3M Scotchlite™ Reflective Material

Technical Data Sheet

Release 1, March 2018

3M™ Scotchlite™ Reflective Material High Gloss Products

Description

3M™ Scotchlite™ Reflective Material – High Gloss Products are designed for use on safety garments and when properly used, help enhance the visibility of the wearer in nighttime or low-light conditions when illuminated by headlights. Scotchlite reflective material – high gloss products consist of highly retroreflective microprisms formed on flexible, glossy and UV-stabilized polymeric film. A flexible vinyl film sealed on the backside of the 3M™ Scotchlite™ Reflective Material – High Gloss Trim encapsulates the microprisms and protects the reflective product from dirt and moisture penetration. Fluorescent red-orange and fluorescent lime-yellow high gloss colors enhance conspicuity under daytime conditions, particularly at dawn or dusk or on cloudy days.

3M™ Scotchlite™ Reflective Material - High Gloss Products								
Product Number	**Daytime Color**	**Reflected Color**	**Initial Average R_A[1]**	**Minimum R_A[2]**	**Sealed Edges**	**Seal Pattern**	**Sew Channels**	**Polyester Liner[3]**
Trims								
6160R[4]	White	White	700	330	X	X	X	
6187R[4]	Fluorescent lime-yellow	Yellow	700	330	X	X	X	
6196R[4]	Fluorescent red-orange	Orange	450	330	X	X	X	
6360	White	White	700	330	X			
6387	Fluorescent lime-yellow	Yellow	700	330	X			
Films								
6260 6260R[4]	White	White	700	330				X
6287 6287R[4]	Fluorescent lime-yellow	Yellow	700	330				X
6296	Fluorescent red-orange	Orange	450	330				X

1. R_A measured by 3M on new product at +5.0° entrance, 0.2° observation angles.
2. ANSI 107 minimum coefficient of retroreflection. R_A measured by 3M on new product at +5.0° entrance, 0.2° observation angles.
3. The polyester liner on Series 6200 and 6200R High Gloss films needs to be removed prior to sewing.
4. Series 6100R High Gloss Trim and Series 6200R High Gloss Film incorporate a coating to help resist dye migration.

Retroreflective Performance

The coefficient of retroreflection (R_A, in cd/lux/m^2) is measured by methods traceable to either of the following retroreflective intensity testing procedures:

- ASTM E809-08 and E810-03 (R_A) CIE 54.2:2001 (R')

The R_A values are averages of readings taken from rotation angles that are 90 degrees apart unless stated differently. The 0° rotation angle is to be taken as the down web direction of 3M supplied rolls. These data were generated by 3M and are based on testing new product. Use, wear, laundering, and environmental conditions will affect performance. Please contact your 3M Representative for product specifications.

Certifications: ANSI/ISEA 107 and CSA Z96

The following products have certificates available for ANSI/ISEA 107-2015 American National Standard for High-Visibility Safety Apparel and Accessories and CSA Z96-15 Canadian Standard for High Visibility Safety Apparel.

Product Number	Daytime Color	ANSI 107	CSA Z96	Wash Cycles	Combined Performance	Recommended for Occupational Use
Trims						
6160R	White	X		75		X
6187R	Fluorescent lime-yellow	X		75	X	X
Films						
6287R	Fluorescent lime-yellow	X		na[5]	X	

5. Seal film needs to be added to 6287R by the customer in order to have wash cycles referenced on ANSI/ISEA 107 and CSA Z96 certificates. The customer takes responsibility of obtaining those certificates with wash cycle claims not to exceed 75 cycles.

Scotchlite reflective material – high gloss products are not certified for marine safety applications requiring IMO type approval. 3M™ Scotchlite™ Reflective Materials – SOLAS Grade Products have this type of certificate.

Physical Performance

3M™ Scotchlite™ Reflective Material – High Gloss Products will meet or exceed the following specifications as noted.

All R_A values are at 0° orientation, 5° entrance angle and 0.2° observation angle, unless stated differently (see product certificates on our website for third party testing laboratory and test date).

Physical Performance	Approved Products	Test Method
Retroreflectivity: (Initial)	Products listed in the ANSI/ISEA 107 Certifications section	Per ANSI/ISEA 107 and CAN/CSA Z96
Abrasion: $R_A \geq 100$	Products listed in the ANSI/ISEA 107 Certifications section	EN 530 Method 2, 5000 cycles
Flexing: $R_A \geq 100$	Products listed in the ANSI/ISEA 107 Certifications section	ISO 7854 Method A, 7500 cycles
Cold Fold: $R_A \geq 100$	Products listed in the ANSI/ISEA 107 Certifications section	ISO 4675, -20 °C (-4 °F)
Cold Fold: (initial)	All high gloss products	ISO 4675, -15 °C (+5 °F) Will not crack
Temperature Cycle: $R_A \geq 100$	Products listed in the ANSI/ISEA 107 Certifications section	12 hours @ 50 °C (122 °F) 20 hours @ -30 °C (-22 °F)
Wash: $R_A \geq 100$	Products listed in the ANSI/ISEA 107 Certifications section	ISO 6330 Method 6N 75 cycles @ 60 °C (140 °F)
Wet Reflectivity: $R_A \geq 100$	Products listed in the ANSI/ISEA 107 Certifications section	ANSI/ISEA 107, Annex A

Solvent Resistance: During 3M laboratory testing, Scotchlite reflective material high gloss products did not dissolve or pucker when wiped several times with a soft cloth containing mineral spirits, kerosene, unleaded gasoline, methanol or VM&P Naphtha.

UV Stability: 3M™ Scotchlite™ Reflective Material – Series 6100R High Gloss Trim and Series 6200R High Gloss Film have superior color and brightness retention after UV exposure compared to other high gloss products. However, fluorescent colors may show fading in extreme UV light exposures

Color Specifications

The initial color for 3M™ Scotchlite™ Reflective Material – High Gloss Film (when measured with white backing) and Trim, as measured in accordance with ASTM E1164-09a (45/0 or 0/45 geometry, illuminant D65, 2° standard observer) are within the color boxes defined below:

White[6]	Y(%) ~ 46	x 0.303 0.368 0.340 0.274 y 0.287 0.353 0.380 0.316
Fluorescent lime-yellow	Y(%) ≥ 70.0	x 0.387 0.356 0.398 0.460 y 0.610 0.494 0.452 0.540
Fluorescent red-orange[7]	Y(%) ≥ 40.0	x 0.610 0.535 0.570 0.655 y 0.390 0.375 0.340 0.344

6. Typical values only, not to be used for specification purposes. Data generated by 3M laboratory testing.

7. Excluding 3M™ Scotchlite™ Reflective Material – 6296 Fluorescent Red-Orange High Gloss Film.

Performance

While use of 3M™ Scotchlite™ Reflective Material enhances visibility, no reflective material can guarantee absolute visibility, particularly in adverse weather conditions or unusually harsh wear conditions. Performance will vary depending upon actual use, exposure conditions, and proper cleaning/maintenance. The Scotchlite reflective material product portfolio offers a range of product attributes, and users should test the reflective material on their finished garments to satisfy conformance to their own requirements.

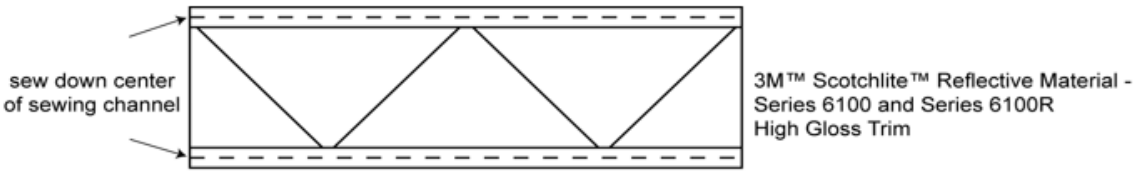
3M recommends that all customers, in accordance with good manufacturing practices, establish an ongoing quality system which includes maintaining lot/roll identification throughout the garment production process. Customer should also store input materials and final products in accordance with manufacturer recommendations, as well as implement continuous testing throughout their production and on their finished garments that reflects their garment needs.

Application Instructions

Whenever two or more pieces of Scotchlite reflective material are used together on a single surface or as a set, they should be matched to ensure uniform color and reflectivity. All safety garments should be constructed in accordance with ANSI/ISEA 107 or other prevailing standard.

Sewing to Fabrics

Sew in place with no more than 8 stitches per inch (2.54 cm), and not less than 1/8" (3 mm) from the edge of the material. Thread recommendation: 100% polyester. To reduce sticking, apply a non-stick material (e.g., silicone or nylon) to the bottom of the presser foot. Sewing channels along the edge are provided on 3M™ Scotchlite™ Reflective Material – Series 6100 High Gloss Trim and Series 6100R High Gloss Trim to protect against water penetration. Sew down the center of the 1/4" wide sewing channels.



Welding to Fabrics

3M™ Scotchlite™ Reflective Material High Gloss Products are composed primarily of vinyl materials and will weld suitably to most PVC films with any of the following methods: radio frequency (RF), high frequency (HF), dielectric or ultrasonic. Adhesion to specific films will vary with the lubricants, pigments, plasticizers and fillers used to make the PVC film. It is important to test weld strength with each new lot and new vendor.

RF Scaling

Radio Frequency is a widely used method of sealing vinyl films. It has the advantage of handling patches and trims using a step-and-repeat process. For more information, please refer to our 3M™ Scotchlite™ Reflective Material High Gloss Film Application Guide for Welding.

Ink	Ink Type
VF Series Flat Vinyl Screen Ink[8]	Opaque
3M™ Scotchlite™ Transparent Screen Printing Ink Series 2900	Transparent

8. Nazdar VF Series ink is not recommended for 3M™ Scotchlite™ Reflective Material – Series 6100R High Gloss Trim or 3M™ Scotchlite™ Reflective Material – Series 6200R High Gloss Film.

IMPORTANT NOTE

3M™ Scotchlite™ Reflective Material High Gloss Film is shipped with a polyester liner on top of the vinyl film for easy handling. This polyester liner can be removed either before or after the sealing process and needs to be removed before sewing or screen printing. The film does not require a sealing film to be retroreflective. However, we do recommend the application of a sealing film to keep out dirt and water that can result in decreased reflectivity.

IMPORTANT NOTE

Dyes may migrate when placed in direct contact with vinyl and some fabrics. Prior to application, 3M™ Scotchlite™ Reflective Material – High Gloss Products must be kept separate and should be tested for dye migration. However, 3M™ Scotchlite™ Reflective Material – Series 6100R High Gloss Trim and Series 6200R High Gloss Film have a special coating to resist dye migration.

Care and Maintenance Instructions

IMPORTANT NOTE

Test each application according to appropriate care instructions required for the finished product. Actual life of Scotchlite reflective material high gloss products depends on cleaning methods and wear conditions.

Care Label Recommendations

Wash		Dry		Iron	
	Machine wash, 60° C (140° F)		Tumble dry medium, 50° C (122° F)		Do not iron
	Do not bleach				
	Do not dry-clean				

3M™ Scotchlite™ Reflective Material

Product Availability

3M™ Scotchlite™ Reflective Material – High Gloss Products are available in rolls and sheets in the following standard widths and lengths:

Product Number	Roll Width (Unless Noted)	Splices Allowed	Standard Roll Length
Trims			
6160R	1", 1 3/8", 1 1/2", 2" (25.4 mm, 34.9 mm, 38.1 mm, 50.8 mm)	2 per roll	100 m
6187R	1", 1 3/8", 1 1/2", 2" (25.4 mm, 34.9 mm, 38.1 mm, 50.8 mm)	2 per roll	100 m
6196R	1", 1 3/8", 1 1/2", 2" (25.4 mm, 34.9 mm, 38.1 mm, 50.8 mm)	2 per roll	100 m
6360	3/4" (19.05 mm)	2 per roll	100 m
6387	3/4", 1 3/8" and 4" (19.05 mm, 34.9 mm and 101.6 mm)	2 per roll	100 m
Films			
6260	18.0" (457.2 mm)	2 per roll	100 m
6287	18.0" (457.2 mm)	2 per roll	100 m
6296	18.0" (457.2 mm)	2 per roll	100 m
6260R	18.0" (457.2 mm)	2 per roll	100 m
6287R	18.0" (457.2 mm)	2 per roll	100 m

Storage and Shelf Life

Store in a cool (4 to 32 °C, 40 to 90 °F), dry area (less than 70% relative humidity) and use within two years after date of receipt. Store rolls in original shipping cartons. Ensure that the lot/roll identification remains with product rolls. Return partially used rolls to the carton or suspend horizontally through the core. Cut pieces should be stored flat.