Scotchlite™ Reflective Material

Technical Bulletin
January 2022

Laminating Conditions Guide: 3M™ Scotchlite™ Material – C790 Carbon Black Stretch Transfer Film

Description

3M™ Scotchlite™ Reflective Material – C790 Carbon Black Stretch Transfer Film is designed to be laminated at temperatures lower than typically used for other Scotchlite transfer films. This fact, plus its four-way stretchability, enables its use on a wider range of fabrics, including those that are sensitive to heat such as polyurethane and spandex.
This bulletin provides additional details concerning the range of laminating and process conditions for this product. Below is a comparison of the lamination temperatures among our consumer solutions products, along with instructions:

3M™ Scotchlite™ Reflective Material			
Lamination Conditions	**C725 Silver**	**C750 Silver**	**C790 Carbon Black**
Temperature	165 °C to 190 °C (325 °F to 375 °F)	165 °C to 177 °C (325 °F to 350 °F)	149 °C to 160 °C (300 °F to 320 °F)
Time	10-20 seconds	10-20 seconds	20-25 seconds

1. Platen press lamination for logos and other pieces (approximate conditions):
   a) Temperature range: 149 °C to 160 °C (300 °F to 320 °F); It is recommended not to laminate at temperatures below 149 °C (300 °F).
   b) Pressure: 2 to 3 kgf/cm2 (30 to 45 psi)
   c) Time: 20 to 25 sec
   d) When laminating onto stretchable fabrics, use lower heat transfer conditions (e.g., 149°C, 20 sec, 2 kgf/cm2 depending on the type of fabric)
   e) When laminating on non-stretchable fabrics where wash durability is the more important and slight cracking after wash is acceptable, use higher heat transfer condition (e.g., 160°C, 20 sec, 2 kgf/cm2)
   f) One-step heat transfer is recommended. Re-heating the laminated film after removal of the liner may have adverse effects on its bonding strength or stretch.

2. Continuous lamination for piping, webbing etc. (approximate conditions):
   a) Temperature range: 149 °C to 160 °C (300 °F to 320 °F); It is recommended not to laminate at temperatures below 149 °C (300 °F).
   b) Nip pressure: 2 to 3 kgf/cm2 (30 to 45 psi)
   c) Line speed: Not faster than 3 meters/minute (10 ft/min)
   d) Line tension: Do not stretch the fabric during lamination when applying onto stretchable fabric. If it is laminated under high stretch/tension, possible problems that may occur:
      - If the laminated trim is relaxed before the C790 adhesive has cooled, you can get areas where the adhesive lifts away from the fabric.
      - If the fabric cools and then relaxes, it may curl. The resulting trim can be wavy when sewn onto the garment.

3. 3M™ Scotchlite™ Reflective Material – C790 Carbon Black Stretch Transfer Film has excellent 4-way stretch on many fabrics. We recommend wash testing to ensure that appearance is acceptable prior to production, especially for those high stretch fabrics with very low tensile strength. Cracking may occur if the fabric is highly stretchable and the texture on fabric surface is rough. The degree of cracking is affected by the lamination condition and the characteristic of the fabric.

Most crack lines are obvious only when stretched. The overall retroreflective performance of transfer film is not affected by the cracks. The following suggested method may help you to optimize the lamination conditions for each fabric.

a) Use the suggested lamination conditions to laminate a sample with the required size and shape on each fabric. Make sure to apply the sample in the same orientation and on the same fabric side as will be done in mass production
b) Let laminated sample sit for 24 hours to obtain targeted performance before stretching or washing.
c) Wash the sample according to test method provided by the specifier.
d) Examine the washed sample.
   - If oozing edges are present after heat lamination, reduce the lamination temperature, pressure, or use a slightly shorter heat press time.
   - If cracking after washing is present, reduce your lamination temperature or pressure setting.
   - If delamination or edge lifting occurs after wash, increase the lamination temperature or pressure settings.
e) Cracking after wash may be inevitable in pieces narrower than 0.5 mm.

4. If cracking is seen when using high stretch fabrics, the following suggestions may reduce the cracking:
   a) Do not stretch the fabric during lamination.
   b) Replace the fabric with a less stretchable fabric or one with higher tensile strength.
   c) Wash the fabric sample in a laundry bag to avoid unnecessary stretching.
   d) Lower the wash cycle specification.
   e) Adjust the customer visual standard so that minor cracks are allowed.

5. For lamination operations, customers should periodically check their equipment to ensure that the temperature set point matches the actual platen or roll temperature and that the temperature is uniform across lamination area.

6. Below are several factors that may affect adhesion on stretchable fabrics:
   a) Surface roughness (texture).
   b) Stretchability of the fabric (The texture changes when stretched).
   c) Types of fabric: Woven, knitted etc. Also, the amount of elastic fiber content.
   d) The change in texture at different fabric orientations (e.g., warp and weft directions). Remember to always laminate on the fabric in the same orientation as will be done in mass production.
   e) The difference in texture on each side of the fabric (one side may be rougher).
   f) Surface treatment on the fabric (i.e., DWR): Durable water repellent (DWR) finish can be difficult to adhere to. Contact your local 3M Application Engineer for assistance.

7. In accordance with good manufacturing practices, 3M recommends that all customers:
   a) Establish an ongoing quality system which includes maintaining lot/roll identification throughout the garment production process.
   b) Implement continuous testing throughout production and on finished garments that reflects the garment needs. This includes wash testing.
   c) Periodically check the lamination equipment to ensure that the temperature set point matches the platen or roll temperature and that the temperature is uniform across the lamination area.

8. 3M™ Scotchlite™ Reflective Materials can adhere to many fabrics. However, some fabrics such as nylons and those treated with a durable water repellent (DWR) finish can be difficult to adhere to. For the best attachment in these cases, sewing is recommended by using 3M™ Scotchlite™ Reflective Material – Fabric. When transfer films are used, continuous testing should be done to ensure acceptable adhesion is maintained as input materials may vary. For specific application assistance, contact 3M Technical Service.

Please refer to our website, Scotchlite.com, for new or updated technical bulletins and technical data sheets.

Important Notice

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Because of the variety of factors that can affect the use and performance of reflective material, user is solely responsible for evaluating the product and determining whether it is fit for a particular purpose and suitable for user's method of application. User is solely responsible for determining the proper amount and placement of the product. While reflective products enhance visibility, no reflective product can ensure visibility or safety under all possible conditions. 3M may change the product, specification and availability of the product as improvements are made; therefore, user should contact 3M for latest information before specifying the product.

3M

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