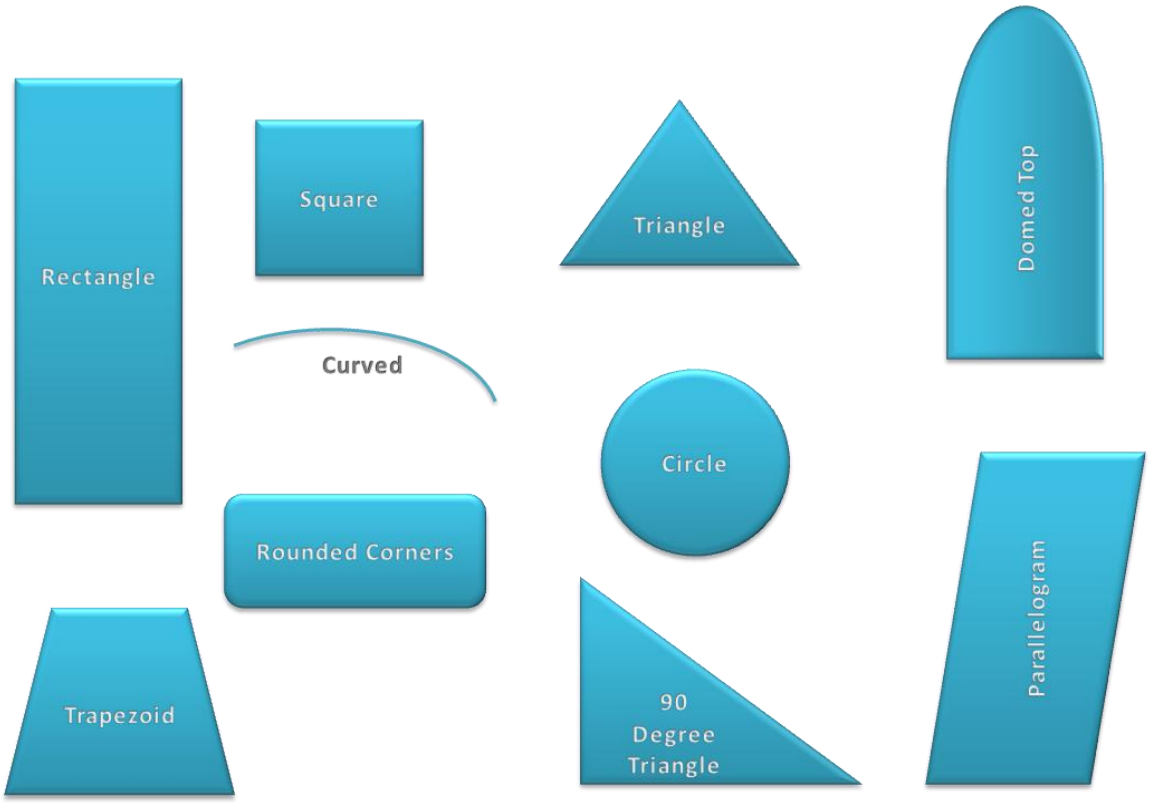
APPLICATIONS AND FEATURES

- **Hospitality** – Hotel room privacy screen, bathroom / bedroom privacy screen, external windows, doors, conference centre windows & roof-lights, bar & restaurant screens, toilet cubicles, balustrades and balconies.
- **Commercial** – Office & boardroom partition screens, doors, sliding/folding doors, windows, roof-lights.
- **Healthcare** – Sheer easily cleaned surfaces that allow patient privacy and dignity at the flick of a switch. Fire rated hospital doors, moveable privacy screens, and X-Ray protection screens.
- **Security** – Cell doors and windows, vision panels, entrance foyer, teller & cash counting screens. Also can be incorporated into bullet proof glass.
- **Industrial** – Machinery screening, roof-lights, doors, components.
- **Rail** – Driver privacy & security screens.
- **Retail & Showroom** – Projection windows, vanity screens, feature screens.
- **Projection** – Internal or External high resolution rear projection screens.

ADVANTAGES & BENEFITS

- Instant and precise privacy control
- Efficient use of space in the built environment
- Blocks 99.5+% of damaging UV rays
- Eco friendly
- Exceptional optical qualities that reduce glare and eye strain
- High durability, solid-state technology with no moving parts to wear out or break
- Large sizes of many shapes can be produced
- Stable colour characteristics for the life of the unit
- Aesthetically pleasing, hygienic & low maintenance
- Reduce uncomfortable “Gold fish bowl” feeling when working in high-density office buildings
- Reduced fading of carpets, furniture and protects valuable artwork
- High UV stability
- High contrast for use as rear projection screen
- Long life - tested to in excess of 1,000,000 cycles

SHAPES



OPERATION

LC SmartGlass is operated by applying 65V AC or 110V AC to the glass from a power transformer supplied. When a current is applied to the glass it immediately turns from opaque to clear allowing vision through. When the current is removed the glass returns to the frosted “private” state. LC SmartGlass can be operated by wall switch, radio remote, PIR switch, Crestron, ABX and more...

CONTROLS

- Crestron, ABX, BMS, Wall switch, Remote control, Movement sensor, Timer, Door lock, etc....

DURABILITY

Test No.	Test Item	Test Conditions	Result
		On(1sec) Off(1sec),	
1	Switching	110Vac 60 Hz 1 Million Times	Passed
2	High Temperature (Boil test)	70°C / 2 Hours	Passed
3	High Temp. / Humidity	50°C / 95%RH, 14 Days	Passed
4	Low Temperature	-20°C / 21Days	Passed
5	Heat Cycle	-20°C to 70°C (1Hrs/Cycle), 5,000Cycles	Passed
6	Weathering	Standard (For Laminated Glass)	Passed
7	Heat Resistance	Standard (For Laminated Glass)	Passed
8	Water submersed	21 Days	Passed

Product samples used 10.8mm LC SmartGlass - Mfg 16/09/08 Batch 2242A

Check on Chemical resistance acc. DIN EN ISO Task 12543-4

LC SmartGlass CONFIGURATION

(For non-standard configurations please contact us to discuss)

GLASS COLOR: Clear, bronze, grey, green, blue tint.

GLASS TYPE (All laminated): Annealed (Standard), Low Iron, heat/chemical strengthened, tempered, Fire rated, curved, bullet resistant, tinted, mirrored.

THICKNESS:

Interior 9.5 mm, 11.5 mm, 13.5 mm or 15.5 mm
Door 11.5 mm or 13.5 mm all tempered
Exterior Flexible: Ex. 28 mm insulating glass unit (IGU)
4 mm Low-E outer glass + 12 mm airspace + 11.5 mm LC SmartGlass™ panel

SIZE:

Standard - up to 1155 mm x 3000 mm Special – 1525mm x 3200mm.
Special sizes above the standard can be produced to client requirements up to.

RATIO:

Maximum Ratio Width: Height approx 4:1
(Without applying bus bars top and bottom or on 2 opposing sides)

WIRING:

Double insulated 0.5 mm2 dual core flex standard 4 meter.
Longer wires can be supplied upon request.

SHAPE: Many shapes and curved including drilled holes

ENVIRONMENTAL: Storage / Operation $-10^{O}C$ to $50^{O}C$

SIZE TOLLERENCE: ± 3 mm on OA size and ± 0.5 mm on thickness

BOWING TOLLERENCE: ± 3 mm per linear meter

ELECTRICAL:

Driving voltage	65VAC or 110 VAC
Current	less than 200 mA/m^2
Power	approx. 5 $watt/m^2$

SWITCHING TIME: Approx. 1/100 second at room temperature

OPTICAL:

Transmission	approx. 75%
View angle	approx. 120^{O}

Scattering effectiveness approx. 100 mm

LIFE: Greater than 10 years

WARRANTY: 5 years

LC SmartGlass Sound Control Data*

LC SmartGlass Thickness	Configuration	DB Rating
9.5 mm	4 mm / 1.5 / 4 mm	35
11.5 mm	5 mm / 1.5 / 5 mm	37
13.5 mm	6 mm / 1.5 / 6 mm	39
25.5 mm	12 mm / 1.5 / 12 mm	44

*Values are nominal (+/- 5%) and are dependent on glass configuration used. The above figures are recommended for guide purposes only.

LC SmartGlass Optical performance*

	LC SmartGlass (11.5mm) Power ON	LC SmartGlass (11.5mm) Power OFF	Clear Float Glass (6mm)	Frosted Glass (6mm)
Visible Light Transmission	75%	67%	86%	76%
Clarity	76%	4%	83%	18%
UV Transmission	0.5%	0.5%	55%	55%

*Values are nominal (+/- 5%) and are dependent on glass configuration used. The above figures are recommended for guide purposes only.

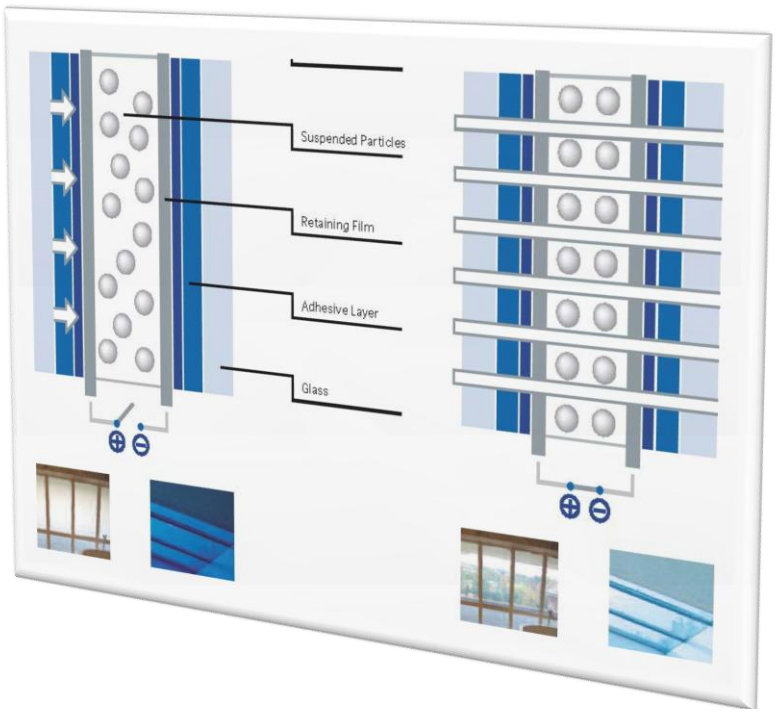
SPD SmartGlass - Solar Control

OVERVIEW

SPD-SmartGlass™ can be manually or automatically "tuned" to control the amount of light and glare passing through a window. While glass is a favored product for use in building facades; glare, solar heat gain and UV exposure are problematic and can often make the use of glass impractical resulting in the need to invest in expensive solar shading devices. Glass facades using patented SPD light-control technology reduce the need for air conditioning during the summer months and heating during winter. The ability to instantly switch the glass to maximize daylight when it's really needed and to provide controllable solar shading during peak light conditions is valuable and unique. All SPD SmartGlass panels are bespoke manufactured using a lamination process which encapsulates a SPD "Suspended Particle Device" film between 2 or more glass sheets.

PRINCIPLE

When the power supply is switched **on,** the rod shaped suspended particle molecules align, light passes through and the SPD SmartGlass panel clears. SPD SmartGlass protect from damaging UV when on or off.
When the power supply is switched **off** the rod shaped suspended particle molecules are randomly oriented blocking light and the SPD SmartGlass becomes dark blocking up to 99.4% of light.



SPD SmartGlass™ APPLICATIONS & FEATURES

External Glazing

- Fixed or casement windows and doors
- Create comfortable environments in offices, bedrooms, sunrooms and conservatories.
- Can be used in the marine and aviation industry.
- In SPD SmartGlass Curtain walling, the use of a photocell will automatically protect the interior of a building when the suns rays shine
- Can be single, double or triple-glazed including low E glass and gas filling, resulting in improved thermal performance and reduced solar heat gain and unparalleled U Values

Roof-Lights

- Skylights
- Roof-lights – Fixed or opening
- Commercial and Domestic

Security and Safety

- Protect staff and interiors from the effects of harmful UV rays.
- Reduced harmful solar heat gain.
- Control glare.
- Reduce the effects of noise pollution.
- Added security and safety due to toughened laminated glass construction.
- Low electric consumption.

ADVANTAGES & BENEFITS

In an effort to reduce glare the windows of many commercial buildings are permanently tinted, therefore requiring more lighting inside the building than that which is optimally needed. Natural day lighting, which can be regulated using SPD SmartGlass™ products, has been shown to improve health and well being, and thus its regulation is considered by many to have a strong influence on one's attitude and productivity.

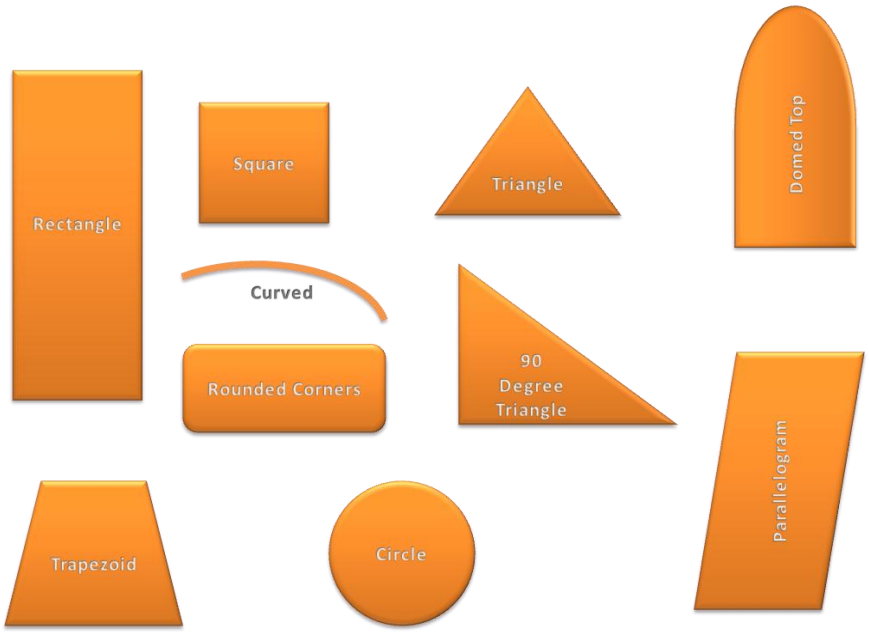
- Instant and precise control of light
- Energy Savings on cooling & lighting costs
- Eco friendly, reduce building carbon emissions
- Exceptional optical qualities that reduce glare and eye strain
- Elimination of the need for expensive window dressings like electronic louvers; blinds and solar shades used in architectural applications
- High durability, solid-state technology with no moving parts to wear out or break
- Large sizes of any shape can be produced
- Stable colour characteristics for the life of the unit
- Wide working temperature range from -20^{o}c to +70°c - Ideal for exterior applications
- Ambient temperature control
- Aesthetically pleasing
- Hygienic low maintenance material
- Enhanced corporate image

- Wide light transmission ranges
- Reduces uncomfortable “Gold fish bowl” feeling when living or working in high-density buildings such as apartment blocks or office complexes
- Reduced fading of carpets, furniture and protect valuable artwork
- Protecting skin from damaging UV rays
- High UV stability
- Low working voltage
- High contrast at any viewing angle and any illumination level
- Long life - tested to in excess of 100,000 cycles
- Cost competitive.
- Infinite range of light transmission levels without the blocking of ones view.

SPD SmartGlass - CONFIGURATION

- Maximum Size: 1,045 * 3,000 mm
- Minimum Size: 200 * 300 mm
- Weight: 35.5 kg/m2 (24.0mm SPD SmartGlass DGU)
- Thickness: Various from 9.5mm for laminates and from 20mm for Double Glazed units
- Colour tints: Blue
- Glass types: Gas filled double glazed units (external windows)
- Processing: Double Glazed, Drilled Holes, Curved, Shaped, Triple Glazed
- Warranty: 5 Years
- Leadtime: 8-12 weeks
- Control: Wall switch, Remote control, Movement sensor, Light sensor, Timer

SHAPES



TRANSMISSION DATA - SPD SmartGlass

	SPD SmartGlass (11.5mm) Power ON	SPD SmartGlass (11.5mm) Power OFF	Clear Float Glass (6mm)	Frosted Glass (6mm)
Visible Light Transmission	49%	0.24%	86%	76%
Clarity	N/A	2.90%	83%	18%
UV Transmission	0.5%	0.5%	55%	55%

*Values are nominal (+/-5%) and are dependent on the glass configurations used. SmartGlass International reserves to right to amend information without prior notice

Sound Control Data - SPD SmartGlass*

SPD SmartGlass Thickness	Configuration	DB Rating
9.5 mm	4 mm / 1.5 / 4 mm	35
11.5 mm	5 mm / 1.5 / 5 mm	37
13.5 mm	6 mm / 1.5 / 6 mm	39
25.5 mm	12 mm / 1.5 / 12 mm	44

*Results vary according to glass specification and framing system employed. The above figures are recommended for guide purposes only and may change without prior notice.

MANUFACTURING

The production team at SmartGlass International Ltd uses a combination of experience, technology and skill to manufacture each SmartGlass panel to the highest levels of quality. In house proprietary manufacturing processes using an Autoclave lamination process employ heat, vacuum and pressure to produce a multilayer glass sandwich. Each SmartGlass panel is handmade & bespoke for the clients requirements. The production cycle lead time for each panel is 3-5 days depending on configuration.

All of the materials used in the production process are of world class standard and while expensive; these materials ensure premium quality in the finished product.

Each SmartGlass panel is assembled in a climate controlled clean room environment. Production employees are empowered to strive for World class manufacturing standards and individually sign off each bespoke made panel after manufacturing and testing.

After manufacturing, cleaning and wiring each SmartGlass panel is tested by switching approximately 57,000 times in rapid on/off sequence.

SmartGlass can be manufactured into various shapes including holes in the film. (Contact us for detailed explanation) All panels are bespoke manufactured and **cannot** be cut after manufacture.

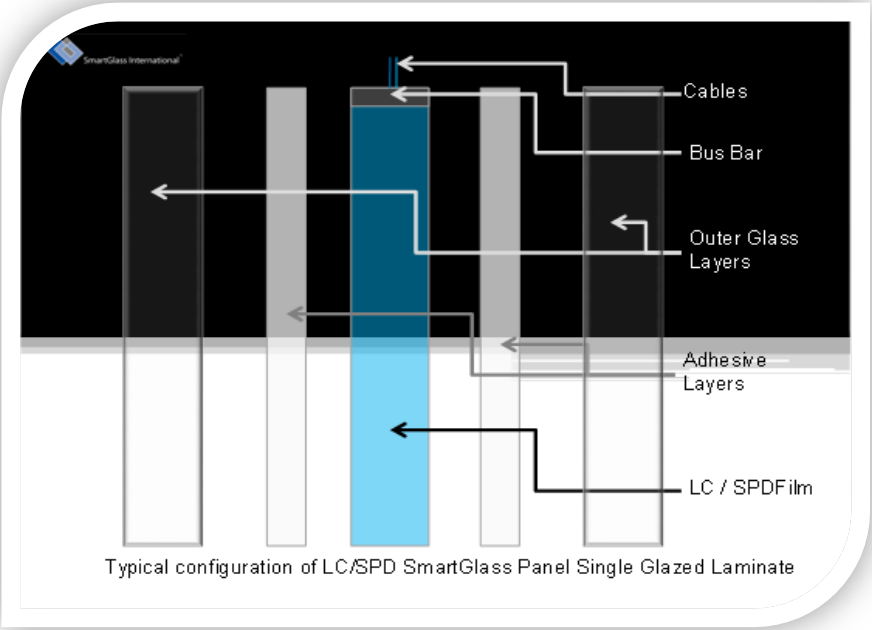
SmartGlass™ is real life field tested for in excess of 14 years.

SMARTGLASS PANEL

LC & SPD Smart films are laminated between two or more pieces of glass.

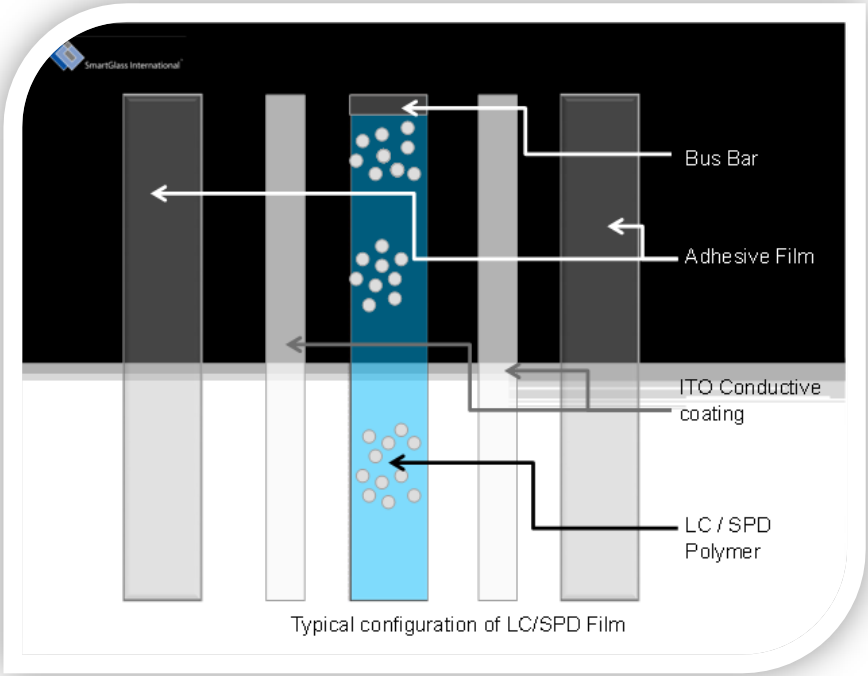
Liquid crystals - the same technology is used in digital watches, TV's and computer screens. Liquid crystals are sandwiched between two layers of transparent conductive film to make LC Smart Film. The film is then laminated between two pieces of glass. When electricity is applied to the film the liquid crystals line up and the window is clear (**slight haze**). When the power is turned off, the liquid crystals return to their normal positions and turn the glass from clear to opaque. 2 wires exit the top of each unit where they are connected to a copper bus bar.

Note: Framing needs to hide 15 mm where the bus bar is visible, generally at the top of the SmartGlass panel.



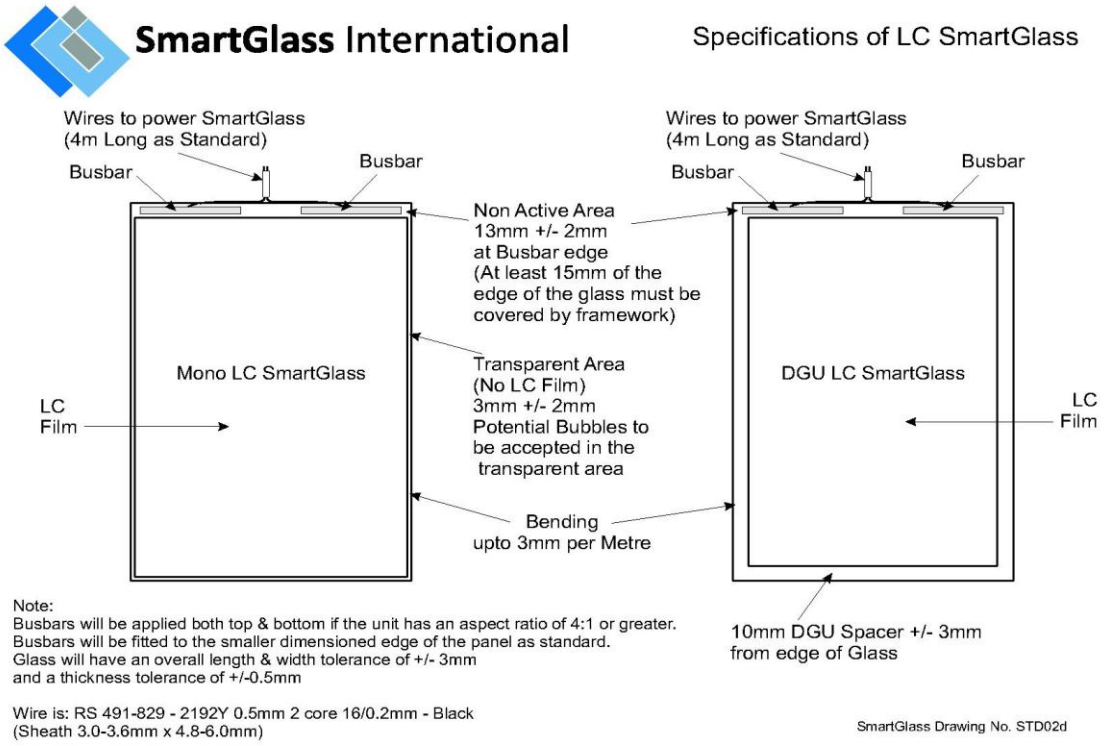
Typical configuration of LC/SPD SmartGlass Panel Single Glazed Laminate

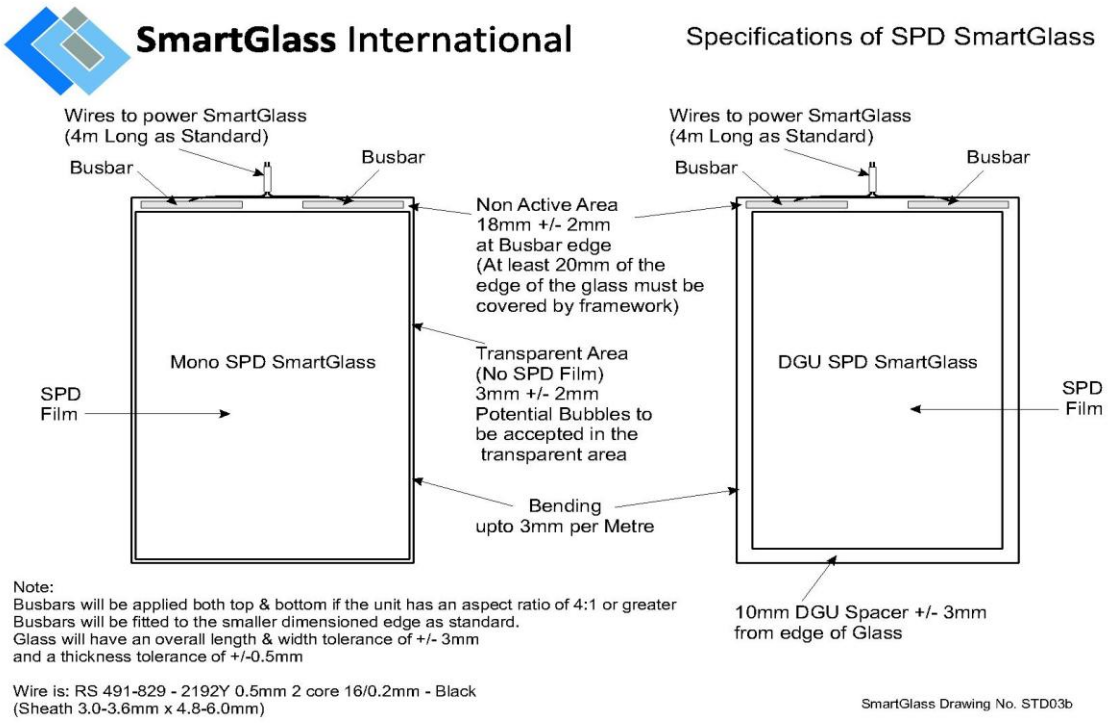
The electro active Smart film is sandwiched between two or more glass layers in a similar way to how normal laminated glass is constructed. The outer layers are made up of glass (normally 5 mm or 6 mm thick) each side, then an interlayer is inserted on each side to encapsulate the Smart film and bond the complete laminate.



LC & SPD Smart film's are manufactured using electrically conductive ITO coatings, polymer matrix', liquid crystals or suspended particles, adhesive films and bus bars.

SPECIFICATION OF LC & SPD SMARTGLASS





SmartGlass - Transmission & Test Data

Energy Transmission Measurements

To provide a better understanding of what these figures are measuring, the brief explanation below discusses the various spectrums of energy created by the sun. These are the same energy spectrums that building products and windows must endure on a daily basis. Some of the characteristics are positive and ones that we want to maximize, while others are detrimental and must be reduced or controlled in some manner.
Electromagnetic energy from the sun is broken into a variety of categories or spectrums based on the wavelength of the energy. The three main spectrums that affect the building products industry, people and furnishings in commercial and domestic settings are UV, Visible Light and Infrared energy. Read on to see how SmartGlass can not only achieve immediate privacy on demand but can control, protect and enhance building environments.

ULTRA VIOLET - UV

UV energy is not visible to the human eye and is typically broken into three categories: UVA, UVB, and UVC. UVC energy is mostly rejected by the earth's atmosphere, never reaching the earth's surface. UVB and UVA energy pass through the atmosphere and reach the earth's surface. As it pertains to the window market, most of the UVB energy is blocked by standard float glass. Clear double pane windows will reject almost all of the UVB energy.

Therefore the remaining UVA energy is the primary target. UVA energy passes through standard float glass, and can only be blocked by coatings or films that are capable of reflecting or absorbing this spectrum of light such as our SmartGlass technologies. UVA energy is the primary component responsible for fading of furnishings, art work and overall deterioration of fabric quality.
The more a window product can reject or absorb the sun's UV energy, the longer the life and quality of the items being protected. All window products should strive for the lowest UV transmission value possible.

VISIBLE LIGHT

Visible light is the only portion of the sun's spectrum that human eyes can see including natural daylight and all the colours of the rainbow. Visible light has mostly good attributes associated with it but eye strain associated with glare can cause serious problems for building occupiers. Natural light is often desired to make a home or building feel open or well lit. Large amounts of natural light will also reduce the need for lighting in a given structure, thus reducing utility costs. Windows that are tinted will have lower visible light transmission values. It should be noted that large amounts of natural light can also increase the amount of glare. This unwanted element can be aggravating in rooms with televisions or computer monitors and areas in office buildings where employees have to combat uncomfortable and often dangerous glare levels. SmartGlass allows the user to control visible light transmission and by choosing grey or blue tinted versions for specifically bright areas the user is protected and inhabits a safer and more comfortable environment.

INFARED – IR

Infrared energy relates to the heat energy that is emitted from the sun and is also referred to as radiant heat. Infrared energy is light that our eyes cannot see, but which our bodies can detect as heat. The radiant heat energy emitted by the sun in the solar spectrum is typically classified as Near Infrared (NIR) energy. This is the energy one feels as heat when standing in the sun. This is the same energy that hits a window surface and transmits through the glass to increase the temperature inside a building. Being able to "control" this near infrared energy transmission value allows a window to control the amount of heat that is added to a building by the sun. Decreasing the infrared transmission value of a window will decrease the amount of heat energy added to a building, thus reducing over-heating effects that occur in summer months and in hot climates. The use of SmartGlass protects building occupants and significantly reduces carbon emissions and costs associated with air conditioning and cooling. The ability of a window using LC SmartGlass™ to reject infrared energy will be directly related to a window's Solar Heat Gain Coefficient (SHGC). The lower the Infrared Transmission Value the lower the corresponding Solar Heat Gain Coefficient.

Evidence of Performance

light transmittance
light reflectance

Test report 410 33071e

ift ROSENHEIM

Customer **SmartGlass International Ltd.**
Unit6 Renmore Business Complex
Kilcoole

County Wicklow
Ireland

Product	Laminated glass
System designation	LC SmartGlass™
Construction	4 float / 1 LC-foil / 6 float

Light transmittance τ_v
Light reflectance ρ_v

Opaque state
$\tau_v = 0{,}67$
$\rho_v = 0{,}18$
Transparent state
$\tau_v = 0{,}75$
$\rho_v = 0{,}14$

ift Rosenheim
Anerkannte Prüfstelle im bauaufsichtlichen Verfahren zur Bestimmung des Emissionsvermögens und g-Wertes
BAY 18

ift Rosenheim
4 July 2007

N. Sack

Norbert Sack, Dipl.-Phys.
Head of Testing Department
ift Centre Glass - Building Materials - Building Physics

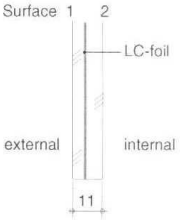
Böck F.

Florian Böck, M.Eng., Dipl.-Ing. (FH)
Test Engineer
ift Centre Glass - Building Materials - Building Physics

Basis

EN 410 : 1998-04
Glass in building – Determination of luminous and solar characteristics of glazing

Representation



Instructions for use

This test report may be used to classify the light transmittance τ_v and the light reflectance ρ_v

Validity

The data and results given relate solely to the described, tested object.

Testing the total solar energy transmittance does not allow any statement to be made on further characteristics of the present structure which could define performance and quality.

Notes on publication

The **ift** Guidline "Conditions and Guidline on the Use of **ift** Test Reports" applies.

The cover sheet can be used as an abstract.

Contents

The report contains 4 pages in total

02-07 / 390

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Dr. Jochen Peichl

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Kto. 3822
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Notified Body Nr.: 0757
Anerkannte PÜZ-Stelle: BAY 18

ift ROSENHEIM

1 Object

1.1 Description of test specimen (all dimensions in mm)

Product	Laminated glass
Type	LC SmartGlass™
Total thickness	11
construction	4 float / 1 LC-foil / 6 float

For the determination of the spectral data test specimen of single panes were used:

Dimensions (B x H)	80 x 300 mm, 300 x 300 mm
Glass thickness	11

The description is based on the documentation of **ift**. Numbers and names of material are given by the customer. (Further data from customer are marked with *).

1.2 Representation of test specimen

The illustration was produced by the **ift** as a schematic representation of the cross section.

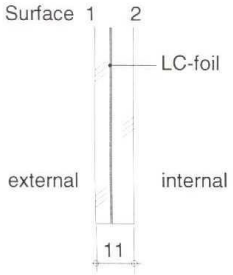


Figure 1 Representation of the system LC SmartGlass™

ift ROSENHEIM

2 Procedure

2.1 Sample

The specimen were selected by the customer.

Quantity	80 x 300 mm, 3 peaces 300 x 300 mm, 3 peaces
Delivered	16 April 2007 by the customer
Registry No	21783

2.2 Process

Technical basis	
EN 410 : 1998-04	Glass in building – Determination of luminous and solar characteristics of glazing
Deviations	There are no deviations from the test procedure or test conditions

2.3 Test equipment

IR-Spectrometer	Equipment No 22133
Type	Shimadzu UV-3102PC with LISR-3100, Integration sphere Ø150 mm
Measured range	190 nm to 2500 nm
Resolution	variable, 2 nm was selected
Climatic conditions	approx 20 °C, 50 % RH
Reflection standard	calibrated reflection standard, Fa. Labsphere; aluminium mirror
Averaging	average of three samples

2.4 Execution of the test

Date/period	31 May till 2 July 2007
Test engineer	F. Böck

ift ROSENHEIM

3 Detailed results

Table 1 Measured and calculated values according to EN 410 for light at normal incidence for the laminated glass LC SmartGlass™

		opaque	transparent
Ultraviolet transmittance	τ_{UV}	0.18	0.23
Light transmittance	τ_V	**0.67**	**0.75**
Light reflectance	ρ_V	**0.18**	**0.14**
Solar direct transmittance	τ_e	0.61	0.65
Solar direct reflectance	ρ_e	0.15	0.12

ift Rosenheim
4 July 2007

Evidence of Performance

total solar energy transmittance
light transmittance

Test report 410 33071/2e

ift ROSENHEIM

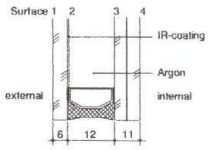
* Translation of test report n° 410 33071/2 dated 31 October 2007

Client **SmartGlass International Ltd.**
Unit6 Renmore Business Complex
Kilcoole, County Wicklow
Ireland

Basis
EN 410 : 1998-04
Glass in building – Determination of luminous and solar characteristics of glazing

Product	Insulating glass unit
System designation	Insulating glass unit with LC-Glass
Construction	6/12/11 mm
Gas filling	90 % Argon
Type of coating	IR-Coating on surface 2
Coating designation	arcon N33, arcon sunbelt platin
Uncoated pane	LC-Glass

Representation



Instructions for use
This test report may be used to classify the total solar energy transmittance g as well as the light transmittance τ_v.

Total solar energy transmittance g
Light transmittance τ_v

g = 0.39 to 0.51*
τ_v= 0.54 to 0.65*

* Exact value see table detailed results

Validity
The data and results given relate solely to the described, tested object.
Testing the total solar energy transmittance does not allow any statement to be made on further characteristics of the present structure, which could define performance and quality.

Notes on publication
The **ift** Guideline "Conditions and Guideline on the Use of **ift** Test Reports" applies.
The cover sheet can be used as an abstract.

ift Rosenheim
16. novembre 2007

Michael Rossa, Dipl.-Phys.
Head of Testing Department
ift Centre Glass, Building Materials & Building Physics

Florian Bock, M.Eng., Dipl.-Ing. (FH)
Test engineer
ift Centre Glass, Building Materials & Building Physics

Contents
The report contains a total of 4 pages

05-11 390

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Notified Body Nr. 0757
Anerkannte PÜZ-Stelle: BAY 18

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1 Object

1.1 Description of test specimen (all dimensions in mm)

Product	Insulating glass unit
Type	Insulating glass unit with LC-Glass
Total thickness	29
Construction	6/12/11
Coating	Thermal protection coating
Type / Manufacturer	arcon N33 / company Arcon
Coating on surface	2
normal emissivity ε_n	0.03
or	
Coating	Solar control coating
Type / Manufacturer	arcon sunbelt platin / company Arcon
Coating on surface	2
normal emissivity ε_n	0.03
Gas filling in cavity	according to manufacturer
Gas type	Argon
Volume in %	90

For the determination of the spectral data test specimen of Insulating glass unit with LC-Glass™ single panes were used:

Dimensions (B x H)	80 x 300 mm, 300 x 300 mm
Glass thickness	11

The description is based on the documentation of **ift**. Numbers and names of material are given by the customer. (Further data from customer are marked with *).

1.2 Representation of test specimen

The illustration was produced by the **ift** as a schematic representation of the cross section.

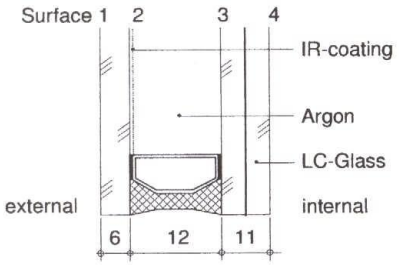

Fig. 1 Representation

ift ROSENHEIM

2 Procedure

2.1 Sampling

The samples were selected by the client.

Quantity	3
Delivered	16 April 2007 by the client
Registration No.	21783

The spectral data of the coated single pane (coating arcon N33 and arcon sunbelt platin, company Arcon, thickness 4 mm) was taken from the **ift** certificate 697 7032482. The coating of the single pane arcon N 33 has been extrapolated from 4 mm to 6 mm substrate according to EN 410, Annex A.

2.2 Process

Technical basis	
EN 410 : 1998-04	Glass in building – Determination of luminous and solar characteristics of glazing
Deviations	There are the following deviations from the test procedure and/or test conditions: Due to the light dispersion (LC-Glass), additional measurements according to DIN 5036 have been made with a 1.25 integration sphere.
Uncoated pane	Laminated glass of the client

2.3 Test equipment

IR-Spectrometer	Equipment No 22133
Type	Shimadzu UV-3102PC with LISR-3100, Integration sphere Ø150 mm
Measured range	190 nm to 2500 nm
Resolution	variable, 2 nm was selected
Climatic conditions	approx 20 °C, 50 % RH
Reflection standard	calibrated reflection standard, company Labsphere; aluminium mirror
Averaging	average of three samples

2.4 Testing

Date/Period	31 May - 31 August 2007
Testing personnel	F. Böck

ift ROSENHEIM

3 Detailed results

Coating		arcon N33 [3]		arcon sunbelt platin [3]	
State of the LC Glass		opaque	transparent	opaque	transparent
U_g [1] in W/(m²K)	U_g	1.3	1.3	1.3	1.3
Ultraviolet transmittance	τ_{uv}	0.06	0.08	0.04	0.06
Light transmittance	τ_v	**0.58**	**0.65**	**0.54**	**0.60**
Light reflectance (external)	ρ_v	0.21	0.18	0.18	0.15
Solar transmittance	τ_e	0.38	0.41	0.30	0.33
Solar reflectance (external)	ρ_e	0.29	0.27	0.31	0.30
Secundary internal heat transfer factor	q_i	0.11	0.10	0.09	0.08
Total solar energy transmittance ($g = \tau_e + q_i$)	g	**0.49**	**0.51**	**0.39**	**0.41**
Shading coefficient (b-Factor) [2]	b	0.61	0.64	0.49	0.51

[1] U_g according to calculation DIN EN 673
[2] Shading coefficient (b-Factor) b = g/0.8 according to VDI-Guideline 2078
[3] Coating on surface 2

ift Rosenheim
16. November 2007

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SCHOTT AG
Werk Grünenplan

SCHOTT

Verteiler:	z. K.:	Grünenplan, 12.02.09 17.02.09
ATQ-21/Schm Kevin Root (SmartGlass)	ATQ/Düs ATV-N/StR ATV-Q/VH	ATV-Q / We

Test results A02/09

Product/Sample: Laminated Glas – LC SmartGlass,™ ca. 8,8 mm Glass thickness

Task: Check on chemical resistance acc. DIN EN ISO 12543-4

Results/Tests

Glass No 1-3 — **Humidity test with condensation CH (KK)-Test /+ 50 °C:**
after 336 hours: OK no attack in the laminate, slight change of colour. (circular slightly infiltrated humidity)

Glass No 2 — Spots on the glass surface

Glass No 1-2 — **High temperature Test (Boiltest) (2 sample because we needed 1 reference sample**
After 2 hours: OK no attack in the laminate, slightly change of colour

Notice: 1 Reference sample

Conclusion: Test results okay. No attack / no failure, only slight change of colour.

See E-Mail Kevin Root 16.02.2009
The samples have passed all the tests. The discolouration is acceptable.

...

UKAS TESTING
2223

WINTECH Test Report/Certificate No: EW/10/3200/10922

Date of Testing: 17th March 2010

SmartGlass International Ltd, Unit 21, Cookstown Industrial estate, Tallaght, Dublin 24

11.4mm Laminated LC Smart Glass (5mm Toughened/1.4mm thick liquid Crystal foil and EVA adhesive composite/5mm Toughened), has Passed the test requirements of BSEN 12600 'Glass in Building – Pendulum Test – Impact Test Method and Classification for Flat Glass, and is therefore classified as 1B1'.

SAMPLE REFERENCE No.	ALLOWABLE BREAKAGE MODE	PERFORMANCE CLASSIFICATION	DIMENSIONS OF TEST PIECES	RESULT
1	B	----	876 x 1938	Pass (did not break)
2	B	----	876 x 1938	Pass (did not break)
3	B	----	876 x 1938	Pass (did not break)
4	B	3	876 x 1938	Pass (did not break)
1	B	----	876 x 1938	Pass (did not break)
2	B	----	876 x 1938	Pass (did not break)
3	B	----	876 x 1938	Pass (did not break)
4	B	2	876 x 1938	Pass (did not break)
1	B	----	876 x 1938	Pass (did not break)
2	B	----	876 x 1938	Pass (did not break)
3	B	----	876 x 1938	Pass (did not break)
4	B	1	876 x 1938	Pass (did not break)

These results are valid only for the conditions under which the tests were conducted.

Product Definition: Symmetrical Product.

All Test Pieces were fully clamped in the test frame during testing.

When tested by the method given in clause 4 in BSEN 12600 each test piece shall either not break or break as defined in the following way:
Numerous cracks appear but no shear or opening is allowed within the test piece through which a 76mm diameter sphere can pass when a maximum force of 25 N is applied. Additionally if particles are detached from the test piece up to 3 minutes after impact, they shall, in total, weigh no more than a mass equivalent to 10,000 mm² of the original test piece. The largest single particle shall weigh less than the mass equivalent to 400 mm² of the original test piece.

Tested By: D Potts and D Reynolds of Wintech Engineering Ltd.

Report Compiled By: E Watkin Signed:

This report is a copy as agreed with Wintech Engineering Ltd. The original, signed copies are controlled by SmartGlass International Ltd

Technically Approved By: R Withers, Quality/Technical Manager Signed:

Date of Issue: 22nd March 2010

This report and the results shown are based upon information, samples supplied and tests referred to above. The results obtained do not necessarily relate to samples from the production line of the above named company and in no way constitute any form of representation or warranty as to the performance or quality of any products supplied or to be supplied by them. Wintech Engineering Ltd or its employees accept no liability for any damages, charges, cost or expenses in respect of or in relation to any damage to any property or other loss whatsoever arising either directly or indirectly from the use of this report.

Wintech Engineering Ltd, Halesfield 2, Telford, TF7 4QH
Tel: 01952 586580, Fax: 01952 586585

TRAC
testing regulatory and compliance

Certificate of Testing

Serial Number: 16229
Issue 2
Page 1 of 3 Pages
Client's Order Number: Pro- Forma
Works Order Number: 11208-00
Date of Test: 5th March 2009

SmartGlass International Limited
21 Cookstown Industrial Estate
Tallaght
Dublin 24
Ireland

Attn.: Mr. Bob Hudson.

Specimen: 1 off — A4 Size Laminated SmartGlass Sample
Identification: — LC SmartGlass (film 0.8 mm, Glass thickness 8.8 mm)
Cape Stores No.: — 23245
Receipt Date: — 5th March 2009

Specification: Ingress Protection Testing
Tested in accordance with BS EN 60529:1992.

IPX7 - Temporary Immersion
Duration: 30 minutes
Depth: 1 metre from bottom surface

Procedure: IPX7 - Temporary Immersion
The enclosure was immersed in water such that the bottom of the specimen was at a depth of 1 metre for a period of 30 minutes. The specimen was function tested during the immersion, as shown in Figures 1 and 2.

Results: IPX7 - Temporary Immersion
The specimen continued to function throughout the immersion. After testing the external surfaces were dried. The specimen was then functioned and inspected for any water ingress. None was found.

The specimen therefore satisfies the requirements of BS EN 60529: 1992 IPX7

TEST ENGINEER ..... Q.A. APPROVAL .....

G. Ball — D. K. Morris Chief Test Engineer

WARWICK
Rothwell Road, Warwick, CV34 5JX, UK.
T: +44 (0)1926 470470 F: +44 (0)1926 470479 E: test@tracglobal.com
www.tracglobal.com

Issue Date: 19th March 2009

UKAS 0026

LC SmartGlass is certified IPX7 rated and tested in accordance with BS EN 60529:1992.

BALLISTIC RESULTS

LC Smartglass has passed a number of ballistic tests with many different combinations of laminated glass and with many different calibre rounds up to standard BSEN 1063:2000 threat level BR6. Please contact us for further information and test results.

HAZE

It should be noted that LC SmartGlass is *not* optically as clear as normal float glass. A haze in the form of clouding in the glass is considered normal and is unavoidable due to the nature of the product makeup. It should also be noted that ambient lighting conditions will have an effect on haze levels; direct lighting onto LC SmartGlass should be avoided. Every precaution has been taken to ensure minimum haze. Tinted glass can be used to reduce the visible haze such as blue, green or grey tints. It is essential that the end client understands that *a degree of haze will be present depending on configuration and will not be considered as a reason for exchange or refund*.

GLASS

1. Where used, all tempered glass complies with BS6206A.
2. Will be provided in the type and thickness shown on the project drawings or specified to the client.
3. Where glass type is not shown on the drawings or as specified, type and thickness will be supplied as directed by the Architect, main contractor or designer.
4. Where applicable SmartGlass panels will receive a permanently etched safety certification label unless specifically directed by the Architect.
5. Each SmartGlass panel will contain an identifying label.
6. Float glass-clear: Type 1, Class 1.
7. Fire Rated glass: Borosilicate, BS 476: Part 22 (Subject to conditions).
8. Laminated Safety Glass
9. Specialist glass can be requested for use in specific applications.

GLAZING GUIDELINES

Interior Butt Joint Glazing

SmartGlass™ panels can be butt glazed using a recommended minimum of 9 mm in glass thickness. Long edges will be polished giving an even vertical finish. Panel thickness will vary depending on several conditions including the height and span of the glazed area. We will recommend the ideal glass thickness to protect against bowing and to provide safety, fitness for purpose and adherence with legislative guidelines.

A standard neutral cure structural silicone sealant may be used to close the joint as specified by us. A minimum of a 4 mm separation between panels is recommended. Alternatively a plastic "H" section will be used instead of silicone to dry join panels.

Refer to applicable local building guides for design load requirements regarding interior glazing. Safety and suitability for purpose will be treated as the main driving factors in assessing suitability for butt joint glazing. Note: Not all internal applications will be suitable for butt joint glazing and support framing may be required.

Operable Doors & Windows

Swing door & windows can be glazed with SmartGlass.

Cable connectors will be used to protect wires travelling between the door and frame where the wiring is then connected to the transformer/ power conditioner. Contact switches can also be used.

FDL1 300*10MM FLEXIBLE LOOP

CDL1 291*26MM CONCEALED DOOR LOOP

INSTALLATION

Clients and their installers should inspect each piece of SmartGlass immediately prior to start of installation.

Do not install items which are improperly sized, have damaged edges, or are scratched, abraded, or deficient in any other manner.

Do not remove labels where provided by SmartGlass International until so directed by the Architect, client or site manager.

Adhere to all SmartGlass™ installation instructions and installation drawings.

Locate setting blocks of standard width and thickness at quarter points of all glass panels unless otherwise recommended by manufacturer or supplier.

Use setting blocks of proper durometer, size and thickness to support the glass in accordance with the manufacturers' recommendations.

Glass lap and edge clearances must be provided according to relevant standards of the manufacturers.

If the installer has any questions or concerns, please immediately contact your local SmartGlass representative.

SURFACE CONDITIONS

Examine the areas and conditions under which work of this section will be performed. Correct and make good conditions detrimental to timely and proper completion of this work. Do not proceed until unsatisfactory conditions are corrected. After preparation of the glazing system the glazing channels, stops and gaskets should be cleaned to receive the SmartGlass materials, making free from obstructions and substances which might impair the work at hand. Comply with manufacturers' instructions for final wiping of surfaces immediately prior to application of primer and glazing compounds or tapes
USE ONLY SUPPLIED NEUTRAL CURE SILICONES, 1 tube will be supplied with each SmartGlass panel.
DO NOT USE ACETIC SILICONES.

Install glass in a manner which produces the greatest possible degree of uniformity of appearance.

Do not install glass in dynamic frames such as operable windows or sliding doors, without the consent of SmartGlass International Ltd.

Glazing to exterior and wet interior conditions must be wet-sealed and impervious to moisture with provisions to allow for weeping of condensation that may infiltrate of condensation in the system. Electrical connections must exit at the head of any framing system using SmartGlass panels in wet environment applications

Pressure glazing systems without positive positioning stops are not to be used with SmartGlass.

The glazier should place all electrical connections & wires properly to allow easy access by an electrician.

Cut and seal joints of glazing gaskets in accordance with the manufacturers' recommendations to provide watertight and airtight seal at corners and other locations where joints are required.

GLAZING METHODS

Wet Glazing: If an elastomeric (non-acetic) sealant is used, it must be compatible with the SmartGlass panel interlayer. Never use putty or glazing compound to glaze SmartGlass.

Exterior Applications - Insulated Glass Units made with SmartGlass can be installed as per normal glazing with the exception of accommodating the unit wiring. SmartGlass is suitable for glazing to steel, timber, aluminium and UPVC framing systems.

Wet Glazing: Pre-shimmed glazing tape and non-acetic sealants are required to create a seal impervious to moisture for all exterior applications.

Butt-Joint Glazing: SmartGlass panels can be butt-joint glazed in interior applications (Long edges polished recommended).

Non-Acetic Sealants

Smartglass International Ltd only recommends **SOUDAL SLIRUB 2** as the sealant for use in butt-joint glazed SmartGlass panel systems. 1 tube will be supplied with each SmartGlass panel as standard.

Structural Silicone Glazing: Insulated glass units manufactured with SmartGlass should not be structurally silicone glazed unless agreed in advance & in writing by SmartGlass International.

FRAME DESIGN

Frame edge clearance and face clearances may be used, except the edge bite must be 10 mm minimum and framing must include a hole of 6 mm diameter to pass wires through. To maintain a proper seal against the infiltration of water and air adequate bite and sealing is required.

Inadequate clearance for the edges can cause damage due to glass-to-metal contact. Minimum edge clearances should allow for a tolerance of ±1.5mm. This should only be increased if the surrounding materials tolerances are difficult or impossible to control.

The industry standard for framing deflection must be adhered to. The deflection must not exceed either the length of the span divided by 175, or 18 mm, whichever is less. All expansion joints and anchors must be designed so that the glass framing does not incur a load due to structural movement.

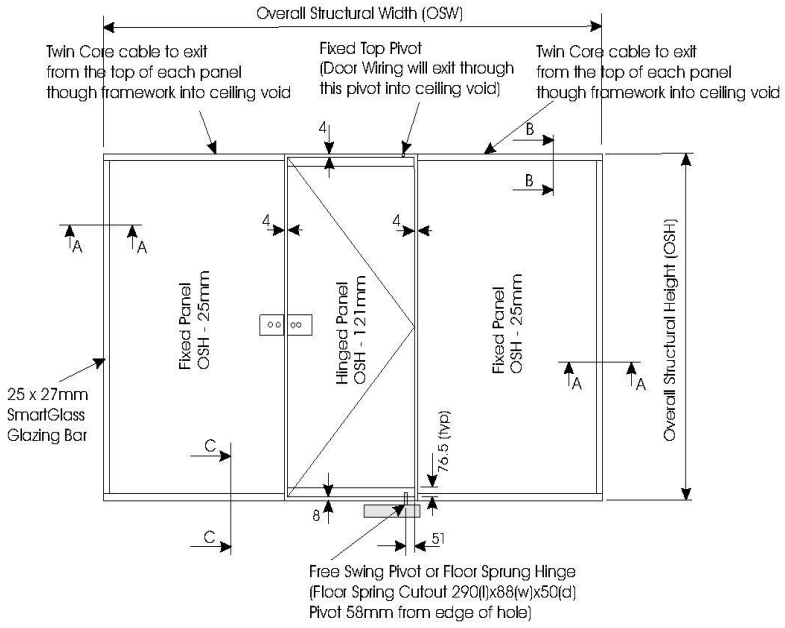
Glass larger than .66 square meters should be placed on four EPDM or neoprene setting blocks. These blocks should have a durometer hardness of 85±5. They should be centred at the bottom quarter points (i.e. equal distance). The blocks should be 1.5 mm narrower than the channel width. Lock-strip gasket systems also require setting blocks. Recommendations can be obtained from the gasket manufacturers.

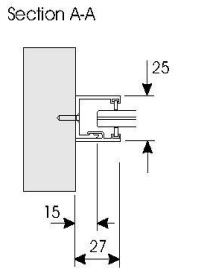
Once the SmartGlass is installed, the architect, general contractor, or building owner should provide for glass protection and cleaning. Weathering steel such as Cor-Ten or alkaline materials may cause surface damage due to staining. Abrasive cleaners should never be used, particularly when the surface to be cleaned has a reflective coating. Windblown objects, welding sparks, plaster, or other material applied to the glass surface during construction may cause irreversible damage.

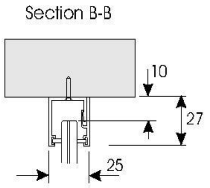
SmartGlass International Ltd will not be held liable for damage caused by others; the main contractor is responsible for protection of glass on site following delivery & installation.

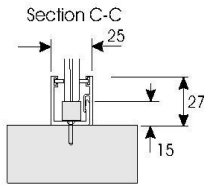
PLEASE SEE ILLUSTRATIONS BELOW FOR TYPICAL GLAZING SYSTEMS USED

SmartGlass International
Door System





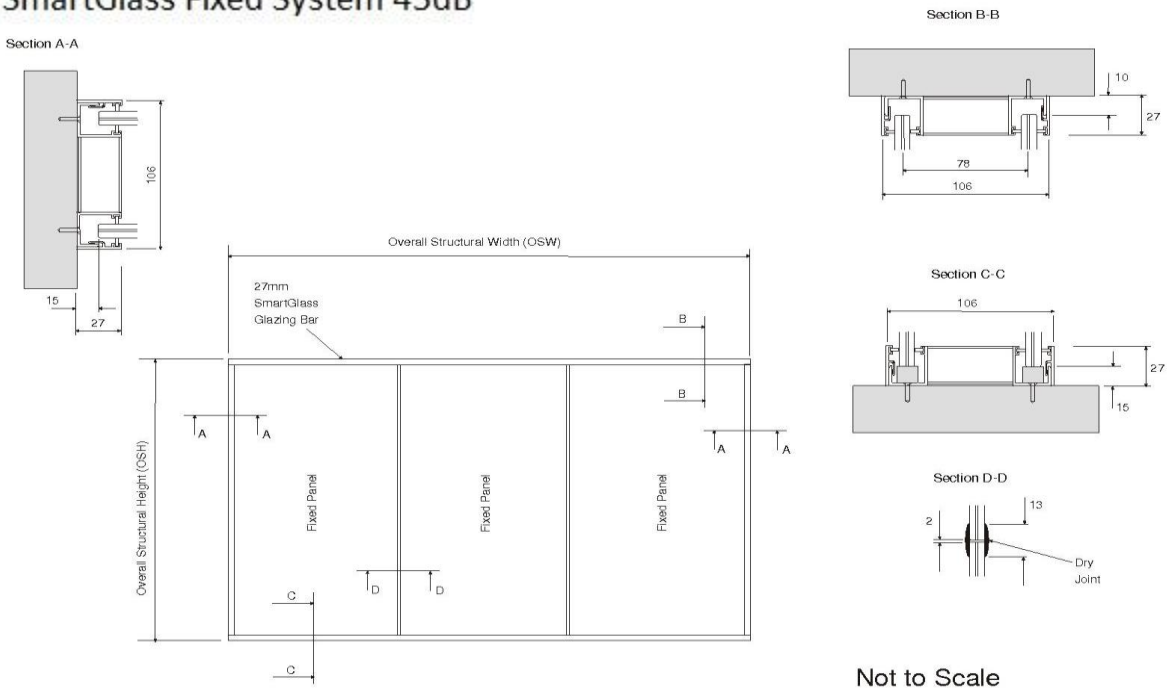




Not to Scale

SmartGlass International

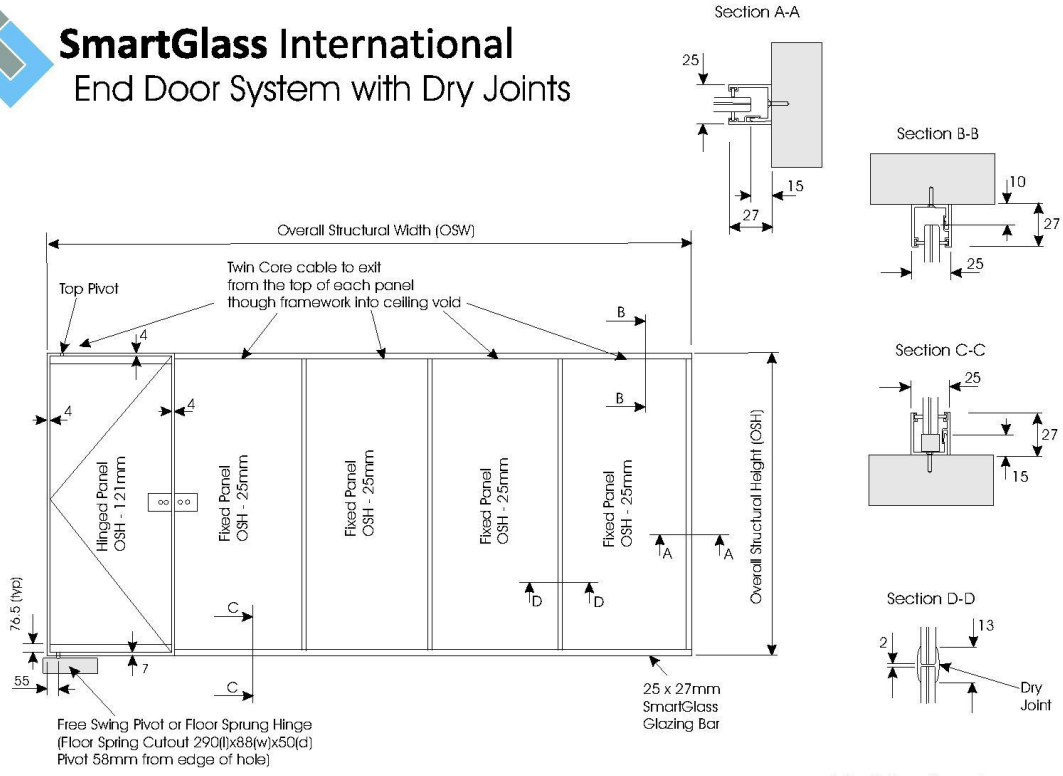
SmartGlass Fixed System 45dB



Not to Scale

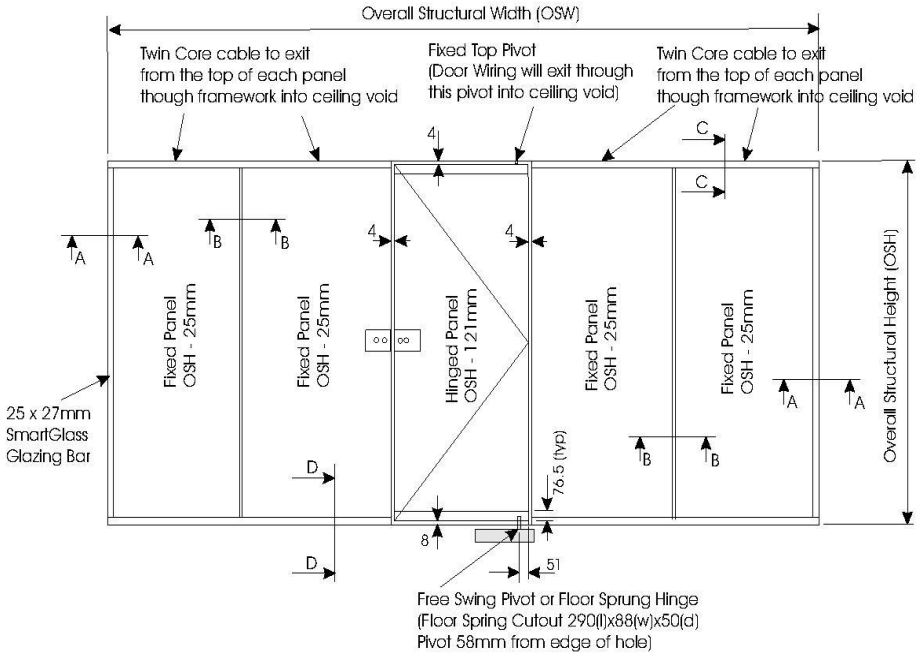
SmartGlass International

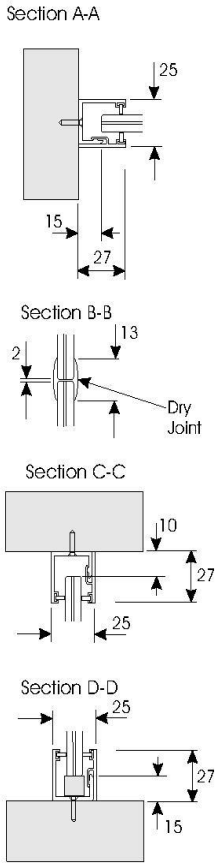
End Door System with Dry Joints



Not to Scale

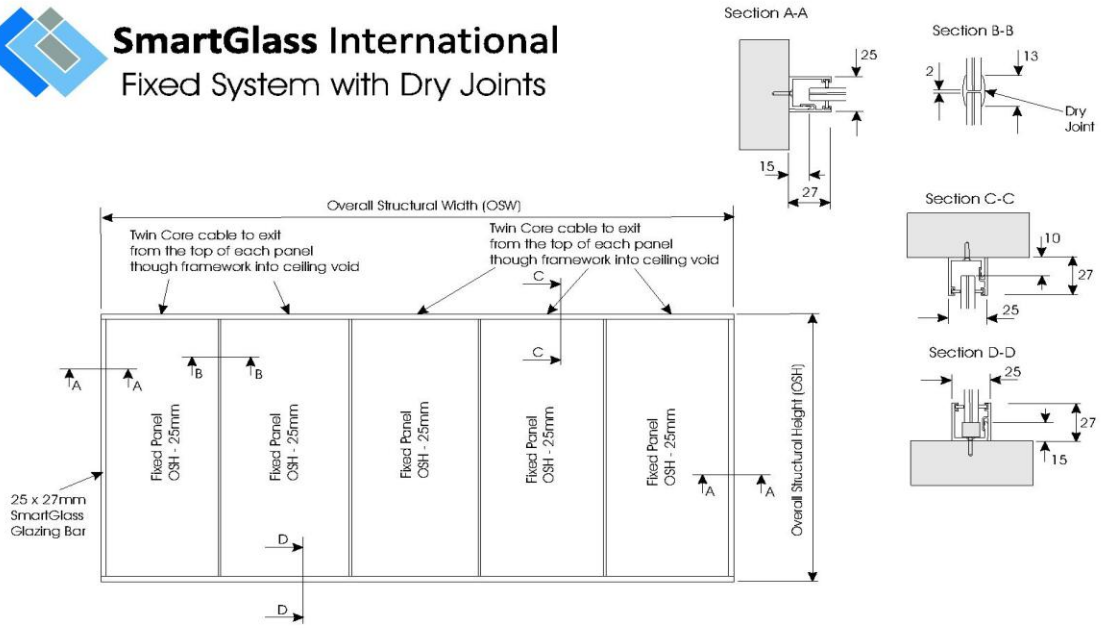
SmartGlass International
Door System with Dry Joints





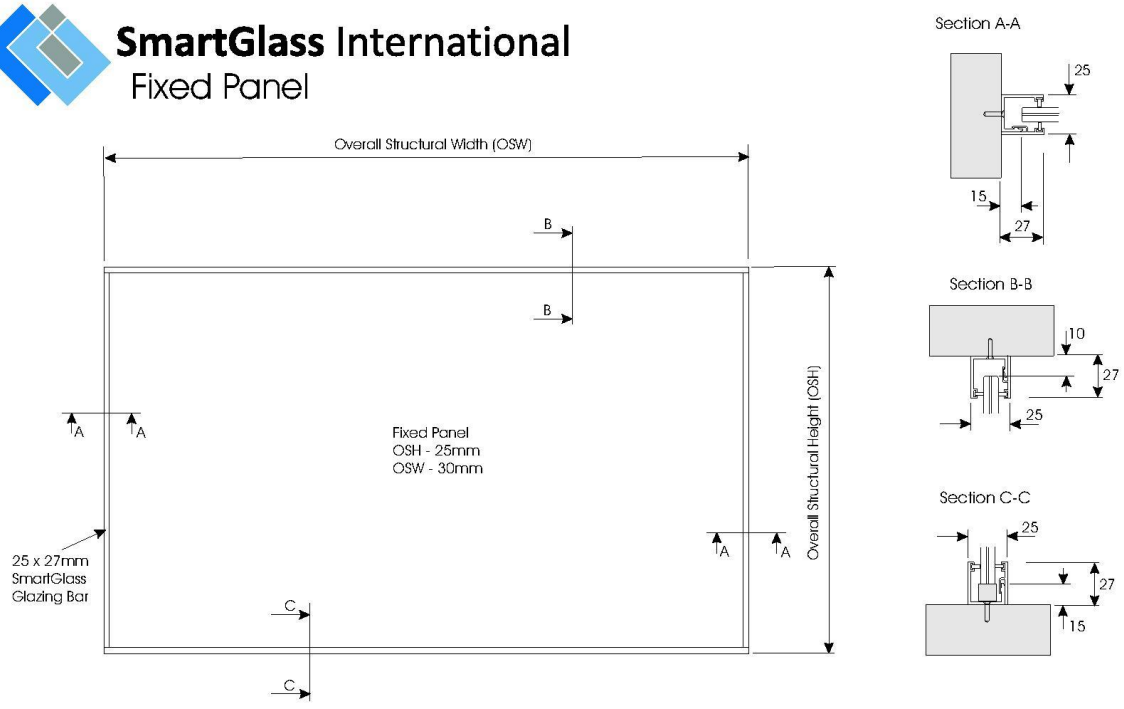
Not to Scale

SmartGlass International
Fixed System with Dry Joints



Not to Scale

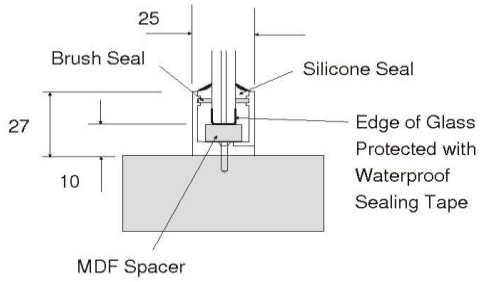
SmartGlass International
Fixed Panel



Not to Scale

SmartGlass International

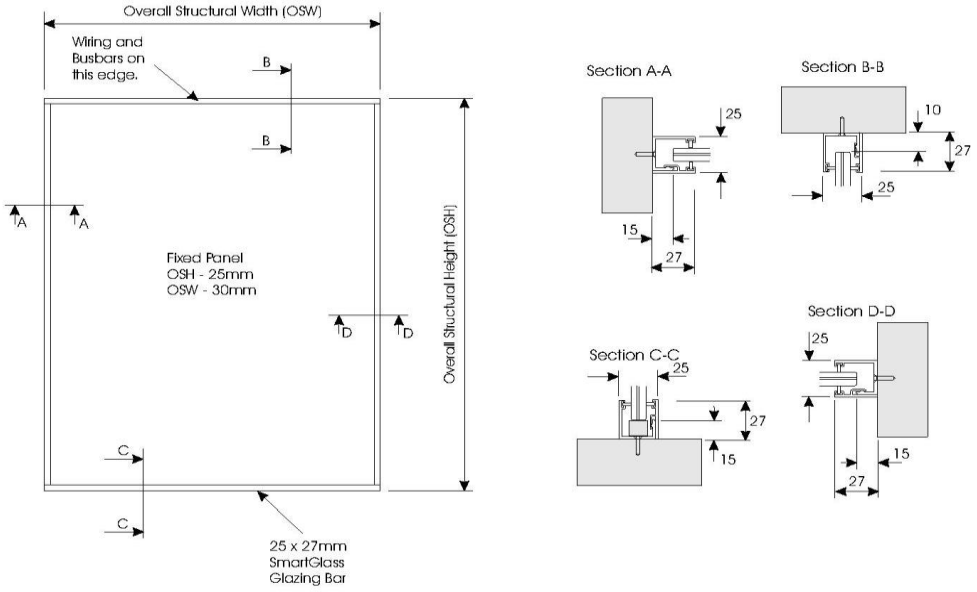
SmartGlass Frame in Wet Area



Not to Scale

SmartGlass International

SmartGlass Fixed System(Higher than Wide)



Not to Scale

SHIPPING AND RECEIVING

SHIPPING

Where applicable we manufacture shipping crates for all individual customer orders. These crates allow for protection of glass in transit but correct handling methods should be observed when off loading. ***Note:*** It is the responsibility of the client to off load glass deliveries unless otherwise agreed prior to dispatch.

If no preferred carrier is specified, the SmartGlass panels for domestic customers will be shipped through our ground carriers. For overseas customers, specifying whether the freight should be shipped via Air or Sea is necessary. Where available, it is recommended to have the clients own agent to take care of the shipping and customs clearance issues. We can do so, at additional cost.

Due to the difficulty in estimating the accurate weight and dimensions of the crate at the time of giving a quotation, the panels will be shipped Freight Collect with the full value insured. Alternatively an estimate will be provided and confirmed prior to despatch.

RECEIVING

Before signing for and accepting the shipment from the carrier, inspect the crate(s) for the following items: a. Inspect crate(s) for visible damage.
b. Check Tip 'N Tell indicator where used.

If damage to any of the panel(s) is found, the shipping documents should be so noted and the driver's signature obtained as a witness. You should inform SmartGlass International immediately of any damaged panels. Photographs should be furnished within 24 hours. A freight claim should be filed to the carrier as early as possible. If you fail to inspect the shipment, the carrier and SmartGlass International Ltd. are ***not*** responsible for damage.

UNCRATING

Ensure the crate is on a level surface. Before removing the lid unscrew screws which are holding the lid down. Be careful to lift the lid off the crate level on all corners. Remove straps holding panels on. Remove the panels carefully, one at a time, using the appropriate lifting methods.

Warning: Loose cables from LC SmartGlass panels are not to be used for lifting, moving or positioning the LC SmartGlass™ panels. Ensure not to snag cables whilst lifting.

STORAGE

Glass edges frequently sustain damage due to careless handling at some point between manufacture and installation, Handle with care. If the SmartGlass is to be stored on the job site or in warehouse conditions, proper blocking and protection should be maintained at all times. As with other flat glass products, the SmartGlass panels must be stored where the relative humidity is less than 80% to prevent the SmartGlass from staining. The SmartGlass temperature should be held nearly constant to prevent moisture condensation on the panels. Storage temperature range is -20 +50 °C (-4° +122°F). The crate should be kept in an upright position or tilted at 5° - 7° from vertical at all times using broad, sturdy uprights to support the weight of the crate. Alternatively the SmartGlass should be stored on a glass “A” frame in a position free from obstruction, traffic and danger.

Note: SmartGlass panels can be heavy at approximately 27.5 kg/m2. Please be careful and take the weight loads into account when moving and storing.

UNEXPECTED BREAKAGE

"Unexplained" glass breakage may occur after all precautions have been taken. Such breakage is beyond the control of the manufacturer and therefore not warrantable. This includes but is not limited to the following items

- Thermal stress
- Glazing system pressures
- Damage during glazing by others
- Handling and storage problems
- Excessive wind loads
- Objects and debris striking the glass
- Damage by persons/objects at the construction site

WARRANTIES

SmartGlass International Ltd. warrants that the physically tangible hardware products delivered should be free from defects in materials and workmanship, assuming normal use, for a period of five years from the date of invoice unless otherwise specified. SmartGlass International Ltd' sole obligation and clients sole remedy in the event of breach of warranty is to repair or replace the defective products. The distributor/customer should promptly notify SmartGlass International Ltd of any defect in products delivered there under, and upon obtaining a return authorisation should ship the defective goods to SmartGlass International Ltd for analysis unless otherwise agreed. SmartGlass International Ltd will bear the expense to repair or replace the products supplied but will not accept any costs incurred by others which are associated with, access, removal or replacement / installation of the goods. SmartGlass International Ltd. is not responsible for products damaged by external events such as, but not limited to catastrophe, incorrect silicone use, improper use, or maintenance or use of unauthorised parts.

The installer shall warrant for five years the satisfactory performance of the widow or partition installation which includes window, framing, glass glazing, anchorage, and electrical work as detailed by the specifications and approved drawings.

ELECTRICAL INSTALLATION

SUPPLIES NEEDED

Installation of SmartGlass panels require the following items:

A 16 AMP (minimum) Residual current device (Rcd) with Miniature circuit breaker (Mcb) or a Residual current circuit breaker with overload protection (Rcbo) must be used along with a fused spur at the connection point for the panel for localised isolation.

A wall mounted switch, 230VAC 50/60 Hz (installer/owner supplied). This switch is required to allow the SmartGlass panels to be turned ON/OFF. Alternatively a radio remote control switch can be specified.

SmartGlass power transformer. SmartGlass panels may be connected in parallel up to 4 square meters total area per single Tim 100 power conditioner/transformer. Bespoke electronic controllers can be used including "smart" systems such as Creston and ABX controllers.

Note: Larger Power Conditioner / Transformers can be supplied to power larger areas of Smartglass, please contact us for further information.

INSTALLATION REQUIREMENTS

As with any electrical device, SmartGlass must be included in the electrical layout for each project. E.g. Position of spurs, switching layout, containment (conduit, trunking etc to house cables) connection boxes etc. The installation must meet all local rules and regulations. Also any metal frames which could come in to contact with the wiring of the panel must be earthed. Smartglass international is not responsible for these layouts however we can be contacted for further information.

POWER TRANSFORMER / CONDITIONER DETAIL

Short circuit proof isolating encapsulated auto wound transformers for step down of 230V to either 110V or 65V depending on which film is used.

WARNING: The transformer must be installed by the electrical contractor in an easily accessible area in order to replace fuse in the event of damage.

Specification: Tim 100 - Power Conditioner / Transformer.

Input Voltage	230V 50-60 Hz
Power	100 VA
Dimensions (L*W*H mm)	166mm * 77mm * 76mm
Weight	2.0 kg
Insulation	Double Insulated (No Earth Required).
Output voltage	110V or 65V

- Twin secondary windings for series or parallel connection
- Integrated overload protection and short circuit proof
- Encapsulated in resin up to 300 VA
- Isolating transformer to IEC 61558-2-4, DIN EN 61558-2-4, VDE 0570 part 2-4

WIRING

SmartGlass International requires that all SmartGlass electrical installations be completed by a licensed electrician, and in compliance with all local rules and regulations.

Before installation, inspect bus bars, electrode leads and wires to assure insulation. No exposed bus bars, electrode leads, or wires should contact any metal frames that will damage the transformer and SmartGlass. Any metal frames must be earthed.

Multiple SmartGlass panels should be connected in parallel with the transformer. Insure that the transformer "in" connects to 230V AC and "out" connects to SmartGlass panel. The output voltage is approximately 115V or 65V depending on the type of film used.

Before turning on the power, test resistance reading between the metal frame and electrode and make sure that the resistance reading is infinite. Otherwise, check short location and insulate electrodes from metal frames.

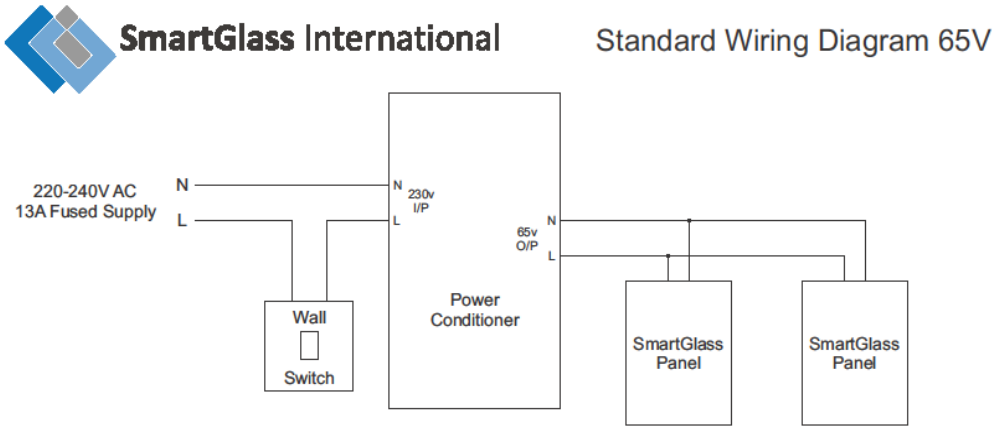
SmartGlass uses approximately 5 watts per square meter in the "on" (clear) state. No electricity is consumed in the "off" (opaque) state. SmartGlass can be controlled with either a single or multiple switches or by radio remote controller.

NOTE: It is vital for correct operation that the switch/remote receiver is positioned on the mains voltage before the transformer/power conditioner. Failure to correctly install the switching mechanism may cause irreparable damage to the LC SmartGlass.

Ensure the mains supply is switched off and take care when opening the power transformer, allow a few minutes to cool down. Internal electronic parts may be very hot, this is normal. Only open the power transformer in the areas noted safe for opening, never open the sealed body of the power transformer.

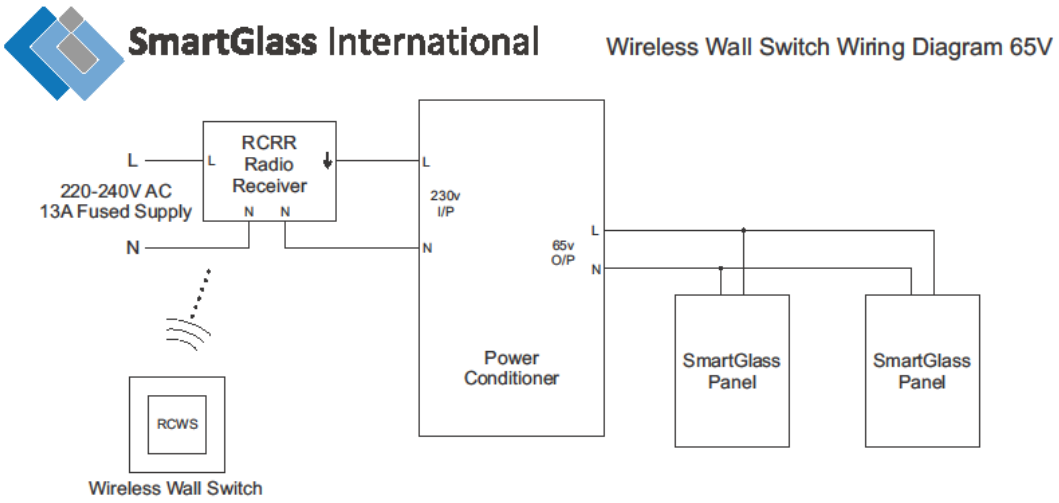
Warning: Do not substitute a higher fuse rating! Fuse rating is critical to properly protect SmartGlass panels. A spare fuse is included on the inside cover of the power transformer supplied.

TYPICAL WIRING DIAGRAM



Please Note: The Power Conditioner has a built in fuse and must be located in an accessible position

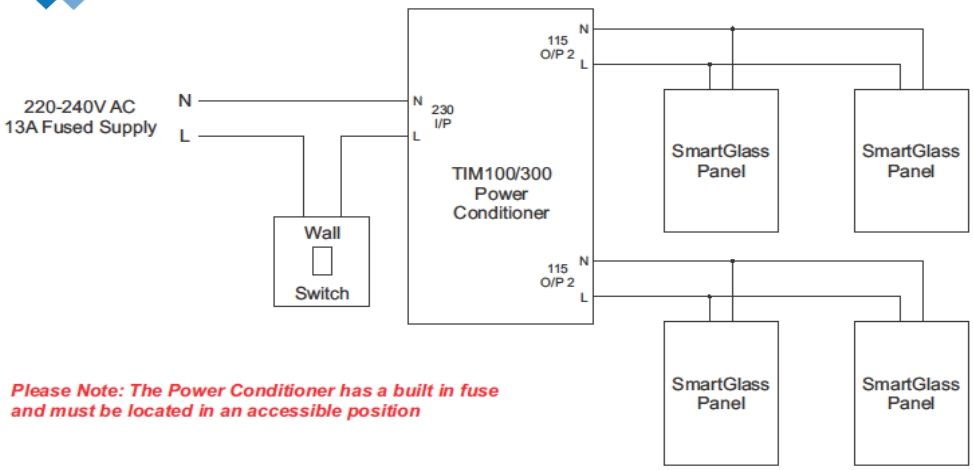
Power Conditioner (230v AC to 65v AC 2x150VA) (223x117x117mm) 1 reqd per switchable area upto 12mSq



Please Note: The Power Conditioner has a built in fuse and must be located in an accessible position

Power Conditioner (230v AC to 65v AC 300VA) (223x117x117mm) 1 reqd per switchable area upto 12mSq

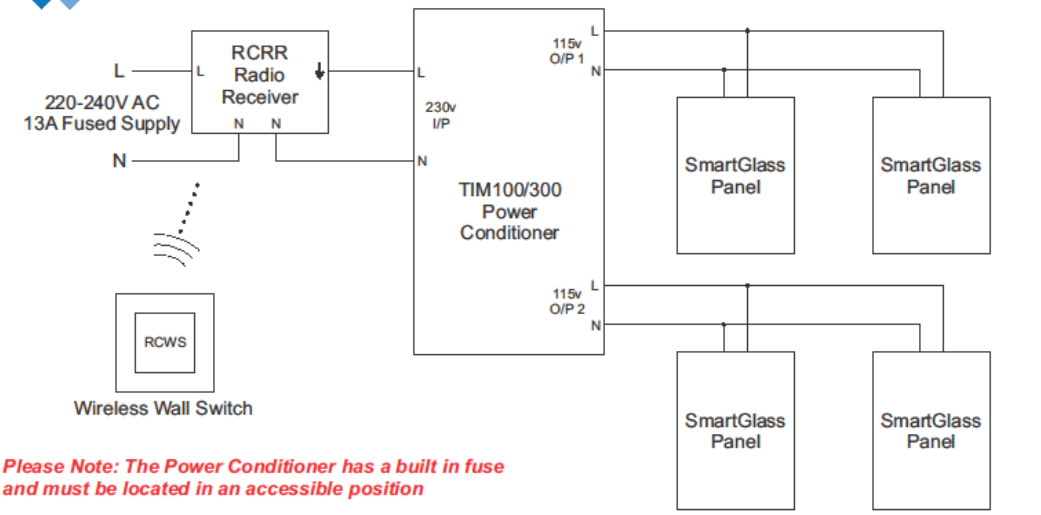
SmartGlass International — Standard Wiring Diagram



Please Note: The Power Conditioner has a built in fuse and must be located in an accessible position

TIM100 Power Conditioner (230v AC to 115v AC 2x50VA) (166x77x76mm) 1 reqd per switchable area upto 2x2mSq
TIM300 Power Conditioner (230v AC to 115v AC 2x150VA) (223x117x117mm) 1 reqd per switchable area upto 2x6mSq

SmartGlass International — Wireless Wall Switch Wiring Diagram



Please Note: The Power Conditioner has a built in fuse and must be located in an accessible position

TIM100 Power Conditioner (230v AC to 115v AC 2x50VA) (166x77x76mm) 1 reqd per switchable area upto 2x2mSq
TIM300 Power Conditioner (230v AC to 115v AC 2x150VA) (223x117x117mm) 1 reqd per switchable area upto 2x6mSq

SmartGlass International

Remote Controls

868.3 MHz (CE Approved, License Free)

RCRR
86 x 76 X 63mm (excluding gland)
Remote Control Receiver Relay
Can be mounted out of site

RCWS
95 x 95 x 16mm
Remote Control Wall Switch
With Glass Surround

MAINTENANCE

Maintenance is generally as simple as keeping the SmartGlass clean. Regular cleaning with neutral materials is recommended for optimum performance. In external windows soapy warm water performs best. Soft coated glass should be cleaned very carefully following the manufacturers own instructions. Use professional glass cleaner or a reputable cleaner.

Annual checks: The client should check that all wiring is in good condition, framing materials are free of any damage and that the transformer and switch are in good visible order. The areas adjoining the SmartGlass including walls, ceilings and floors should be checked for structural integrity, excess humidity and temperature. Should any of these items appear unusual the client should immediately notify the original supplier / installer / contractor or SmartGlass International.

TROUBLE SHOOTING

LC SmartGlass operates at 110V or 65V AC and 50/60 Hz. Higher voltages and frequency may cause permanent damage.

Electrical service must be performed by a qualified electrician who has read and understood this document.

Switch the power ON. Verify that the SmartGlass panel switches. If one or more SmartGlass panels are not operating, check the following

1. Check the circuit breaker to verify power. If there is not power from the circuit breaker, reset or replace the circuit breaker.

2. Visually check the condition of all wiring and that connections have not been broken.

3. Check the switch to verify power. If there is no power from the wall switch check the connection or replace the switch.

4. Check input to the power transformer of affected panels to verify power. If there is not input power to the power transformer, check the wiring between the wall switch and the power transformer for damage and continuous current flow.

5. Check output from the power transformer of affected panels to verify power. If there is no output power from the transformer, the fuse may have blown. Replace fuse with the same size and specifications which is available at electronic supply shops such as RS. Each transformer contains a spare fuse inside the protective cover.

If in any doubt, please contact us to resolve your issue.

CLIENTS (Selection)

End User	Application
The Royal Institution of Great Britain	Unveiling ceremony plaque
Etihad Airlines HQ Abu Dhabi	Executive offices & meeting rooms
Guinness Storehouse Dublin	Visitors Centre bespoke displays and windows
European Space Agency	Viewing rooms
Rolls Royce Marine	Company restaurant screens
Zain Telecom Bahrain	Executive offices & meeting rooms
Brinks Global	Security screens
Petrobras Brazil	Boardroom partition walls
Blackrock Clinic	Hospital Consultancy Room Screens
Central Bank of Ireland	Governors Suite and Meeting Rooms
Chevron Texaco UK HQ	Partition Systems board & Meeting rooms
Wellington Street Jazz Cafe	Toilet cubicle doors
Roseisle Maltings Whiskey Distillery	Feature visitor centre screens
Emirates Airlines	Chief executive office partition Dubai
Montreal Museum of Modern Arts	Feature display window
Nissan UK	Micra CC Launch, 140 panel display
Optica Opticians	Opticical testing rooms
Saudi Aramco Oil	Office Partition Screens
Trinity College	Visitor centre feature wall
Royal College of Physicians	Privacy Doors
Saudi Arabia National Guard	Communications centre control suites
Stonecutter Court London	Conference Rooms
Old Jameson Distillery	Feature display / projection screen
Damico Tankers	Offices, meeting rooms and boardroom
Four seasons hotel	Room dividers
Trinity Yachts	Yacht internal screens
Goldbach Kirchener	Bank boardroom
Top Gear Live Shows - Prototype Tour	Glass car - performed stunts at Top Gear live show
Royal Sunderland Hospital	Doors/Screens for ICCU ward
ITV Daybreak Studios	Glass backdrop in TV studio
Kempinski Hotel Bahrain	Bedroom/En-Suite privacy screens
National Health Service (NHS)	In excess of 20 hospitals in the UK

TESTIMONIALS (Selection)

"LC SmartGlass was used to create a partition separating bedroom and bathroom in each room. Switchable SmartGlass was the ideal solution to create a bright open space as it not only lets more light into the bathroom but also gives the impression of increased space throughout the entire room."
Marites Araneta, Eccleston Square Hotel

"I was thoroughly impressed by the funky, cool smart glass bathroom. I have never seen this type of glass before and it still impresses me even now. I enjoy showing guests the smart glass and seeing their genuinely positive reaction. The smart glass adds a lot of fun to guests stays!!"
Kym Hammond – Reception Manager, the Brew House Hotel

"The SmartGlass allows my team of care staff to effectively review patients safely and conveniently. This is a wonderful innovation that allows critically ill patients a high level of safety during their hospital stay."
David Mc Nicholas, Sunderland ICCU Manager

"Dear Bob, On behalf of the Royal Institution, I am writing to thank SmartGlass International for supporting our Grand Launch. It was a truly special day, made even more memorable by the unique unveiling ceremony. Many thanks for donating the smart glass plaque and for all your help with the installation and testing that made it possible. I'm sure you'll agree it was very fitting for the RI – the home of science and technology – to launch our new era using such innovative technology as SmartGlass. As a small token of our appreciation, I enclose a copy of the commemorative book from the launch, which was presented to HM when she officially opened the new RI."
Baroness Susan Greenfield - Director

Top Gear Live has a reputation for pushing the boundaries of car theatre and each new tour requires incredible technology, passion and dedication to deliver the spectacle our audiences have come to expect. For the 2010/11 Prototype Tour I needed a company who could help me make a car turn from solid to transparent at a touch of a button. SmartGlass International were a great partner working meticulously with me to develop the car panels required for this unique hyper car and proved to be the perfect solution to a problem no one thought they'd ever have; how do I turn my car see through?
Rowland French, Top Gear

"We at Kentish Town Sports Centre have found the installation of Smart Glass to have been of great benefit to the service we provide to our many and varied customers.
We run 'women only' swimming sessions for religious reasons or for other privacy issues and this means that we can have our pool in 'privacy' mode or 'open' mode for when the pool is being used for children's swimming lessons when parents like to observe from a distance. We have had no maintenance issues with this facility and would recommend this product to anyone in a similar circumstance to ourselves."
Grant McCahon, Kentish Town Sports Centre

"From ordering to installation everything went smoothly. The finished room divider has added a new dimension to our working environment making the office seem much more spacious (replacing a wall) and giving privacy when required"
Martin Travis – Symbolic & Chase

"I'm very pleased with how the SmartGlass turned out; it was well worth the investment and continues to impress me"
Michael Linnit – Chatto & Linnit Ltd

"We recently opened our brand new flagship clinic in Marylebone Village London. We decided to create a wall and door out of SmartGlass leading in to our Skin Experience room. The result is beautiful and clients have been really impressed. At night we open the glass and have the room all lit up and it has turned out to be an amazing feature in our clinic."
Theresa Candolo – Salon Manager, Skin Health Spa Marylebone London

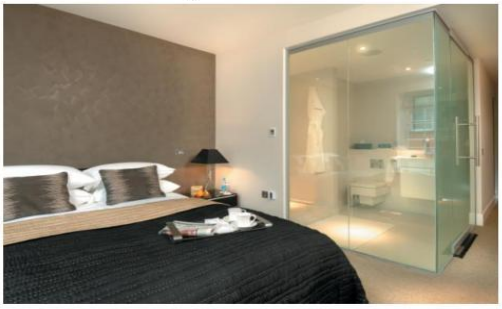
SmartGlass goes boutique chic…

The Brew House Hotel, located in the historic Pantiles area of Tunbridge wells, is a luxurious boutique hotel and stylish destination for travellers the world over.
Designed to a superior standard, the Brew House hotel blends contemporary modern style with imaginative lighting and comfortable furnishings. With a total of just fifteen rooms, the design team at the Brew House hotel care and attention could be given to each room in creating a modern and sophisticated state of the art space in terms which was both functional and elegant.

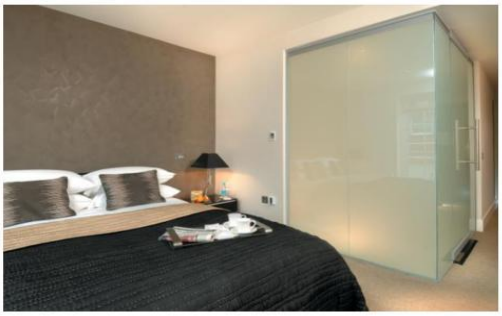
SmartGlass International

SmartGlass International specialise in the hospitality, commercial and healthcare sectors providing switchable glass solutions to projects small and large across the globe.

Privacy control glass was specified in the design brief when the hotel was at planning stage where the en-suite could be separated from the bedroom instantly. With elegance and sophistication at the forefront of the design brief, a sleek and stylish interior was required which could also serve the functional purpose of instant privacy control.
SmartGlass International, the leading worldwide manufacturer of electronically switchable glass would be the solution to this design task.



LC SmartGlass Switched On



LC SmartGlass Switched Off

Project: Hotel refurbishment

Client: The Brew House Hotel Tunbridge Wells

Date of completion: September 2008

LC SmartGlass

LC SmartGlass offers privacy on demand at the flick of a switch matching the criteria of the design brief entirely. This modern design feature precisely matches the image that the Brew House wishes to portray; a chic boutique stylish destination. All LC SmartGlass panels are bespoke manufactured using a lamination process which encapsulates a PDLC film between 2 or more glass sheets. Using a minute electrical current, users can immediately switch the LC SmartGlass from clear to private (opaque) and vice versa.

How does it work?

When the electrical supply is switched on, the liquid crystal molecules align and incident light passes through and the LC SmartGlass panel instantly clears.

When the power is switched off the liquid crystal molecules are randomly oriented scattering light and the LC SmartGlass becomes opaque (private).

The Brew House Hotel

LC SmartGlass is an easily cleaned, low maintenance surface which is ideal for application in the hotel environment. The SmartGlass not alone serves as a privacy screen but also features as a unique/exciting gadget for guests to enjoy.

The privacy screen in each en-suite room is comprised of five LC glass panels fitted together using a clear silicone joint to create a smooth glossy surface.
The glass can be changed from clear to opaque using a wall switch which is located inside the bathroom area.

The Brew House Hotel has received some outstanding reviews on travel review website TripAdvisor.co.uk; "The bathroom was lovely especially the SmartGlass which when activated by a switch turned the glass frosty, a nice touch", "The bathrooms were a marvel, from the SmartGlass to the flooring of the shower".

"I was thoroughly impressed by the funky, cool smart glass bathroom. I have never seen this type of glass before and it still impresses me even now. I enjoy showing guests the smart glass and seeing their genuinely positive reaction. The smart glass adds a lot of fun to guests stays!!"

Kym Hammond – Reception Manager

SmartGlass International "tunes in" to ITV Daybreak…

Daybreak is the weekday breakfast television programme broadcast from 6:00am to 8:30am for the British commercial ITV network anchored by Adrian Chiles and Christine Bleakley.

Daybreak took to the air on Monday 6th September as the much-heralded replacement for breakfast TV show GMTV. More than one million people tuned in to see the launch of ITV's new breakfast show - an improvement over its predecessor, GMTV. ITV said the show, which featured an interview with former Prime Minister Tony Blair, peaked at 1.5m viewers. ITV are one of the UK's largest broadcasting stations and reach approximately 13 million viewers a week with Daybreak regularly accounting for a large proportion of this.

The Daybreak studio is located in the heart of London at South Bank studios. The London City skyline is the backdrop to the Daybreak studio offering an unrivalled view across the city from St. Paul's Cathedral right across to the Gherkin.

"The spectacular backdrop of St Paul's Cathedral and the London skyline is a scene to wake up to" Christine Bleakley.

SmartGlass International

SmartGlass International's SPD SmartGlass was specified for this state of the art television studio project to create a solar control glazing system that would combat the negative effects of direct sunlight including glare and heat.

SPD SmartGlass is the latest innovation from SmartGlass International and is the ideal solution for a project of this type precisely meeting the design brief.

SPD SmartGlass offers the perfect solution and is installed in approximately 100 panels throughout the studio. The glass facade can be automatically dimmed from clear to dark controlling glare and solar heat gain while protecting the studio inhabitants from the damaging effects of UV.

SPDSmartGlass

SPD SmartGlass can be manually or automatically "tuned" to precisely control the amount of light, glare and heat passing through a window. While glass is a favored product for use in building facades; glare, solar heat gain and UV exposure are problematic and can often make the use of glass impractical resulting in the need to invest in expensive solar shading devices. Glass facades using patented SPD light-control technology reduce the need for air conditioning during the summer months and heating during winter.

Client: ITV Daybreak
Operator: GMTV Limited
Contract Size: £135k
Date: August 2010

The ability to instantly switch the glass to maximize daylight when it's really needed and to provide controllable solar shading during peak light conditions is valuable and unique. This feature is especially useful for application in a television studio as it allows for maximum daylight to enter without compromising recording quality and controls room temperature which is also critical in this particular environment.

Daybreak is broadcast from dawn meaning the levels of sunlight entering the studio vary throughout the morning. When the sun is just rising over London the backdrop is in darkness, at this stage the glass is at its clearest state where it will allow for maximum light penetration. As the morning gets brighter, the glass is "tuned" to control glare from the sun and heat passing through into the studio.

Principle

All SPD SmartGlass panels are bespoke manufactured using a lamination process which encapsulates a SPD "Suspended Particle Device" film between 2 or more glass sheets.

When the power supply is switched on, the rod shaped suspended particle molecules align, light passes through and the SPD SmartGlass panel clears. SPD SmartGlass protects from damaging UV when on or off.

When the power supply is switched off, the rod shaped suspended particle molecules are randomly oriented blocking light and the SPD SmartGlass becomes dark blocking up to 99.4% of light.

SPD SmartGlass has lots of advantages supplementary to what is listed above including energy savings on cooling and light costs, reduction of buildings carbon emissions and elimination of the need for expensive window dressings.

SmartGlass International is delighted to work on such a state of the art project where innovation and design are at the forefront.

SmartGlass drives in Top Gear…

Top Gear Live is a live arena show of the award winning TV program Top Gear. The live show features breath-taking stunts, remarkable special effects and epic driving sequences. The live show is home to an array of pyrotechnics, a bombardment of noise and a spectacle of motoring.

A collection of the finest cars from all over the globe grace the arena floor. Jeremy Clarkson, Richard Hammond and James May host the live show with their cheeky approach to motoring and humour whilst some of the world's best precision drivers perform awe-inspiring stunts live in the arena.

"This show is like nothing we have done before. It will have some very very special, special effects," Jeremy Clarkson.

Ever since it made its live debut on the World Stage in 2008 Top Gear Live has been seen by over 1,000,000 fans and is continuing to push the boundaries of car theatre.

Top Gear Live 2010

For the 2010 show, Top Gear producers wanted to create the ultimate car to star in the finale of the live show. After much debate regarding model, materials, specifications etc. they decided on an almost impossible concept.

"A car will come out and become invisible" Richard Hammond.

The producers were faced with a problem. How would they design a car which could change state instantly and give this magnificent illusion? What type of materials would allow them to create this?

It was decided that a switchable glass would be used to make up the bodywork of the car which could switch on and off simultaneously giving the effect of changing visible/invisible states.

The interior of the car was visible when in its clear state showing the famous "Stig" and his female sidekick; when the glass switched to its "invisible" state the passengers could not be seen.

SmartGlass International

SmartGlass International was approached to quote this project at the early design stages and to investigate whether the concept would be viable.

SmartGlass International is the leading worldwide manufacturer of electronically switchable glass and provides the perfect solution to this design problem. SmartGlass can be used in almost every glazing application as it is available in a number of different shapes and can also be curved making it suitable for a range of different applications specializing in the hospitality, healthcare and commercial sectors.

LC SmartGlass

LC SmartGlass is one of the trademarked electrochromatic glass products available from SmartGlass International.

LC SmartGlass panels are bespoke manufactured using a lamination process which encapsulates a PDLC film between 2 or more glass sheets. When a minute electrical current is activated, users can immediately switch the LC SmartGlass from clear to private (opaque) and vice versa precisely meeting the proposed design brief.

In this case, polycarbonate replaced traditional glass to make up the panels. The panel sizes were much smaller for this application than usual and required much more detailed wiring so that each individual panel would switch at the exact same time on the car. Another design problem would be the convertible roof feature which would be manufactured entirely of SmartGlass.

This was a challenge for the SmartGlass team, but through careful testing of the materials they found the ideal solution. The panels would be aligned and connected in such a way to allow the roof to lift up without the connection being lost so that the panels would switch simultaneously during this particular action scene of the show where the roof rises up to release a passenger from the car. A similar system is used when fitting SmartGlass panels into a folding door system.

SmartGlass International is thrilled to work on such a remarkable and exciting project.

Visit SmartGlass International online to view all of the latest projects and subscribe to the monthly SmartGlass newsletter.

Contact us: info@smartglassinternational.com
www.smartglassinternational.com

Project Case Study No. 31

Smartglass medical

"NOT just one of the best in the country – but possibly the world" is how Dave McNicholas, Unit Manager, describes the new state of the art ICCU at Sunderland Royal Hospital which opened April 11th.

The unit is part of a new £28m ward block at the hospital and is seen as a model of excellence within the NHS as it includes hi-tech technology, incorporating the most advanced electronic patient monitoring systems available.

The Integrated Critical Care Unit (ICCU) includes high dependency single bed units, isolation single bed units and general post-operation single bed units.

City Hospitals Sunderland
NHS Foundation Trust

NHS

Client: Royal Sunderland Hospital, NHS Trust
Architect: HDP Architects
Contractor: Lumsden & Carol Contractors
Project: High Dependency ICCU
Date: Project completed March 2011

Project Brief

Extension of the Sunderland Royal Hospital to increase patient capacity from 970 to 1108. A 138 bed ward extension to provide much needed supplementary care facilities for the hospital. A new high dependency Integrated Critical Care Unit (ICCU) to separate theatre staff and nursing staff to eradicate the chances of contamination spreading between the two sections.

LC SmartGlass

LC SmartGlass toughened panels were used to create a state of the art partitioning system along the corridors of the ICCU. The double doors entering each ward are fitted with LC SmartGlass toughened door panels allowing for patient privacy and dignity at the flick of a switch, while also permitting care staff to effectively monitor patient activity. Through continued studies it has been proven that sheer, easily cleaned surfaces are essential in hospitals in order to reduce the risks associated with the spread of super bugs such as Clostridium difficile (CDIFF), Methicillin-resistant Staphylococcus aureus (MRSA) and Vancomycin-resistant Enterococcus (VRE).

A recent American study by the Cleveland Veterans Affairs Medical Centre in Ohio found that curtains which hang between patient beds in hospitals can become contaminated with drug-resistant bacteria and may be playing a role in the spread of these germs in hospitals.

The study showed that CDIFF, MRSA and VRE can be found on hospital privacy curtains. More worrying, researchers found that these bugs transfer onto the hands of people who handle the contaminated curtains, suggesting that health care workers who operate these may be spreading bugs. The study found that 43 percent of privacy curtains were contaminated with VRE, 22 percent of them harboured MRSA and four percent tested positive for CDIFF.

LC SmartGlass provides the ideal surface to combat these deadly infections and eliminates the need for traditional blind systems which are difficult to clean and high risk in terms of harbouring dirt and bugs.

Principle

When the electrical supply is switched on, the liquid crystal molecules align and the LC SmartGlass panel instantly clears. When the power is switched off the liquid crystal molecules are randomly oriented scattering light and the LC SmartGlass becomes opaque (private).

LC SmartGlass can be tailored to suit varying healthcare applications with requirements such as fire rated, x-ray proof and impact resistant glass.

"This is one of the most carefully designed intensive care units in the country". It gives patients and their families the reassurance that they are receiving the best possible treatment in the most modern of settings, with the latest equipment and the most highly trained staff".

"Our first objective is the patient. The new unit has been developed to ensure that they have the benefit of the very best ICCU service that is available anywhere in the NHS".

Dave Mc Nicholas, ICCU manager

"This is one of the best ICCUs in the world, the state of the art equipment and staff are truly excellent. Any patient treated here will be guaranteed first-rate treatment that is leading the way in critical care."

Graham Howard, City Hospitals Sunderland NHS Foundation Trust

For more information on SmartGlass Medical visit www.smartglassmedical.com.

All photographs are courtesy of HDP Architects

PROJECT PICTURES

LC SmartGlass - Elm Park Marketing Suite

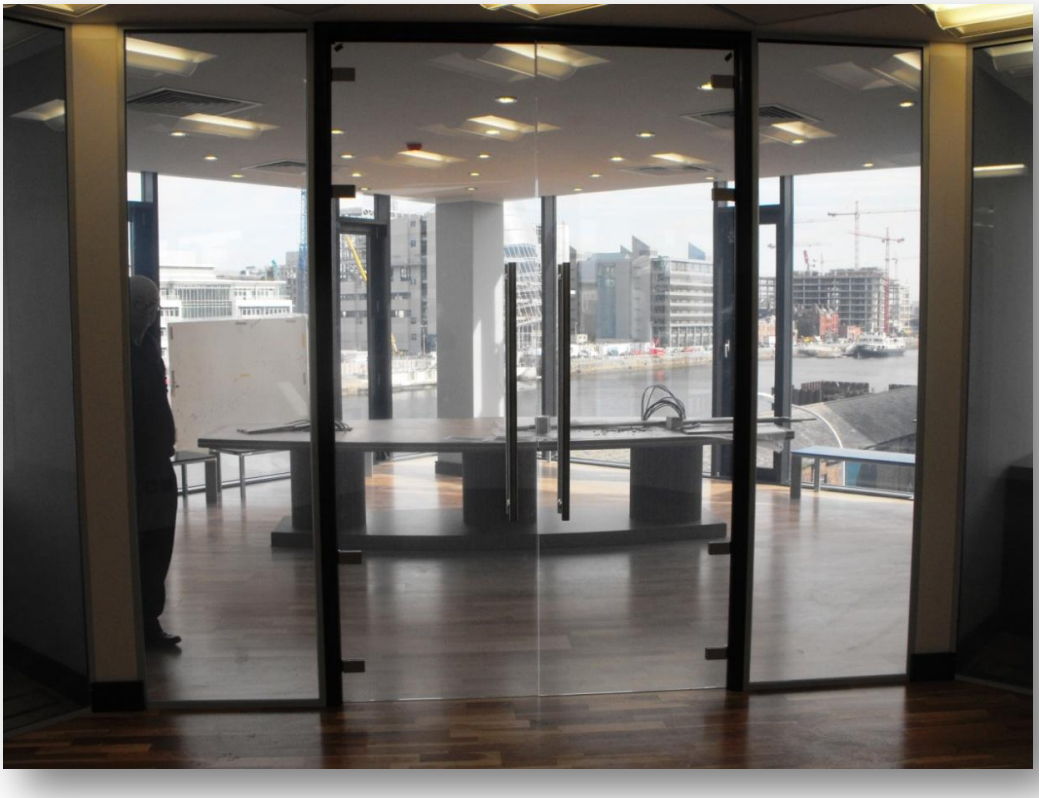
LC SmartGlass – Sunderland General Hospital ICCU

SPD SmartGlass - Manor House, Roof-light

Curved LC SmartGlass- Blue Sun World Sales Office

LC SmartGlass - Royal Institute of Great Britain

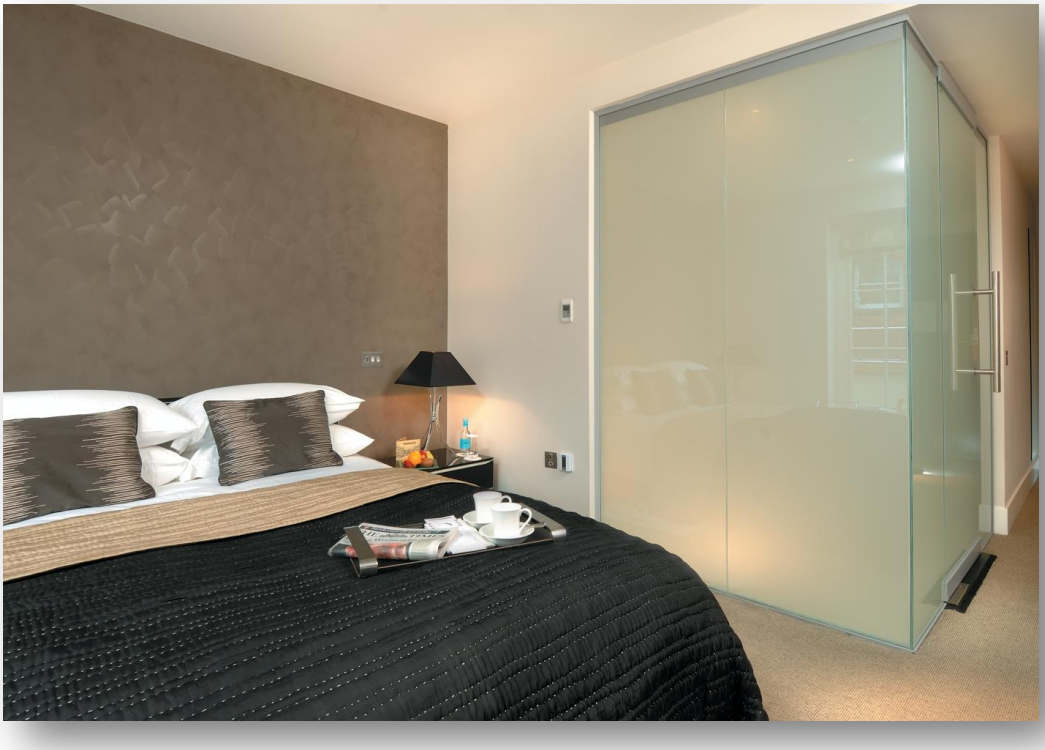
SPD SmartGlass – WTS / United Press TV Studios London & London Eye



LC SmartGlass - Damico Tankers Boardroom

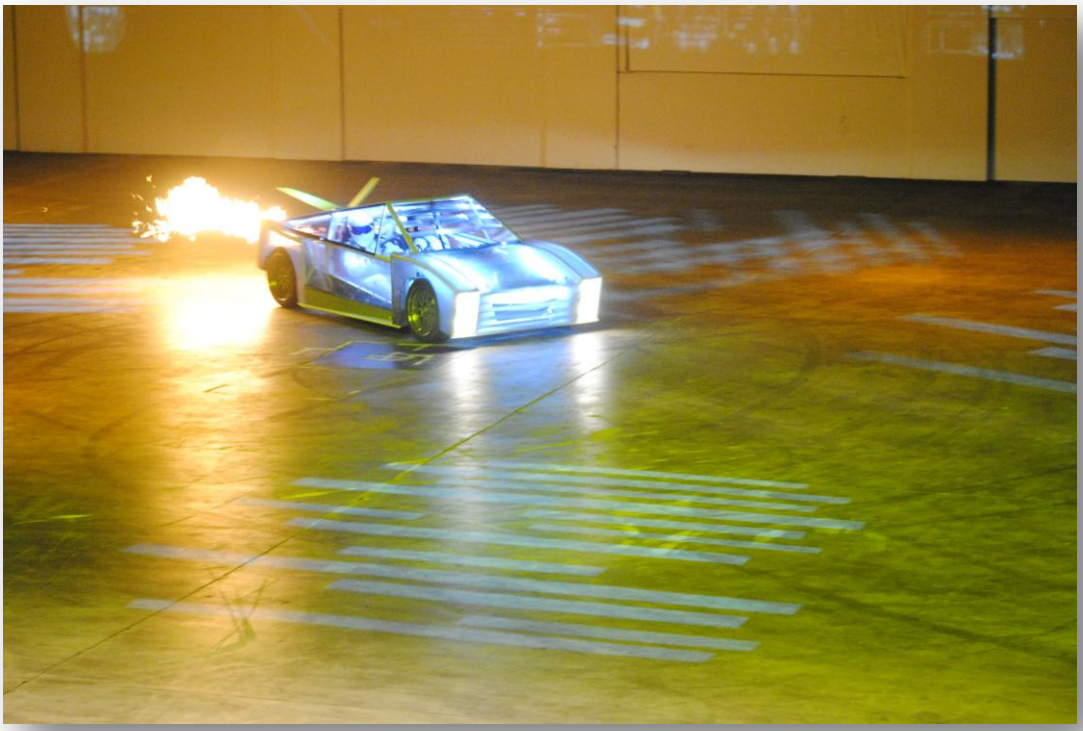
LC SmartGlass - Meeting room, Bank HQ. Courtesy SCHOTT Glass & Golbach Kirchner Germany

LC SmartGlass – Critical care hospital ward



LC SmartGlass - Brewhouse hotel, Tunbridge Wells, Kent, England

SPD SmartGlass- ITV Daybreak TV set London



LC SmartPoly - Top Gear festival. Toured Worldwide

SPD SmartGlass – WTS / United Press TV Studios London & Big Ben

Please visit our website to download the Cambridge university report which discusses SPD SmartGlass benefits

UNIVERSITY OF CAMBRIDGE
Department of Engineering

Smart Building Envelopes

4TH Year Project Report

Prepared by: M. Beevor

Submitted: June 2010

SmartGlass International™ Ltd

Terms & Conditions of Sale

1. **Price -** All quotations are subject to confirmation in writing by the Company on receipt of the order and deposit from the Purchaser.

2. **Delivery -** Time of delivery shall not be the essence of the contract, nor shall the Purchaser have the right to make it such. Whilst every endeavour will be made to adhere to any quoted or agreed delivery date or programme, the Company shall in no circumstances be liable for any costs due to delay in delivery, whether due to shortages of material, labour or any other cause whatsoever.

3. **Payments -** Shall be made at the time specified. The amount of the order value to be paid will be that specified in the face of the contract or calculated in accordance with the formula therein. The amount shall not be subject to any discount or set off whatsoever except with prior agreement in writing by the Company. Payments not received within 30 days from date of invoice will be subject to the additional charges as set out in the European Communities "Late payment in commercial actions" regulations 2002.

4. In the case of goods exported, or sent by independent freight carrier whether arranged by the Company, or others, the Purchaser agrees to comply in all respects, with the freight carrier's conditions of carriage for notification of claims, loss or damage in transit.

5. **Insurance -** It is the responsibility of the Purchaser to insure goods in transit and to pay any costs to the Company for arranging such insurance.

6. **Certificate of Conformity -** The Company shall not supply certificates of conformity unless requested at the time of placing the order. The company reserves the right to charge a fee for any certification supplied.

7. **Retention of Title**

   (1) The goods shall be at the Purchasers risk from the time of delivery or collection.

   (2) In spite of delivery being made, property in the goods shall not pass from the Company to the Purchaser until the full contract value has been paid the full, inclusive of vat where applicable.

   (3) Until property in the goods passes to the Purchaser in accordance with clause (2) the Purchaser shall hold the goods and each of them on a fiduciary basis as bailee for the company.

   (4) Until such time as property in the goods passes from the Company, the Purchaser shall, upon request, deliver up such of the goods as have not ceased to be in existence or resold, to the Company. If the Purchaser fails to do so, the Company may enter upon any premises owned, occupied or controlled by the Purchaser, where the goods are situated, and repossess the goods.

   (5) The purchaser shall promptly deliver the prescribed particulars of this contract to the Registrar in accordance with the companies act. Without prejudice to the other rights of the Company, if the Purchaser fails to do so all sums whatever owing to the Purchaser the Company shall forthwith become due and payable.

8. **Jurisdiction -** The Purchaser accepts that any claim in respect of this or any contract, claim or action with the Company, shall be governed by the jurisdiction of the Irish and English Courts.

9. The Purchaser agrees that these conditions of sale shall bind any subsequent orders and business with the Company unless expressly excluded or varied in writing by the Company.

10. No liability will be accepted by the Company for damage to free issue glass or other materials supplied by the customer for lamination**.**

11. SmartGlass will be sold of merchantable quality, fit for purpose and as described. Caveat emptor, the purchaser is responsible for ensuring that the goods they are purchasing are the goods that they expect to receive. It should be noted that there will always be an element of haze within the SmartGlass. This will not be considered or constitute reason for return or refund.

12. If for any reason the materials supplied develop a fault within the warranty period which is considered to be due to bad workmanship or material faults, Smartglass international Limited will repair or replace at their discretion, such items to the original supply specification. Smartglass International will not be held responsible or accept any costs incurred by others which are associated with access, removal or replacement of the goods.

13. The SmartGlass Handbook which is available upon request from our office, or available for viewing on our web-site, should always be reviewed by the customer for specific instructions on the products.

14. Visual inclusions will only be considered as defects when visible from a distance of equal to or greater than 3 meters from the glass surface.

15. A bending/bowing tolerance of up to 3mm per meter in glass length is within tolerance and will not be considered as defective.