



# Technical Guide for Smart Film

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## **SMART FILM INC.**

**DO NOT ATTEMPT TO INSTALL THE SMART FILM  
PANELS ON A LIVE CIRCUIT!**

**ATTENTION!!**

**CAREFULLY READ ALL INSTRUCTIONS  
BEFORE PROCEEDING  
FAILURE TO COMPLY WITH THE MANUFACTURER'S RECOMMENDED  
GUIDELINES MAY VOID MANUFACTURER'S WARRANTY  
USE ONLY NON-ACIDIC SEALANTS**

Use only neutral cure (non-acidic) silicone sealants. Using any other sealants other than the recommended types may cause permanent damage. Smart Film Inc. provides wiring diagram examples for the operation of switchable Smart Film, however Smart Film Inc. assumes no liability for the wiring of any products and recommends that the purchaser or purchaser's designated agent consult with a licensed electrician for compliance with area Building Codes and professional electrical system wiring. Smart Film Switchable Smart Films are designed for commercial and residential application using 40-60 VAC primary power and a minimum of 15 Amp Circuit Breaker, equipped with ground fault circuit interrupter (GFCI) protection for operation of the Power transformer. Combined Smart Film is not to exceed (150) square feet when powered by a single Smart Film Inc. provided power transformer.



## 1. Shipping

Where required, shipping tubes are individually made for each customer order. These tubes are packaged inside boxes that are designed to provide protection of film and accessories in transit. A small box is attached to the base of the crate containing electrical accessories purchased as part of the order.

It is the responsibility of the recipient to offload deliveries unless otherwise agreed prior to dispatch and correct handling methods should be observed when offloading.

It is the customer's responsibility to notify the shipper if access to the delivery address site is restricted.

If no preferred carrier is stated for shipping within North America, consignments will be shipped through ground carriers, and customers consignments can be shipped via air, sea or road depending on location, cost and timescale required.

All consignments are sent Freight Collect and insured to the full value of the goods, a quotation for crating, shipping and insurance will be provided prior to dispatch.

## 2. Receiving

Before signing for and accepting the shipment from the carrier, the order should be inspected for shortages or damage. If shortages or damage is found the shipping documentation should so be noted and the driver's signature obtained as a witness.

Smart Film Inc. should be notified of any short deliveries and/or damage to goods immediately or in any event within 24 hours of delivery in order to pursue a claim with the carrier.

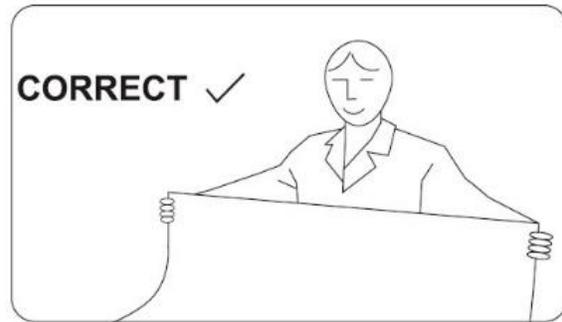
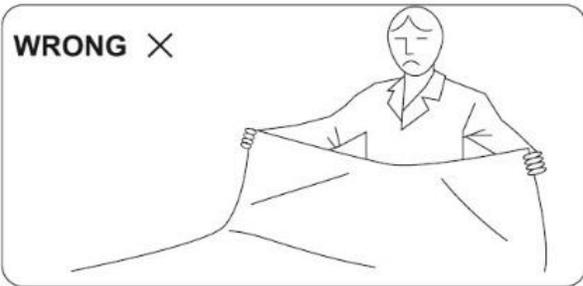
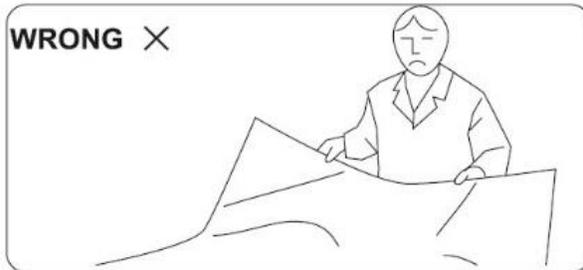
The Courier or Smart Film Inc. are not responsible for shortages or damage if the party taking delivery of the goods fails to inspect the consignment at the time of delivery.

## 3. Storage

Smart Film can sustain damage between delivery and installation; therefore care should be taken when the product is being handled, recommended guidelines for the handling of smart film included in this document. If the Film is not being installed immediately after un-crating, care must be taken to protect it and stored flat, out of direct sunlight, where the relative humidity is less than 80% and a near constant temperature between -20 and +50 °C in order to prevent the formation of condensation on the film.

**When you receive the film carefully remove and unroll from package tube. Allow the film to lay flat on a clean surface for a minimum period of 5 days.**

#### 4. Handling



Never fold, bend or curve Smart Film. Always keep the film flat and straight as shown in picture  
Do not remove the protective liners until you are ready to install the film  
Wear Nitrile gloves when handling the film  
When handling films take particular care with the edges to avoid de-lamination

#### 5. General Installation Guidance

The customer or installer should thoroughly inspect each piece of Smart Film prior to installation.

Never attempt to install products which you consider to be incorrectly sized, damaged, scratched, abraded or deficient in any way, in the first instance contact us for an initial assessment.

Any attempt to install a deficient product will signify acceptance of its suitability and as such cannot not be replaced. Adhere to all Smart Film installation guides.

Smart Film adheres to glass using a silicone based cling layer, and is a **DRY APPLY** product, - **SMART FILM SHOULD NEVER BE WET APPLIED – THIS WILL IRREPAIRABLY DAMAGE THE FILM**

Film Dimensions should be 2 to 3mm smaller in each dimension than the visual area of the glass it is being applied to.



## **NEVER ATTEMPT TO TRIM FILM ON SITE –PLEASE CONTACT US FOR ADVICE**

The buss-bar or electrical connections should never be allowed to have contact with metal frames or trims.

Smart Film should never be installed in situations where it may be subjected to loading or pressure or mechanical stress, for example clamped between metal or plastic fittings, door furniture, and framework or subjected to any other form of concentrated mechanical loads or actions.

We recommend that the electrical connections are positioned and exit at the top of installation.

### **“CAUTION” “RISK OF FIRE ELECTRIC SHOCK OR INJURY TO PERSONS”**

When film is installed in environments where it may be subject to dampness or humidity, each edge must be completely sealed so as to be impervious to moisture ingress, and particular attention must be paid to sealing the bus bar edge.

We only recommend the use of Dow Corning AS7096N, Dow 795, Dow 991, Dow 995 and Dow 1199 as a sealant for use with any of our products; this can be supplied by us upon request. Customer specified holes and cut outs produced during the manufacturing process may cause the edge of the smart film to discolor slightly and as such will require 4-6mm coverage by a trim, escutcheon or bezel.

Great care should be taken when installing fixings and fittings to the film, metal parts should never have direct contact with the surface of the film and film should be cut to fit around fixings, fittings and furniture

To avoid the risk of mechanical threaded fixing becoming loose over time the use of a high quality thread adhesive in line with the manufacturer’s instructions should also be considered.

When two or more films are being applied side by side on a single piece of glass, a gap of 0.5 to 1mm should be left to prevent an electrical short damaging the film edges. It is also recommended that the buss-bar tags of films being applied side by side are positioned with the same polarity adjoining each other (eg.. positive and positive or negative and negative).

## 6. Film Installation

### Step 6.1: Equipment Required

99% Isopropyl Alcohol



Glass Scraper



Glass Squeegee



Glass Cleaner



Lint Free Clothes



Nitrile Gloves



Film Applicator



Silicone



### Step 6.2: Glass Preparation

Spray the glass with a 99% isopropyl alcohol and clean with a soft lint free cloth, REPEAT THIS PROCESS until the surface is COMPLETELY CLEAN

If necessary spray the glass with a 99% isopropyl alcohol and carefully use a window scraper or blade to remove any dirt, blemishes or seeds from the surface of the glass. –the surface needs to be COMPLETELY SMOOTH

Using a lint free cloth, clean the glass surface meticulously with IPA (isopropyl alcohol) and leave to evaporate. Proceed to clean glass surface with a soapy water solution and squeegee off with window squeegee.



### Step 6.3: Preparation of Film

Place the film in safe, clean, flat area, preferably a table which supports the entire film, ensuring the adhesive / cling surface is face up.

Wipe down the protective liner applied to the self-adhesive cling layer of the Smart Film to remove any dust. Before commencing installation ensure the film fits the area to be filmed by carefully positioning it against the surface whilst checking for the required clearances.

### Step 6.4: Preparation of Film for Application

Using the Edge Tab on the label remove the first 100mm (4") of the protective liner applied to the self-adhesive cling layer of the Smart Film completely along the buss-bar edge. **ENSURE YOUR WORKING ENVIRONMENT IS CLEAN AND DUST FREE.**



### Step 6.5: Initial Positioning of Film on Glass

Accurately align the buss-bar edge of the Smart Film with the top edge of the glass, when in position gently run a finger along the film just below the buss-bar to achieve an initial adhesion of the film to the glass with the 100mm (4") of cling layer already exposed.

**TO MINIMISE THE RISK OF DAMAGE TO THE FILM DO NOT REMOVE THE LINER FROM THE UPPER / NON ADHESIVE SURFACE UNTIL THE INSTALLATION IS COMPLETED**

### Step 6.6: Application of Film to Glass

Whilst gently supporting the film at the edges, and at a shallow angle to the glass surface, slowly pull away the liner from the cling surface and allow the film to adhere to the glass under its own weight. Use the applicator to work out any air pockets to the sides or the working edge of the film.

Should it not be possible to work out any air pockets between the film and the glass, slowly and carefully ease the film back from the glass and allow the film to re adhere to the glass using its own weight whilst working with the applicator to remove the trapped air.

Continue this process to the bottom of the film and it is fully installed on the surface of the glass.

### Step 6.7: Finalizing Application

Use the felt edge squeegee gently work out any remaining small bubbles to the edges of the film, ensuring that the edges have good contact with the glass.

NOTE: Should you need to lift the film from the glass once it has been fully applied, to avoid any damage to the edge of the film, use the tip of a fine blade (eg.. a scalpel or craft knife) to gently and carefully ease one of the bottom corners away from the glass, taking great care not to damage the silicone cling liner which adheres the film to the glass. NEVER use a thumb or finger nail, this will damage the corner of the film and possibly cause de-lamination. In some cases air bubbles are inevitable. If the glass panel is not completely smooth a pocket can be formed creating such air bubble. This is a normal situation and does not affect the function of the film.

### Step 6.8: Wiring the Buss-bars

**PLEASE READ THESE SECTIONS IN CONJUNCTION WITH THE ELECTRICAL INSTALLATION NOTES TOWARDS THE REAR OF THIS GUIDE**

Once the installation of the film is satisfactorily completed, electrical installation can commence. Begin by carefully crimping the electrical cables on the Smart Film to the prewired installation. Using 3m UL listed shrink tubes to seal the connection. If your kit comes with solderable copper



tabs you will be required to carefully make the solder connections to the supplied wire. There will be a copper tab for the positive lead and a copper tab for the negative lead. If multiple panels are purchased they are required to be installed in a parallel circuit and appropriately sealed or capped. It is recommended that the film is tested for correct operation at this stage by temporarily connecting the cables to the transformer and switch to ensure that the film is switching from frosted to clear. Once testing is complete, neatly fold the spare wiring back to the film.

#### Step 6.9 – Removal of outer protective liner

Locate the top edge of the outer protective liner, (approximately 10-15mm below the buss-bar). Starting in one corner begin to ease the protective liner diagonally from the face of the smart film, until the liner is removed across its entire width. Slowly and smoothly in a downward motion, pull the liner from the surface of the smart film.

#### Step 6.10: Trimming Off

Adhere a strip of narrow (5mm) clear double sided adhesive tape along the top of the film over the bussbar to tack the cables in place. The bus bars and cables must be securely covered with a suitable nonconductive trim and sealed with Dow Corning sealant to prevent the ingress of moisture onto the electrical connections.

### 7. Electrical Installation Notes

Smart Film is an electrical component and should be provided for in the electrical layout including the provision of fused circuits, switches, cable management and electrical connection boxes. All installations must meet the requirements of local regulations and guidelines and be carried out by a qualified electrician.

**Any metal framework close to or adjoining the wiring of the panel MUST be earthed. Smart Film must NEVER be installed in direct contact with a metal frame. If in doubt consult a qualified electrician prior to commencing any installation work.**

Before installation commences bus bars, connection leads and cables should be inspected to ensure the integrity of insulation. Where ever possible it is recommended that the operation of Smart Film is tested prior to commencement of installation. Great care should be taken to ensure that exposed bus bars, leads or cables do not come into contact with framework and any metal frames must be earthed and are totally sealed to prevent the ingress of moisture or water. Smart Film operates at 40-60 AC Volts, we supply UL/CSA listed step down transformers. Failure to use our Transformers may result in irreparable damage to the Smart Glass / acrylic or Film. (Datasheets can be supplied upon request). This is not covered by the warranty detailed in section 10 below. Multiple Smart Film panels can be connected in parallel to a single transformer up to the maximum 15 square meters A GFCI circuit is mandatory for installation in high moisture areas. It is imperative that the manual switch or remote control is wired into the circuit on the mains voltage side of the transformer; failure to observe this requirement may lead to irreparable damage of the Smart Film panels. Before turning on the power to a new installation the electrician should test the resistance reading between the frame and the bus bar feed cables to ensure that the reading resistance is infinite. If this is not the case the short circuit should be found and insulated accordingly.

### 8. Transformer Data Sheets

Technical drawing of a transformer showing dimensions and electrical specifications.

Dimensions:

- Top view: 2.5000 (width), 2.2333 (height)
- Front view: 3.39 (width), 2.85 (height), 4.00 (base width), 4.50 (total base width)

Electrical Specifications:

- Primary: 120V, 60 Hz
- Secondary: 52V, 1.92A
- Wiring: BLACK, WHITE, RED, RED, FUSE 3.0A

ALL LEADS 12" OUT

INPUT VOLTAGE	OUTPUT VOLTAGE	
	NO LOAD	FULL LOAD
110V	48.3V	45.3V
115V	50.0V	47.6V
120V	52.0V	52.7V
125V	55.0V	52.0V

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REV	NOTES	BY	DATE	REV	NOTES	BY	DATE

**HAMMOND MANUFACTURING**  
H301XXX  
BLK - WHL 120V 60Hz  
RED - RED 22V  
VA: 100  
Type 5AM 3D  
527763  
MADE IN CANADA

**HAMMOND MANUFACTURING**  
ELECTRONIC DIVISION  
52 DANFORTH PLACE  
WATERLOO, ONTARIO, N2J 3Z6  
PHONE: 519.888.8181 FAX: 519.888.8540

**100VA POWER TRANSFORMER**

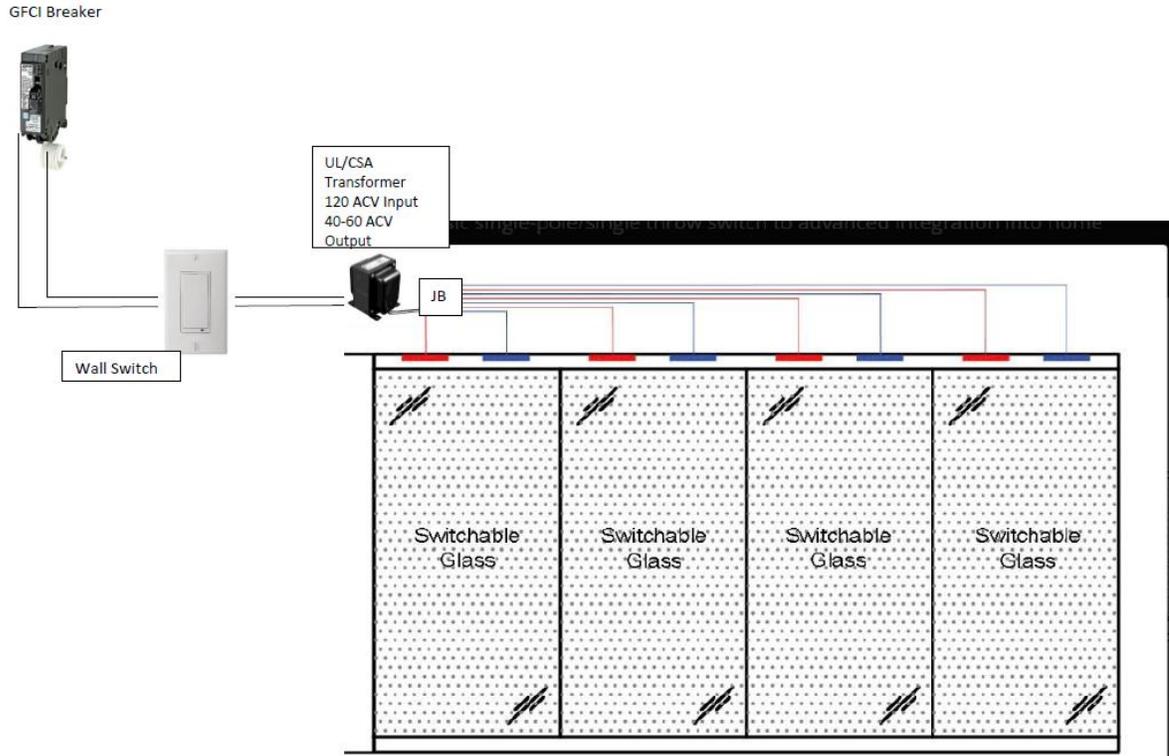
DRAWN: C.BACK DATE: 02/22/16 NUMBER: T.B.D.  
APPROVED: DATE:

## 9. Data Sheet

### Specification of Smart Film

- Operating voltage: 40-60VAC
- Frequency: 60 HZ
- Ampere: 100mA/ sqm
- Power consumption: 4-6W/sqm
- Parallel light transmittance: 80% on 10% off
- Sunlight transmittance: 80% on 10% off
- Haze: 2% on 80% off
- Max size: 1800 \* 30000 mm
- Thickness 0.4mm
- Viewing angle: 150 degree
- Switch: 3 million times switch on and off
- Estimated Life span: 10 years
- Sound control 37db
- Heat Rejection 40% Off
- UV Protection 99% On/Off
- Temperature tolerance of 13F - 190F

## 10. Wiring Diagram



## 11. Cleaning and Aftercare

Once the Smart Film has been installed, the glazing contractor should make provisions to ensure that the films are protected from possible damage caused by the construction practices of other trades.

Special care must be taken during the initial cleaning, cleaning during the construction period, or when film surfaces are severely soiled, in order to prevent marking or damage caused by abrasive contaminants.



In the event that the film surfaces become heavily contaminated with abrasive particles the surface of the film should initially be blown with a low pressure compressed air or electrical blower to remove as much of the contaminant as possible.

Any remaining surface contamination should be removed by gently flicking the surface of the film with a soft bristled cleaning/dusting brush.

**Caution must be taken to ensure that any remaining abrasive materials do not become trapped and dragged across the film surface and the brush; otherwise the surfaces may be scratched.**

For routine cleaning the film surface can be cleaned with Soft IPA wipes and/or a PH neutral, non-abrasive liquid glass cleaning product applied SPARINGLY to lint free, clean, soft microfiber cloth.

Do not allow any metal or hard parts of the cleaning equipment to contact the film surfaces.

**Please note that the plastic surface of the film can be marked or scratched if the care and cleaning instructions are not followed.**

**NEVER ATTEMPT TO CLEAN SMART GLASS OR SMART FILM WITH A WET CLOTH AND BUCKET OR OTHER WINDOW CLEANING TECHNIQUE WHICH DRENCHES THE SURFACE OF THE GLASS OR FILM. THIS WILL CAUSE IRREPARABLE DAMAGE TO THE PRODUCT AND WILL INVALIDATE THE WARRANTY.**

To ensure many years of problem free operation we recommend that Smart film is operated continuously (switched clear) for no longer than 20 hours in any 24 hour period.

**Annual checks:** We recommend that 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 Smart Film 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 Smart Film Inc.

12. UL Documents

## CERTIFICATE OF COMPLIANCE

Certificate Number 20160428-E482301  
Report Reference E482301-20160427  
Issue Date 2016-APRIL-28

Issued to: Wheelok Hdsign Billboards Inc  
7 Sarah Cr.  
Smithville  
ON L0R2A0 CANADA

This is to certify that  
representative samples of

COMPONENT - FURNISHINGS, HOUSEHOLD AND  
COMMERCIAL

— Electrified Glazing — Smart-Film, Models SFGA-x, SFGL-x  
where x is a code which denotes the color.

Have been investigated by UL in accordance with the  
Standard(s) indicated on this Certificate.

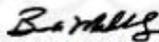
Standard(s) for Safety: UL 962, Household and Commercial Furnishings  
CSA C22.2 No. 0, General Requirements Canadian  
Electrical Code

Additional Information: See the UL Online Certifications Directory at  
[www.ul.com/database](http://www.ul.com/database) for additional information

Only those products bearing the UL Certification Mark should be considered as being covered by UL's  
Certification and Follow-Up Service.

Recognized components are incomplete in certain constructional features or restricted in performance  
capabilities and are intended for use as components of complete equipment submitted for investigation rather  
than for direct separate installation in the field. The final acceptance of the component is dependent upon its  
installation and use in complete equipment submitted to UL LLC.

Look for the UL Certification Mark on the product.



Bruce Matzenholz, Director North American Certification Program  
UL LLC

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. For questions, please  
contact a local UL Customer Service Representative at <http://www.ul.com/local360office>





### 13. Smart Film Inc. Window Smart Film Warranty Limited 1 Year Product Warranty Warranty ID#

**Product Warranty, Limited Remedy and Disclaimer:** Smart Film and the Authorized Window Film Dealer (collectively referred to as “Seller”) warrant for one (1) Year from the date of purchase provided that the product is maintained in accordance with the Window Care Instructions below, that the Smart Film will:

**Maintain-Privacy Properties** without cracking or peeling

**Maintain- Adhesion Properties to a reasonable degree** without blistering, bubbling, or delaminating from the glass. Deviations both concave and convex in the glass may create air pockets, are not the responsibility of Smart Film and will not negatively affect the films operation. Smart Film follow the standards of IWFA

**Maintain- Appearance** without discoloration

B-Smart Film must not remain on (powered) for more than 20 hours in a 24 hour period.

**If the Smart Film product does not conform to this warranty, the sole and exclusive remedy is:**

**Replacement of the Quantity of Film** proven to be defective.

**Note:** Seller’s obligation is limited to furnishing replacement film. Seller will not be liable for installation costs of replacement film.

If the client has not retained the services of Smart Film Inc. for the installation of the sold product, the client shall be fully responsible for the installation thereof, and Smart Film Inc. shall be responsible only for the quality of the product.

Smart Film Inc. warranties are reserved for the original purchase only.

This warranty is NOT valid for any film applied on the exterior of the building.

This warranty is only to the original purchaser of the Product(s) from Seller, is not transferable and is further subject to the terms and conditions set forth herein. SMART FILM INC. MAKES NO OTHER EXPRESS OR IMPLIED WARRANTIES OR CONDITIONS, INCLUDING ANY IMPLIED WARRANTY OF CONDITION OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Except where prohibited by law, Smart Film will not be liable for any indirect, special, incidental or consequential damages, regardless of the legal theory asserted. The Product Warranty applies only when Product is maintained in accordance with Window Care Instructions below, when the Product is properly installed. This Product Warranty does not cover misuse, abuse or acts of God. **This Product Warranty covers U.S. and Canada only.**

**Claims Process:**

To obtain warranty service, please contact your Smart Film Inc. Authorized Window Film Dealer at:

**Important Notice: Window Care Instructions**

Please keep film powered off when cleaning.

Simple solution of water and small amount streak free detergent soap or Isopropyl alcohol and a lint free micro fiber cloth can be used for film cleaning. Add the cleaning solution to the cloth and simply wipe the Smart Film clean. You may also clean the film with standard glass cleaner.

Avoid harsh paper towels to prevent light scratches. Do not use any abrasive cleaner, industrial strength cleaner or other window cleaning tools that may scratch the film. If edges of film are not sealed with silicone, avoid water contact with this area.

**To maintain your warranty, do not use tape or other adhesive products on the film.**