

Smart PDLC/PNLC/SPD Film Busbar Operation Instruction

Storage:

1. For roll type film, put on shelves like this, for precut pcs type, lay flat on table:

Storage environment:

Temperature: -10 – 35°C, Humidity <50%;

Dry indoor environment, avoid sunlight, not to be wet or immersed in water;

Away from heat sources, not exposed to any acid, alkali and organic gases or liquids.

Do not subject smart film to force and compression.

Film Cutting:

1. Prepare film: for self-adhesive film, normally the film size is smaller about 5mm than glass size, for example: the glass exact size: 1000*1000mm, the film suggested about 995*995mm, this will be helpful to install;
For laminated smart glass, the film size should be smaller about 6-8mm than glass size, for example: the finished smart glass size: 1000*1000mm, the film size is about 994*994mm, this is helpful to let glass combine strong;
2. Use the roller cutter like the following pictures to cut film, for self-adhesive film, should let adhesive side on top side, this is helpful to install the film easily; if you have no that, pls make line on film, then use scissor to cut, don't use knife;



Note:

Pls use this type roller cutter to cut switchable PDLC film, if you have no this cutter, pls use scissor, don't use knife!

If you use scissor to cut film, after cutting, use dust free paper with absolute alcohol (more than 95%) to clean the cut edge to remove some burr;

Busbar length:

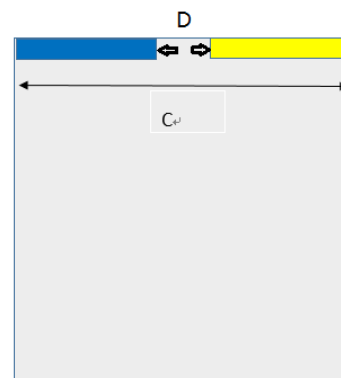
Normally the busbar should be on one whole top width, the middle gap :D should meet the following standard:

When $C \leq 800\text{mm}$, D gap:20%, for example: $C=550\text{mm}$,

the D gap :110mm;

When $C > 800\text{mm}$, D gap:250-300mm, for example: $C=1000\text{mm}$,

the D gap :250mm;



The Busbar Model Standard:

		Busbar Model			
Item		Model A	Model B	Model D	Model C
Busbar Model					
PDLC Film	Standard	Height<2.7m and Ratio of height to width< 7	2.7m≤Height<3.3m or Height<2.7m or Ratio of height to width≥7	3.3m≤Height<5m or Height<3.3m or Ratio of height to width≥7	5m≤ Height or Height<5m or Ratio of height to width≥7
	ITO Resistance	For PDLC film, the ITO is easy damaged,when wiping the polymer with dust-free paper, you need to wipe gently to prevent damage to the ITO and ensure that the resistance is within 300 Ω,less than 200Ω is best;			
PNLC/DLC Film	Standard	Height<1.5m	/	1.5m≤Height<3m or Height<1.5m	3m≤Height or Height≤3m
	ITO Resistance	Since the PNLC film adds an insulating layer to the ITO layer, the insulating layer needs to be wiped clean. After removing the polymer, the insulating layer needs to be wiped off with a little force using dust-free paper moistened with anhydrous ethanol, the square resistance must be less than 300Ω, 150-220Ω is the best.			
EP(SPD) Film	Standard	Height<3m	/	3m≤Height<5m or Height<3m	5m≤ Height or Height<5m
	ITO Resistance	For EP film, when wiping the polymer with dust-free paper, you need to wipe gently to prevent damage to the ITO and ensure that the resistance is within 300Ω, normal 100-300Ω;			

PDLC Film standard:

1. Mostly the busbar should be on the top width side of film:Mode A:

E.g:H1000mm,W500mm, busbar on one Top side:500mm;

Note: the busbar should be on top of window or door film, if on bottom, the water on the windows or doors will drop to the bottom, and the busbar will be eroded after a long time.

2. There have two situation need to make busbar on two short width side:Mode B or one long height side: Mode C:

The height of film is more than 2700mm, you need install busbar on two short width side,

e.g: 2700*1000mm, should on both 1000mm (Mode B) or on one 2700mm side(Mode C);

If the film $H/W \geq 7$, e.g: H:2100mm,W:300mm, $2100/300=7$,busbar should on two width

side(Mode B) or one long height side(Mode C);

3. When the H is 3.3-5m, should use Mode D or Mode C;

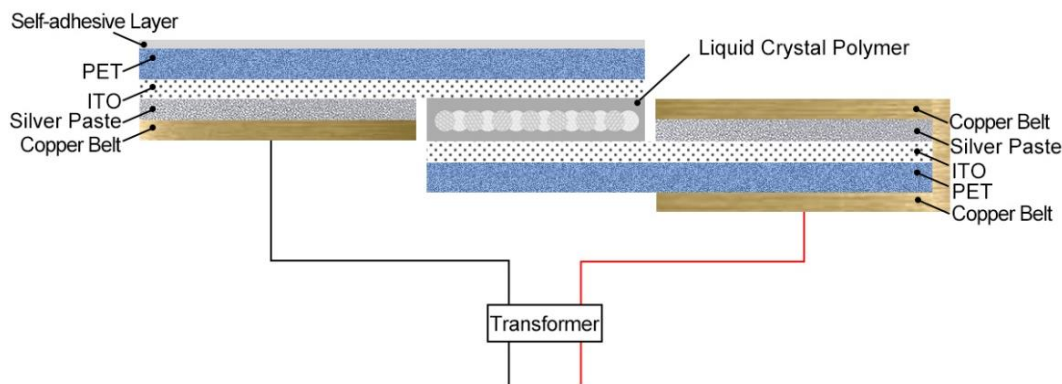
4. When the H is more than 5m, should use Mode C, busbar on long height;

PNLC/DLC film standard:

When height is more than 1.5m, pls use Model C or D;

Self-adhesive Film Busbar Operation Process

Self-adhesive Film Busbar



1. Cut the switchable film according to your size list;



2. Draw busbar position line on busbar side with ruler, on both side of film, keep widths:6-7 mm, the length is about 45% from edge film to middle position, make the positive and negative busbar on each side;



3. Use the busbar knife to cut out the layer of PET;

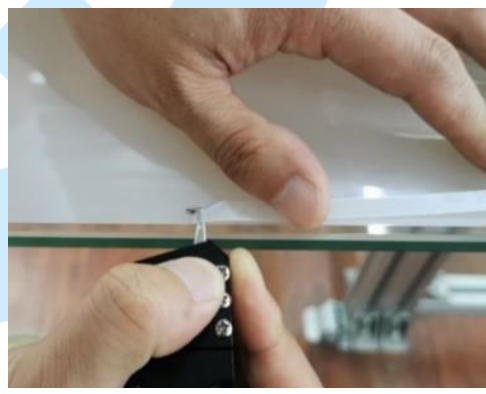


4. Cut from PDLC film sandwiched with the blade, insert the blade between of two PET layer;

Note: Don't let blade touch the bottom side of PET, the ITO coating is easy to damaged by mental;



5. Cut out the one side layer of PET along the line we draw;



6. Cut out another side layer of PET along the line we draw;



7. Prepare dust free paper and dip in anhydrous ethanol (more than 95%), then clean out the liquid crystal polymer, until clean out the polymer totally;

Note: 1.don't use non-dust cloth, this is easy to damage the ITO coating;

2.the anhydrous ethanol should be more than 95%, this is easy to clean out the polymer;

3.don't use strong strength to clean out, it is easy damage the ITO coating;

4.When wiping the liquid crystal plymer, the force should be light, with the elasticity of dust-free paper as the upper limit of force. Dip in anhydrous ethanol as if wiping the surface liquid crystal clear, and it will generally look very clean. Excessive wiping will cause the conductive layer to become thinner, and the resistance value will increase or disappear; About 80%, there is no need to wipe it completely transparent



8. Use the sheet resistance meter to test the sheet resistance value of ITO layer, mostly should less than 300 Ohm, if the data is bigger than 300 Ohm, this show the ITO layer have been damaged, need make new busbar;



Good



Bad

9.use transparent tape to protect the inner cut edger of PET, about 1mm, this will prevent the silver paste touch the inner edge of PET;



Note: the silver paste should leave about 1-2mm space with another ITO layer;

10. Use a brush or other tools to evenly apply the silver paste to the busbar position;



Note: 1. The silver paste position should not come into touch with alcohol and water, especially alcohol. If the silver paste comes into contact with alcohol, the silver paste at this position should be wiped off and reapplied;

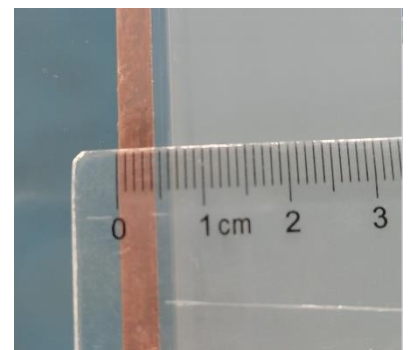
2. Silver paste must not come into contact with alcohol or anhydrous ethanol.

11. use hair drier to dry the silver paste, about 80-100degree 20-30min, until the silver paste completely dry;

Note: must let the silver paste dry totally, you can use nail to scratch to test;



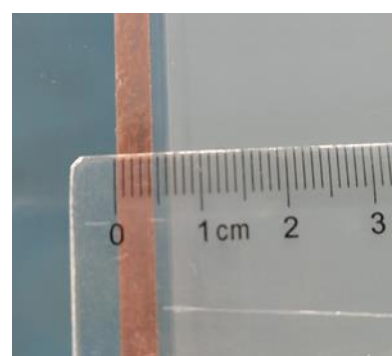
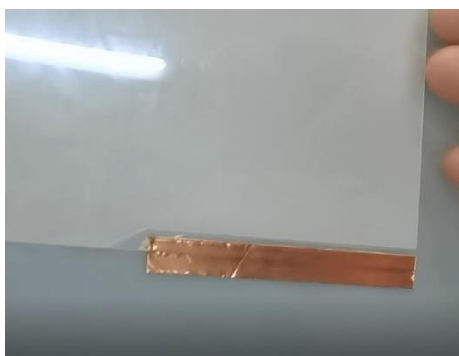
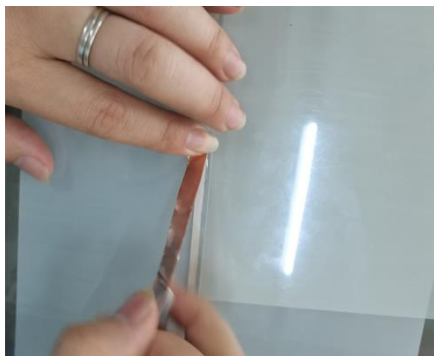
12. Stick 4mm copper belt on the non-adhesive side



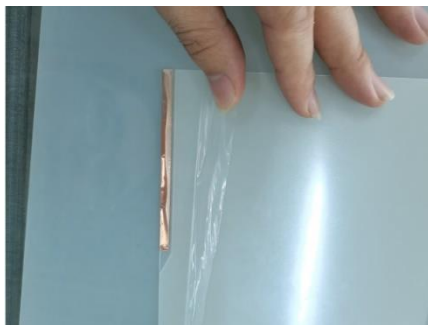
Note: the copper belt should leave about 1-2mm space with another ITO PET layer

13 Install the copper belt on self-adhesive side : we need use the copper belt cross on non-adhesive side, there have two type to do that, we suggest use first way:

Type A: use big width 9mm copper belt cross to the non-adhesive side:

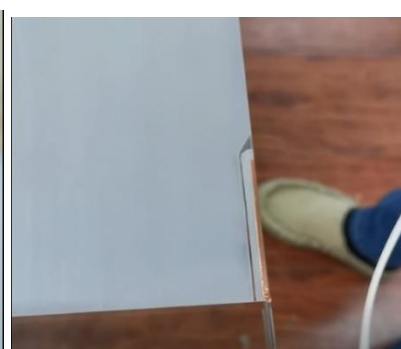
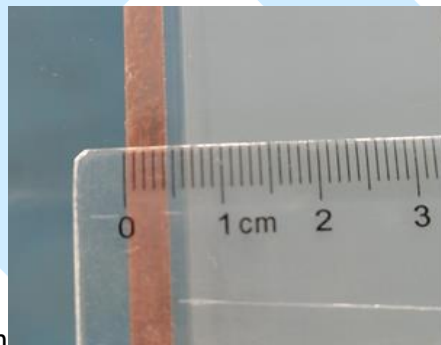


Stick 9mm copper belt on self-adhesive side silver paste

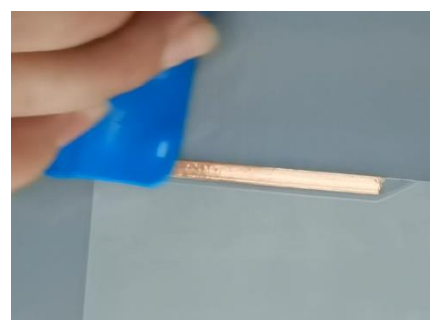
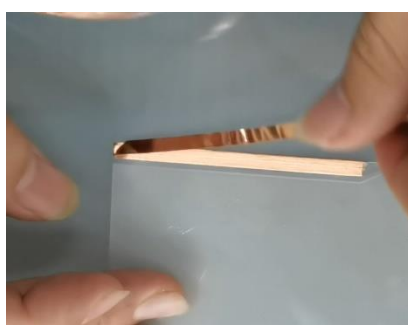
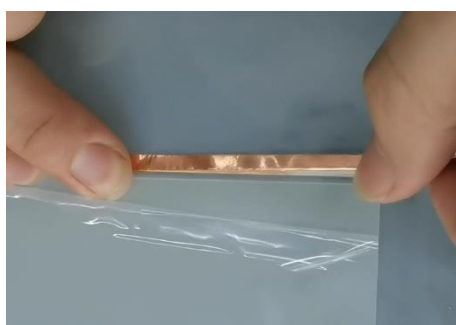


Cross the copper to non-adhesive side and squeeze tight on both side

Type B: use same 4mm copper belt to cross from the side :



Stick another copper belt and cross to non-adhesive side



Use one whole copper belt cross from self-adhesive side to non-adhesive side

Note: pls make the self-adhesive busbar based on above instruction, otherwise the busbar connection will have problem;

Youtube: <https://www.youtube.com/watch?v=dldjVzSVAhk>

14.Prepare the solder tool and busbar wire, solder the busbar wire on both busbar;

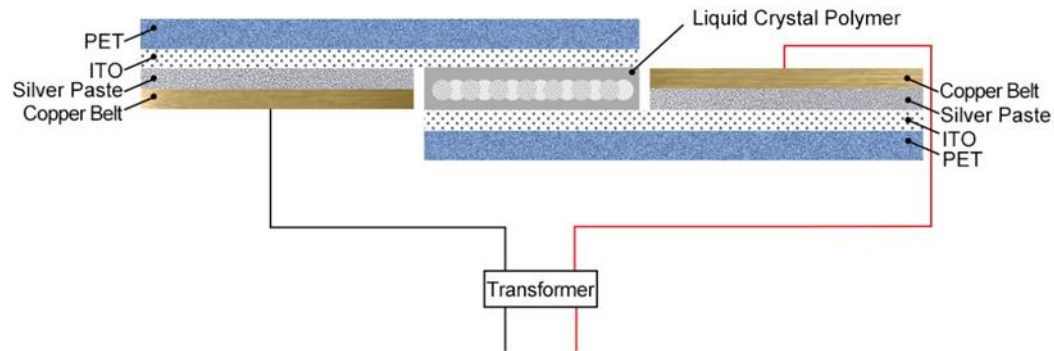


15.Power on and off the film to test with transformer;



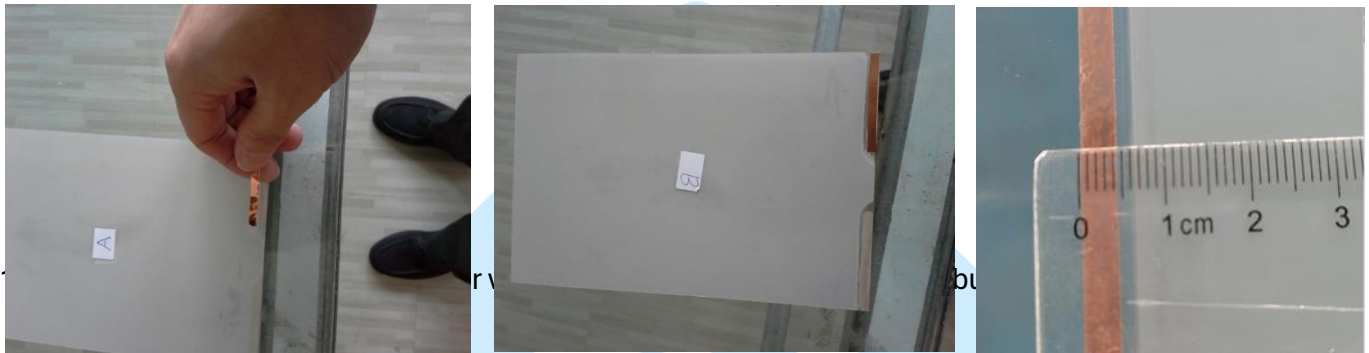
Non-adhesive Film Busbar Operation Process

Non-adhesive Film Busbar



Step 1-11 are same with self-adhesive busbar;

12. Stick a 4mm conductive copper belt on the silver paste area on both side;



14. Power on and off the film to test with transformer;



Busbar Operation



Self-adhesive Busbar Copper Belt Operation



<https://www.youtube.com/watch?v=MwTnZgR2Ki0&t=9s>

<https://www.youtube.com/watch?v=dldjVzSVAhk>



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