



MIR SOLUTION

Registered in Dubai as MIR Green Building Construction Material Trading LLC

Smart Film Technical Handbook

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LCG[®]

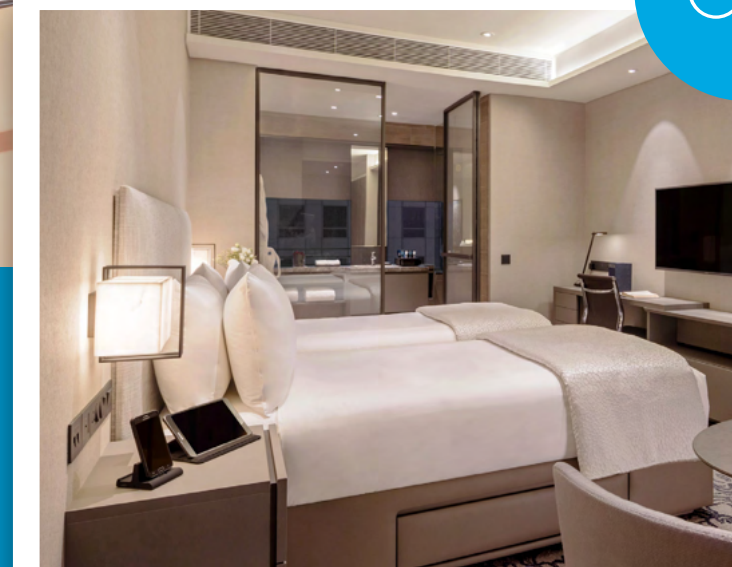
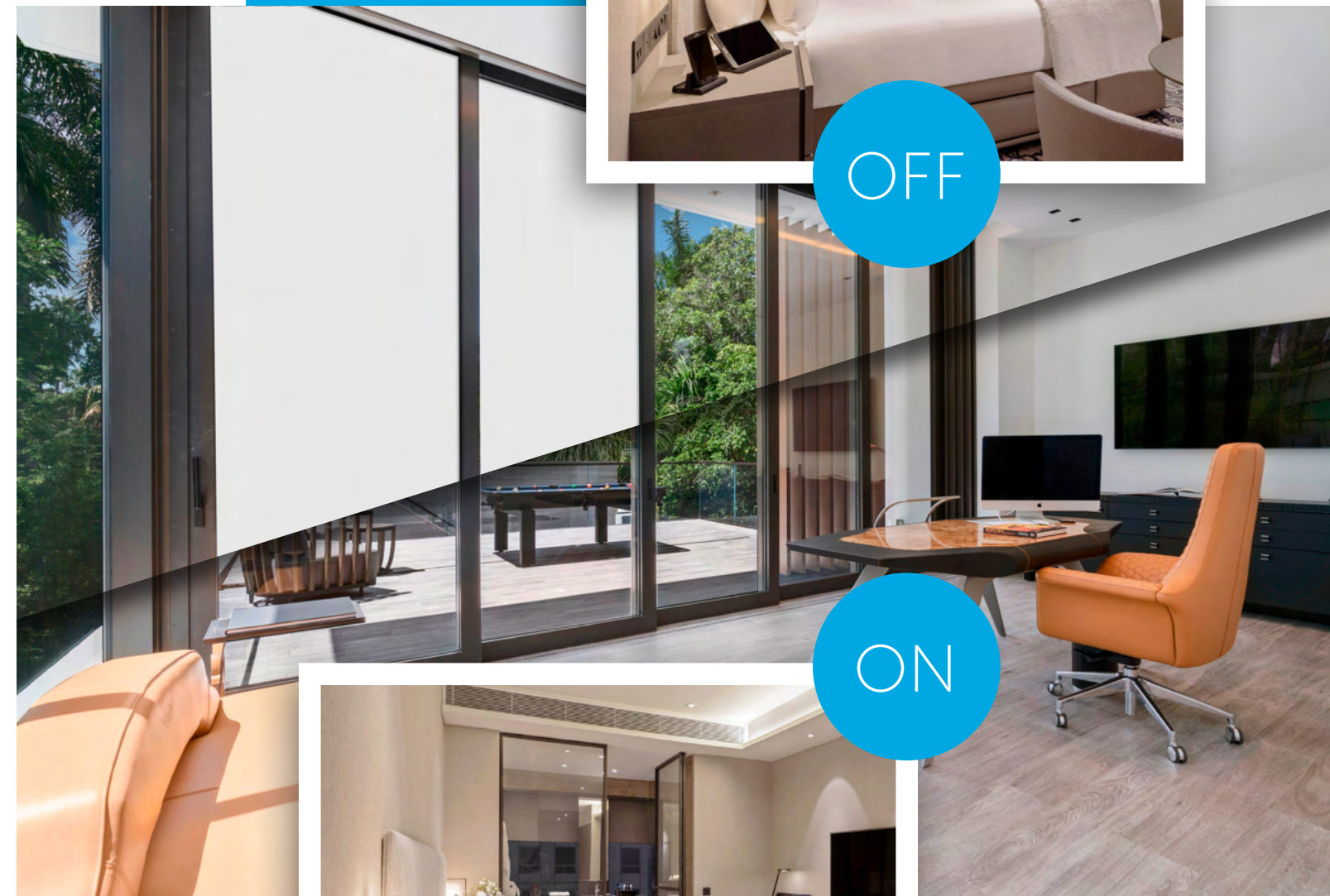
LIQUID CRYSTAL TECHNOLOGIES

Our liquid crystal based products allow glass to switch from opaque to controlled levels of transparent in less than 0.5 seconds.

Controlling various types of light, paired with switchable features, liquid crystal LCG[®] supports:

- instant privacy or an open atmosphere
- solar IR reflection for temperature control
- projection compatible for HD displays when opaque, and full transparency when not in use

All of this - with less electricity than it takes to power a laptop.



Retrofit Privacy Smart Films

A unique solution to convert your existing glass partition to a smart glass partition



Retrofit smart film options

- Custom Sizes
- Maximum Sizes 1.8 x 4 meter.
- Minimum Sizes 200mm x 200mm.
- Power Consumption 5Watts / m²
- 90% total light transmittance. 2%
- Haze.
- 99.5% UV Block.
- Switch speed : 6ms.
- 3 Year Warranty



Switchable privacy films for existing glass

Your existing glass can now be converted to a switchable privacy glass with our switchable self-adhesive films. These films have the same switchable properties as our laminated privacy glass and can be easily installed by our expert team.



Benefits

Save costs on costly glass replacements

Our switchable films can be easily installed on existing glass surfaces saving you expensive glass replacement costs.

Get rid of unhygienic blinds

The Vertical or horizontal blinds typically found in offices are not only difficult to clean but are also breeding grounds for bacteria, dust, and grime. MIR switchable films allow you to have complete privacy without compromising on your aesthetics or cleanliness.

PDLC Retrofit

LCG[®] Technology

Self adhesive smart films are applied to existing glass, allowing any glass to instantly be converted into smart glass. Handled exclusively by professional window film installers, these films are designed to be easily retrofitted into existing spaces.

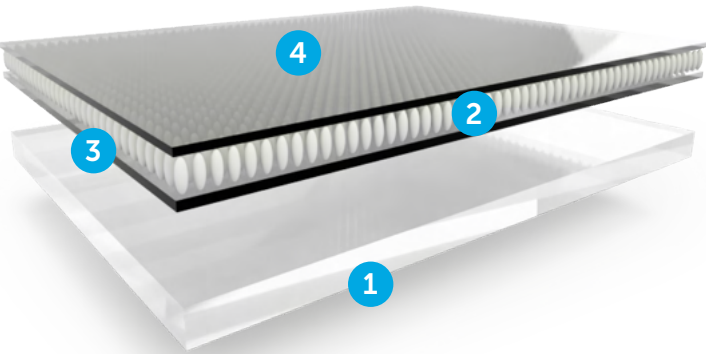
Working just like laminated LCG®, adhesive smart films support on-demand privacy, transparency, projection, and IR solar control. By retrofitting a project with Gauzy PDLC, the function of glass is enhanced from the moment installation is complete.

Adhesive smart films have a scratch resistant coating for durability, and can be installed onto almost any existing window, partition, or door, instantly transforming a space.

Films are precisely installed to ensure all wires and busbars are hidden with frames or other trimming solutions, creating a uniform and finished appearance.

Product Types:

- White
- Grey
- IR Solar Control White



- 1. Glass
- 2. LC Film with PET-ITO
- 3. Dry Adhesive
- 4. Scratch Proof Coating



Specifications:

Specifications:		White LC		Dark LC	
Film Optical Performance					
Attribute		OFF	ON ₁	OFF	ON ₁
Parallel Light Transmittance		4%	74%	2.9%	48%
VLT (Total Transmittance)		67%	77%	36%	50%
Haze (ON) ₂		3.8%		3.8%	
Color Grade		L* = 82.3		L* = 64.7	
		a* = 0.7		a* = 0.55	
		b* = 7.4		b* = 8.2	
Film Technical Properties					
Switching Time		10ms			
Lifecycle		1.8 Million +			
Operating Temperature		-20°C to +70°C			
Power Consumption		1-5W/m2			
Film Thickness ₃		560µ			
Max Film Width (mm) ₄		1200, 1800		1200, 1800	
Cut-to-Fit		Custom Sizes, Shapes, Busbar Position; Holes and Notches			
Glass Types		Annealed, Tempered, Clear, Low Iron/Ultra Clear, IG Units, Other			
Adhesive Type		Dry			
Scratchproof Coating		Yes			
Storage Conditions		-20°C to +60°C, <50% Humidity			
Electrical Performance					
Controller Types		Mini, Flex, Multiplex, Custom			
Operating Modes		Fade, ON/OFF, Dimming			
Operating Voltage		48-70VAC			
Operating Frequency		25,32,50Hz			

₁ Optical Performance measured using square wave signals provided by PDLC Controllers

₂ Haze tested on 'haze-gard i', by BYK. Results reported for LC at 25°C

₃ Film thickness may vary

₄ Films can be ordered in rolls or cut-to-fit sheets at any length

PDLC IR Solar Control LCG[®] Technology

Solar Control PDLC adhesive smart film is ideal for seamless application onto existing glass to reduce HVAC cooling costs and enhance visual comfort in spaces. Blocking IR, UV, and Visible Light, Solar PDLC supports temperature control and glare reduction combined with on-demand privacy and transparency. Solar Control PDLC smart film is an easy to install upgrade, increasing energy efficiency while providing a technologically advanced, sleek shading solution to reduce eye strain while still maintaining a light filled open atmosphere.

Key Features:

- Blocks up to 55% of Solar IR range and 99% of UV
- Reduces temperature by up to 15°C inside a space
- 60% visible light transmission when off maintains a light filled atmosphere while shading and reducing glare
- Premium optical performance with haze as low as 3.6%
- Outdoor grade, supporting architectural glass up to 1.5m wide

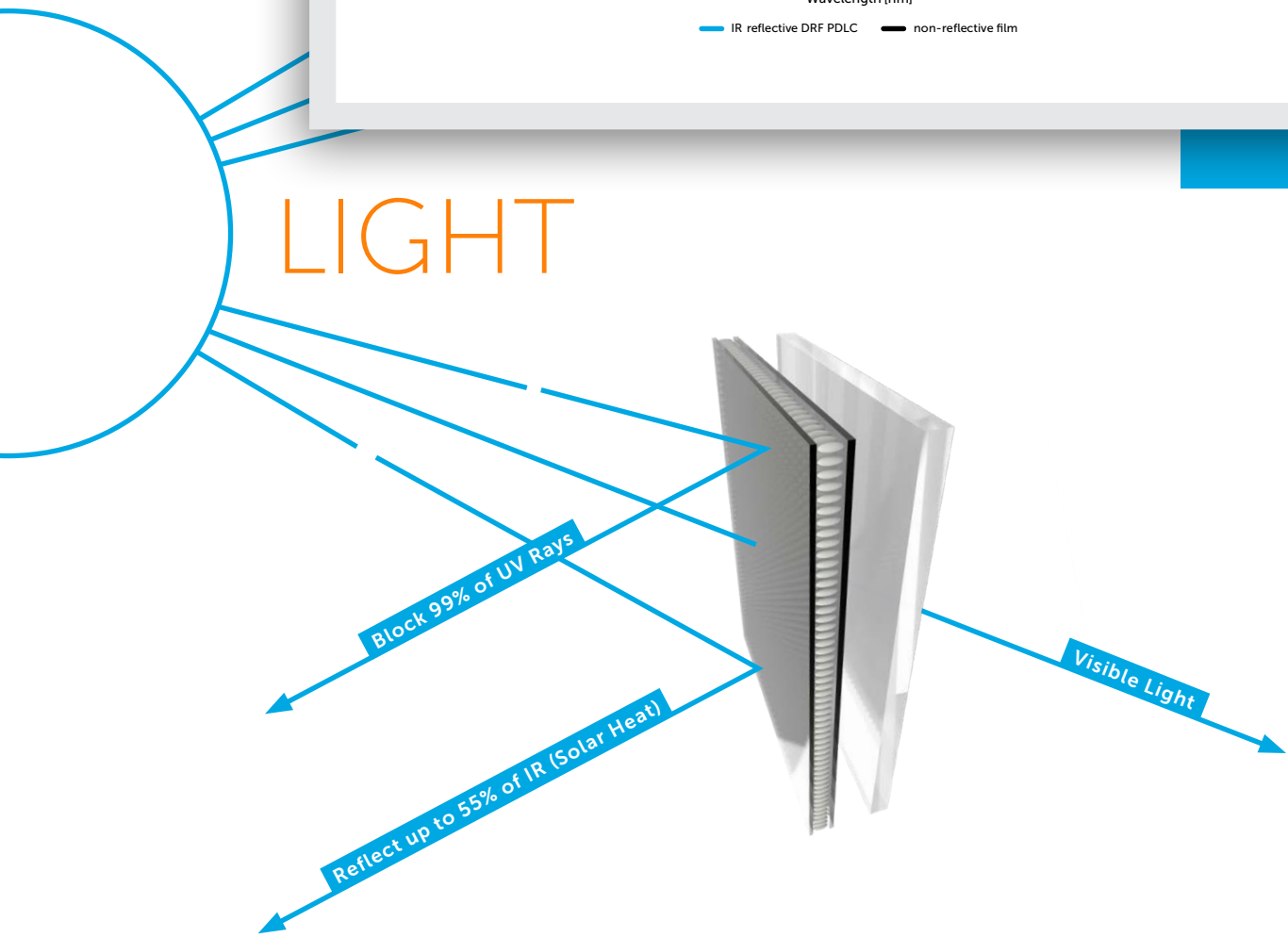
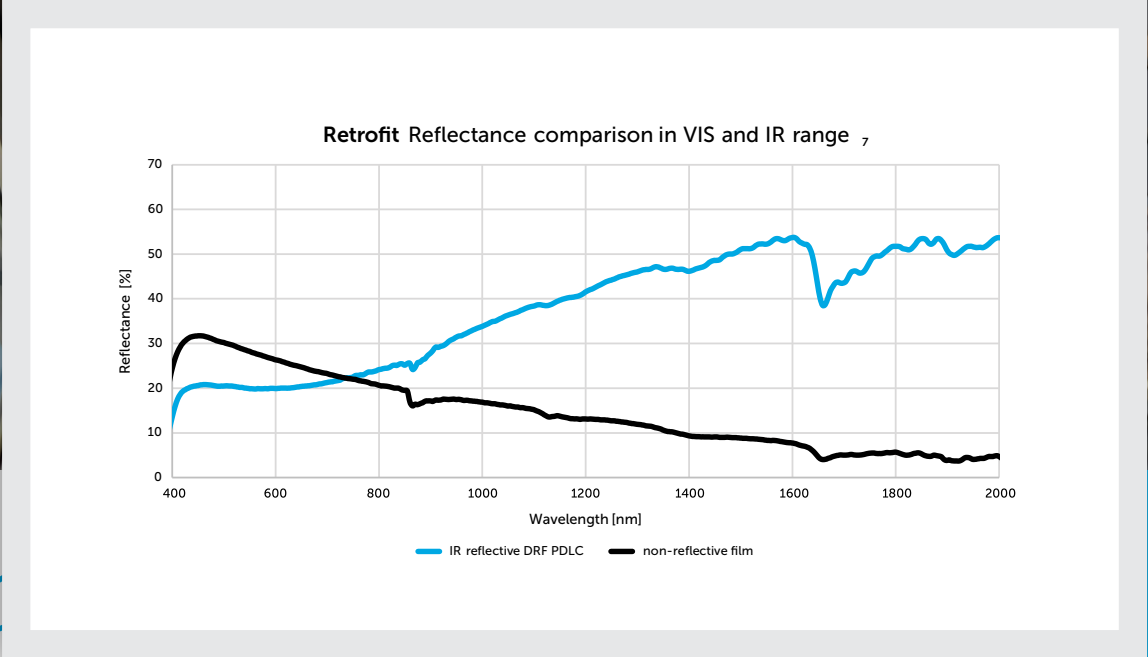
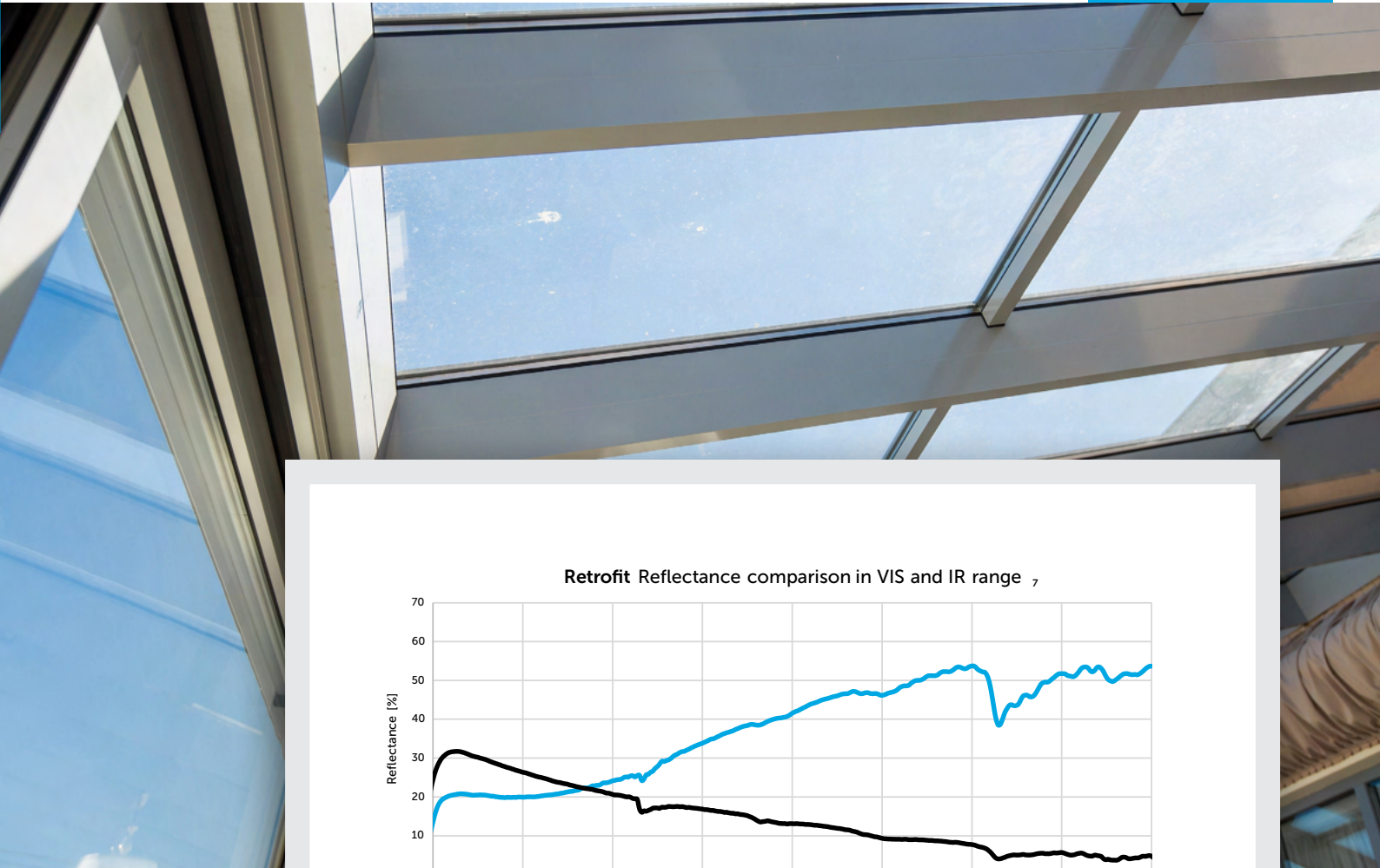
Adhesive smart film with solar control properties is designed to be applied directly onto existing glass windows. The product is optimized to perform in wide temperature ranges that occur in facades, skylights and atriums while complementing sleek and modern design.

Specifications:

White Solar LC

Film Optical Performance		
Attribute	OFF	ON ₁
Parallel Light Transmittance	3.2%	74%
VLT (Total Transmittance)	60%	76%
Haze (ON) ₂	25°C	4.4%
	80°C	3.6%
Color Grade	L*	77.12
	a*	-0.08
	b*	8.92
Film Technical Properties		
Switching Time	6ms	
Lifecycle	18 Million +	
Film Operating Temperature ₃	-20°C to +90°C	
Film Power Consumption	1-3W/m ²	
Film Thickness	505 μ	
Roll Width (mm) ₄	1200, 1500	
Cut-to-Fit	Custom Sizes, Shapes, Busbar Position; Holes and Notches	
Glass Types	Annealed, Tempered, Clear, Low Iron/Ultra Clear, IG Units, Other	
Adhesive Type	Dry	
Scratchproof Coating	Yes	
Storage Conditions	-20°C to +60°C, <50% Humidity	
Film Solar Performance ₅		
Attribute	Off	On
Visible Light Reflection - Interior	19.83%	13.4%
Visible Light Reflection - Exterior	22.02%	14.21%
UV Block	99%	99%
Total Solar Energy Reflection	29.90%	29.20%
Total Solar Energy Transmittance	39.1%	55%
Total Solar Energy Absorption	31%	15.7%
Shading Coefficient	0.56	0.69
G- Value	0.49	0.6
U- Value W/K*m ²	5.88	5.88
ΔT(°C) ₆	Up to 15°C	
Energy Saving	For every degree reduced, Gauzy saves approx. 7% on air conditioning costs	
Electrical Performance		
Operative Controllers	Mini, Flex, Multiplex, Custom	
Operating Modes	Fade, ON/OFF, Dimming	
Operating Voltage	48-70VAC	
Operating Frequency	25,32,50Hz	

- ¹ Optical Performance measured using square wave signals provided by Gauzy PDLC Controllers
- ² Haze tested on 'haze-gard i', by BYK.
- ³ Film thickness (μ) may vary
- ⁴ Films can be ordered in rolls or cut-to-fit sheets at any length
- ⁵ Results based on Gauzy's Solar Film retrofit on clear glass
- * Optical measurements are carried out at different temperatures from low to high to accommodate cooling times of PDLC and glass
- ⁶ Gauzy Solar LCG[®] reflects up to 55% of thermal IR, which reduces temperatures inside a space by up to 15°C. Solar IR = 2000nm. This is the point where thermal IR is generally benchmarked
- ⁷ Above 800 nm, IR PDLC films reflectance range increases and achieves ~55%, at 2000 nm, while the regular PDLC films present ~5%



LCG® PDLC Controllers

Patented controllers ensure the highest quality optical, mechanical, and electrical performance of LCG® laminated smart glass and smart films.

With square wave signals, controllers ensure ultra high transparency, allow films to stay on 24 hours a day, and protect smart glass against power surges.

FLEX, and MultiPlex controllers each offer a unique set of features best suited for varying glass sizes, input channels, and user preferences.

Features:

- On, Off, Dimming, Fade transitions
- Small form factor and footprint for easy installation
- Large drive capacity
- Advanced protection features for better ROI and MTBF
- Ultra-low voltage reduces up to 40% of power consumption
- WIFI/DMX/RS-485 compatible for easy connection to automation systems



Specifications:

	Mini	Flex	MultiPlex
Electrical Performance			
Universal Inupt	110/220VAC, 50/60Hz, 450mA	110/220VAC, 50/60Hz, 1360mA	110/220VAC, 50/60Hz, 1360mA
Output Voltage	42,48,70VAC Square wave, 25/30/32/50/60Hz, 600mA	42,48,70VAC Square wave, 25/30/32/50/60Hz, 1970mA	42,48,70VAC Square wave, 25/30/32/50/60Hz, 1970mA
Supported LCG® Area (up to)	4m² / 43ft²	10m² / 107ft²	10m² / 107ft²
Dimensions (LxWxH) (mm)	125x75x35	165x104x35	224x104x35
Weight (controller only)	.44kg	.71kg	.94kg
Wall Mounting	Built-in	Mounting Brackets	Mounting Brackets
Output Channel	1	1	1 to 32
Operating Configurations	On/Off, Fade	On/Off, Dimmer	On/Off, Blinds Fade
DMX	N/A	On/Off, Dimmer, Open Interface	DMX On/Off
COM	N/A	On/Off, Dimmer, Open Interface	On/Off, Fade
Cascade	N/A	0-10VDC	N/A

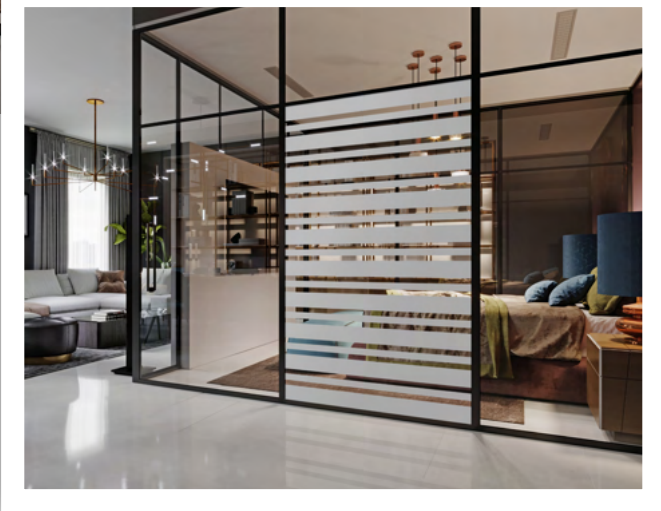


Laser Patterned Designs

Laser patterning machine etches lines directly into the PET's ITO coating, creating segmented films with nonvisible lines. This allows films to have dynamic patterns that appear and disappear.

Custom patterning features and unique designs with straight or curved lines and shapes provide a truly bespoke experience for users.

Laser patterned designs are available on both rolls or cut-to-fit sheets with unlimited segments. Applied busbars are included in cut-to-fit sheets.



Features:

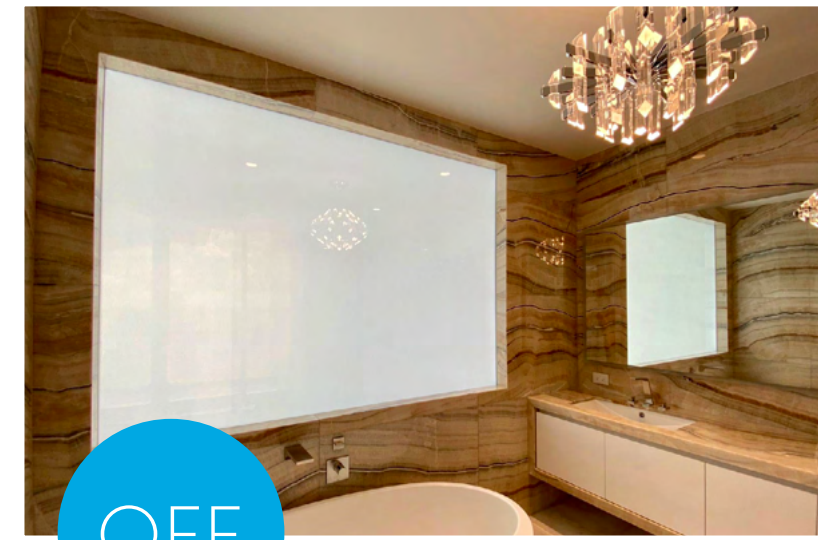
- 35µ lines support nonvisible etching
- Unlimited segments with corresponding busbar positioning
- Controlled by MultiPlex controller
- Fully customizable, including corporate logos
- Allows glass that is fully transparent, fully opaque, or dynamic with shifting patterns
- Repeat patterns available on rolls of both PDLC and SPD technologies

LCG®

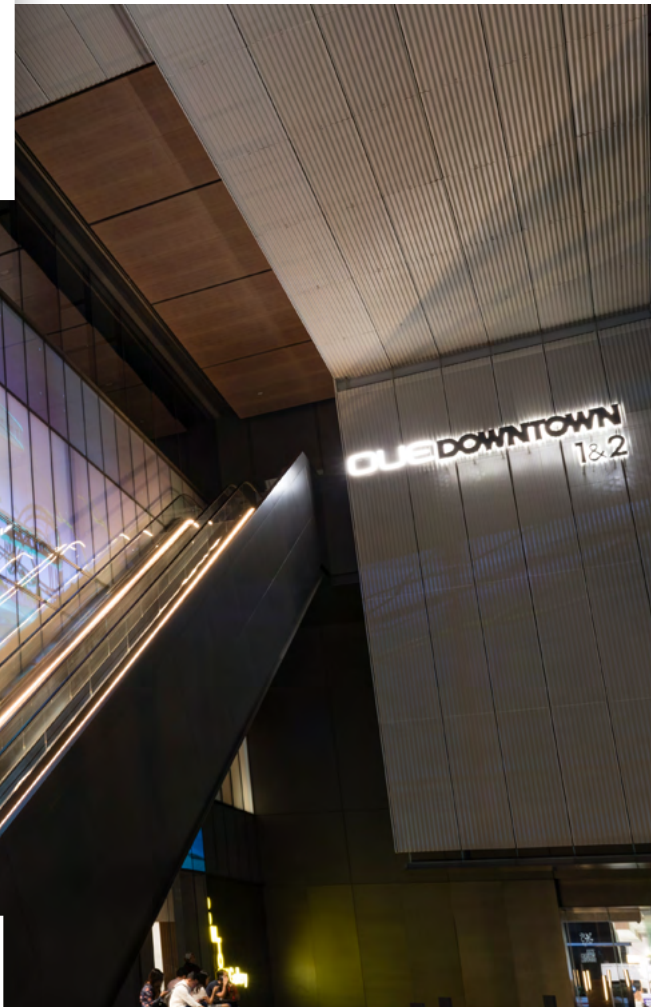
PDLC TECHNOLOGY



OFF



OFF



ON



ON



Advantage

- Ultra Low Haze
- 18 million+ on/off cycles and 10,000 constant "on" hours with no need for a break
- Compatible for lamination with any type of glass, large panels and curved glass
- Segmenting and patterning allows privacy control in selected areas of glass
- Controller prevents burnout, and allows glass to be kept on 24/7
- 0-10v, DMX, or RS485 integration available for home automation systems

LCG® Products

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Certification, durability & testing

Manufacturing Company is ISO 9001 CERTIFIED offering exceptional strength and safety.

BSEN 12150:2000	Glass in Building Fragmentation Test
BSEN 12600:2000	Glass in Building Pendulum Test
BSEN 60529:1992	Ingress Protection, awarded IPx7 rating
EnISO 12543-4	Humidity and Boil Test

Our products also conform to the electrical standards

BSEN 7671	Electrical installations in Buildings
HD 60364-7-701	Installations containing a Bath or Shower
BSEN 61558-2-4	Our Transformers meet this standard

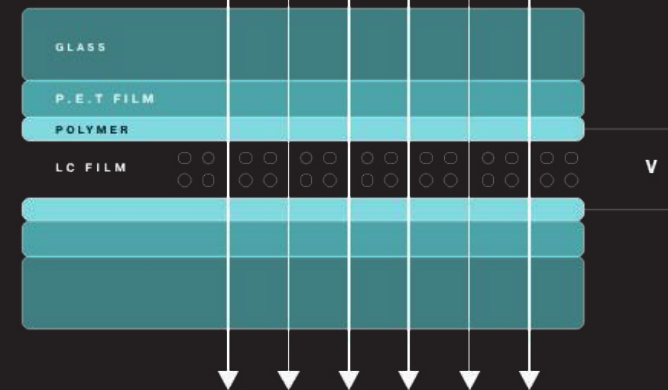
UL & cUL Accrediation

UL 962	Household and commercial furnishings
CSA C22.2 No. 0-10	General requirements Canadian Electrical Code - Part II

Tested in excess of 9 million switch cycles in-house without any change in appearance.

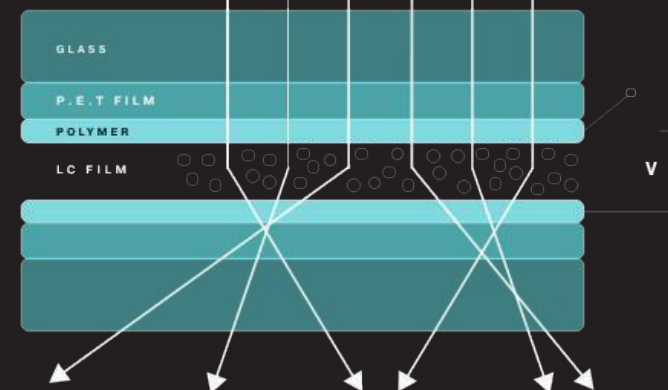
Power On

(Translucent)



Power Off

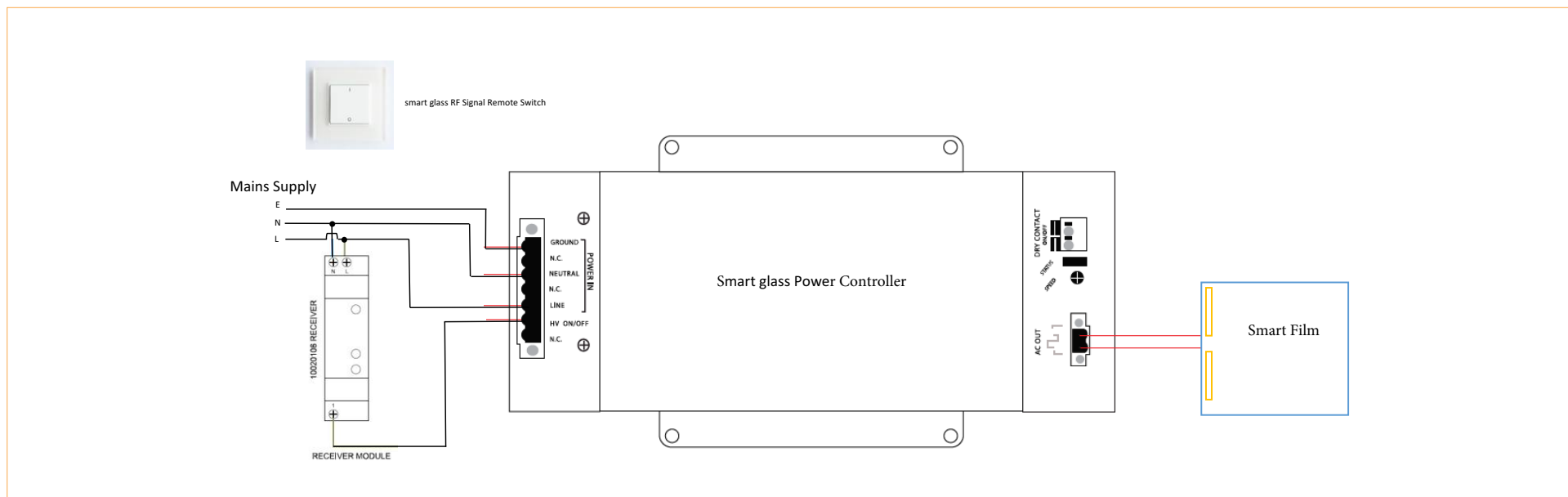
(Opaque)



Wiring and Installation

Wiring Diagrams

Wireless Wall Switch Wiring (Privetek Smart glass Supplied)



Programming of Radio Transmitters

For programming, the 10020069 receiver must be connected to power. The programming is retained when power is disconnected. To prevent associating unintentional switches, when in programming mode the receiver sensitivity is reduced to approximately 5 meters from the switch. To enter the programming mode, press the LRN button for approximately 0.5 sec. The LED will start to flash regularly. To associate a transmitter, simply press the desired switch. The receiver will acknowledge the signal has been recorded to memory by maintaining the LED on for 4 seconds. Once the LED begins to flash again, the next transmitter can be associated or cleared. To clear a transmitter which has already been associated, press the LRN button to enter programming mode and press the desired switch. The receiver will acknowledge the signal has been deleted from memory by maintaining the LED on for 4 seconds.

For alternative switch method wiring diagrams please contact Smartglass representatives.

Notes: The receiver can store up to 32 transmitters or 16 2-way switches. If the memory is full, the receiver will exit the programming mode upon attempting to associate another device.

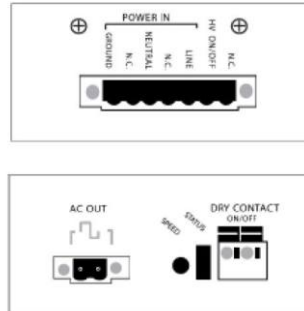
If no button is pressed the receiver will exit programming mode after 30 seconds.

Programming mode is left by re-pressing the LRN button, or after 30 seconds of no activity the receiver exits programming mode automatically.

Signal range is 20m through masonry, 10m through reinforced concrete and 30m through plasterboard/wood – subject to the number of walls.

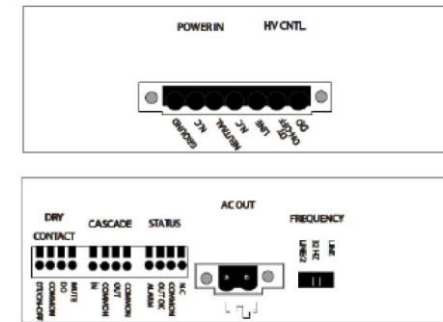
G23070VACM - Mini Controller

- Primary - 110/230VAC Input
- Secondary - 70VAC Output
- Overall Controllable Area - 4m2
- Switch Method
 - Dimmable - N
 - Dry Contact- Y
 - High Volt Switch - Y
- Overall Dimensions - 145mm x 100mm x 32mm



G23070VAC - Flex Controller

- Primary - 110/230VAC Input
- Secondary - 70VAC Output
- Overall Controllable Area - 10m2
- Switch Method
 - Dimmable - Y
 - Dry Contact- Y
 - High Volt Switch - Y
- Overall Dimensions - 145mm x 100mm x 32mm



Wiring & Testing

smart glass International requires that all Smartglass electrical installations be completed by a licensed electrician, and in compliance with all local rules, legislation 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 possibly the Smartglass. All metal frames must be earthed.

When connecting multiple Smartglass panels, they 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 will be approximately 60-80VAC.

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.



Troubleshooting

Privacy smart glass operates at 60-80 VAC 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 smart glass panel switches. If one or more smart glass 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 no 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.





Registered in UAE as **MIR Green Buildings Construction Material Trading LLC**
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