



**DESIGN1**

**DRAWINGS AND SPECIFICATIONS**

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↑FLAP↑



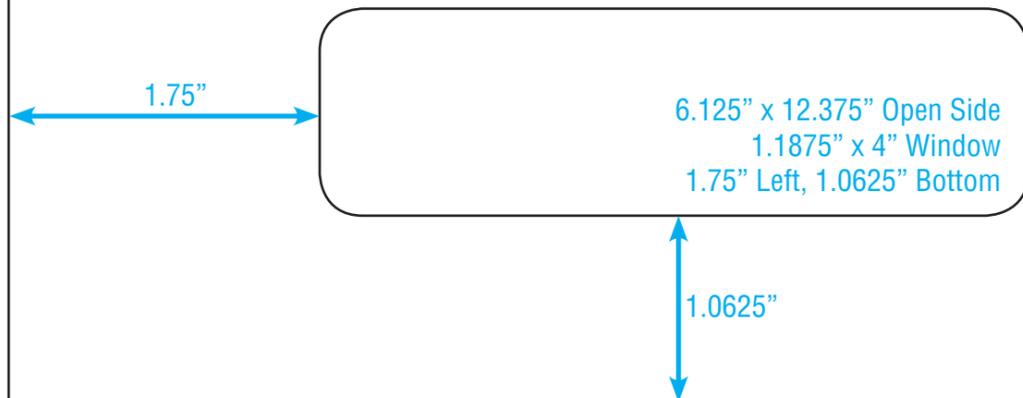
STATE OF INDIANA  
BUREAU OF MOTOR VEHICLES  
WINCHESTER PROCESSING CENTER  
309 W SOUTH STREET  
WINCHESTER, IN 47394-2029

SF53383 (R2 / 6-11)

PRSR. FIRST-CLASS  
U.S. POSTAGE  
PAID  
Indianapolis, IN  
Permit No. 9395

## License Plate and Registration Card Enclosed Remove Both Items

If the license plate number and the plate number on the registration card do not match, return both to any license branch





INDIANA BUREAU OF  
MOTOR VEHICLES  
P.O. BOX 100  
WINCHESTER, IN 47394-9902

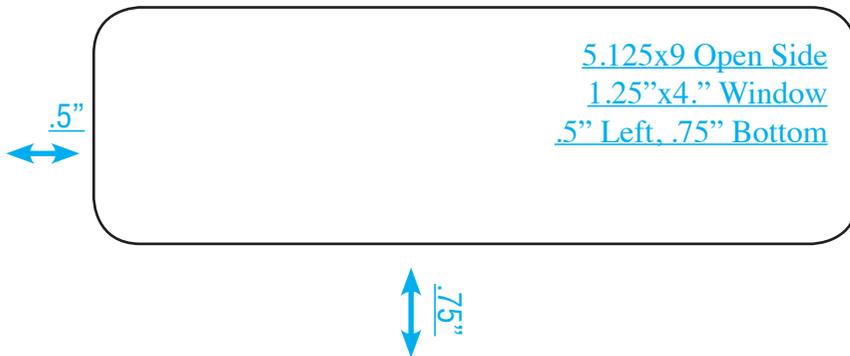
↑FLAP↑

SF 53605 (R / 10-11)

PRSR. FIRST-CLASS  
U.S. POSTAGE  
PAID  
Indianapolis, IN  
Permit No. 9395

## License Plate and Registration Card Enclosed Remove Both Items

If the license plate number and the plate number on the registration card do not match, return both to any license branch

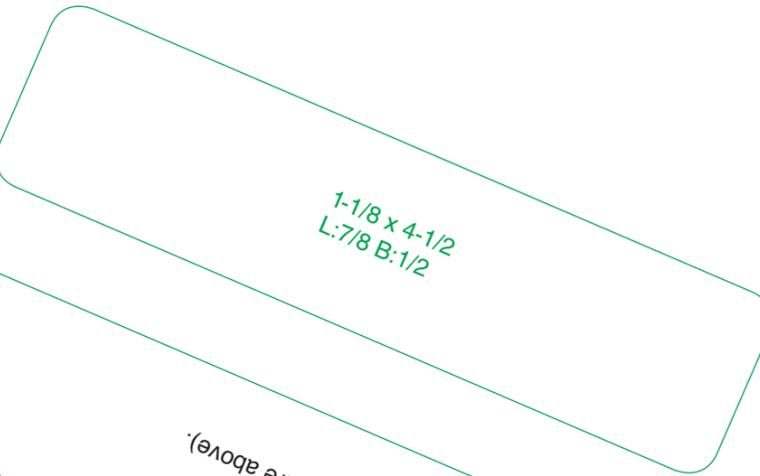


**myBMW.com**

Registration(s) and sticker(s) for your current license plate(s) will arrive within 14 days after receiving this envelope. You may be receiving new license plate(s). The new plate(s) and registration(s) are missing for one or more vehicles. **This Envelope Contains...**

SF 51648 (R4 / 1-14)

STATE OF INDIANA  
BUREAU OF MOTOR VEHICLES  
WINCHESTER PROCESSING CENTER  
309 W SOUTH ST  
WINCHESTER, IN 47394-2029

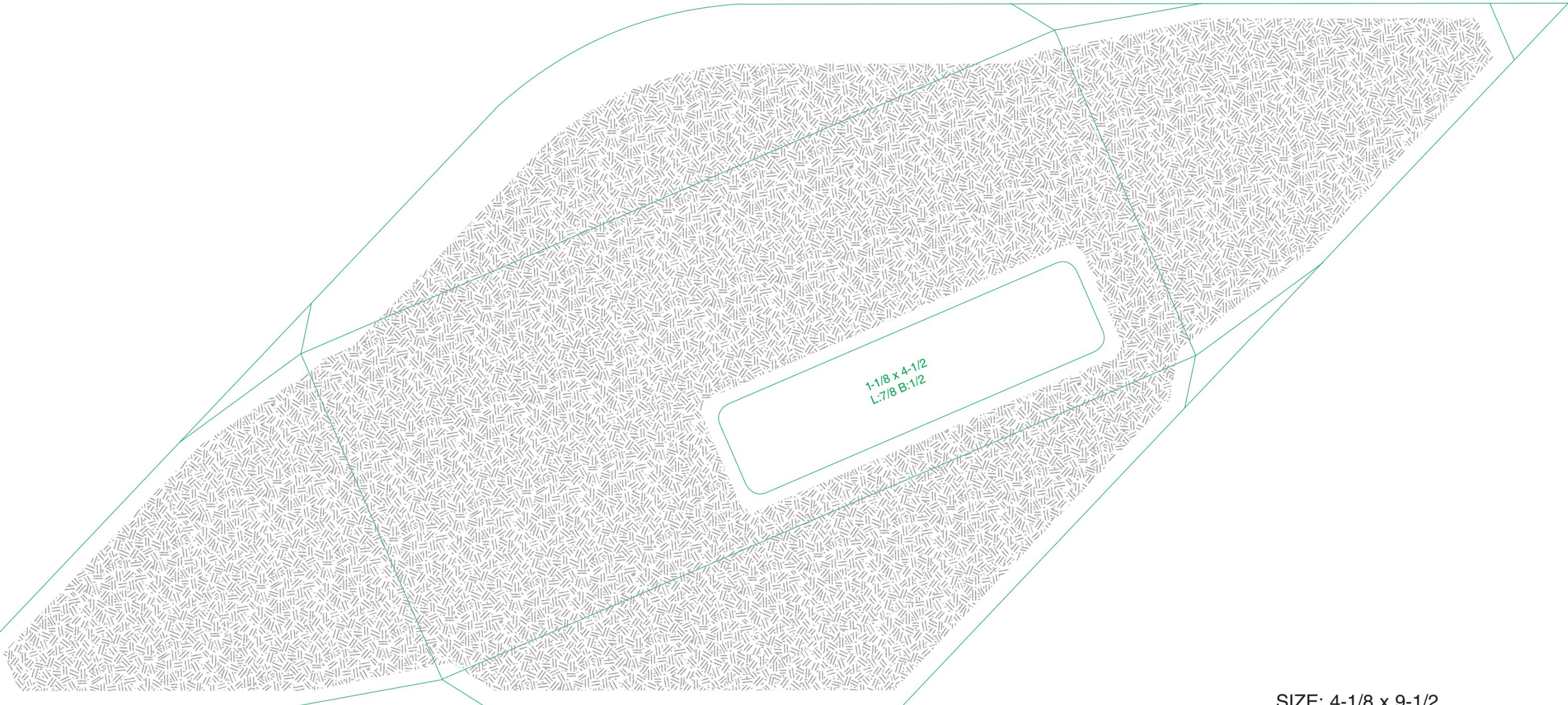


**Placing Your New License Plate Sticker**  
1. Clean and dry the area where the sticker will be placed.  
2. Peel new sticker from backing and place on plate (see picture above).  
3. Rub sticker to make sure it is firmly attached.



SIZE: 4-1/8 x 9-1/2  
WEB: 8-3/16  
CO: 11-1/4  
FLAP: 2-3/8 2"dc  
Rotate: -23.35

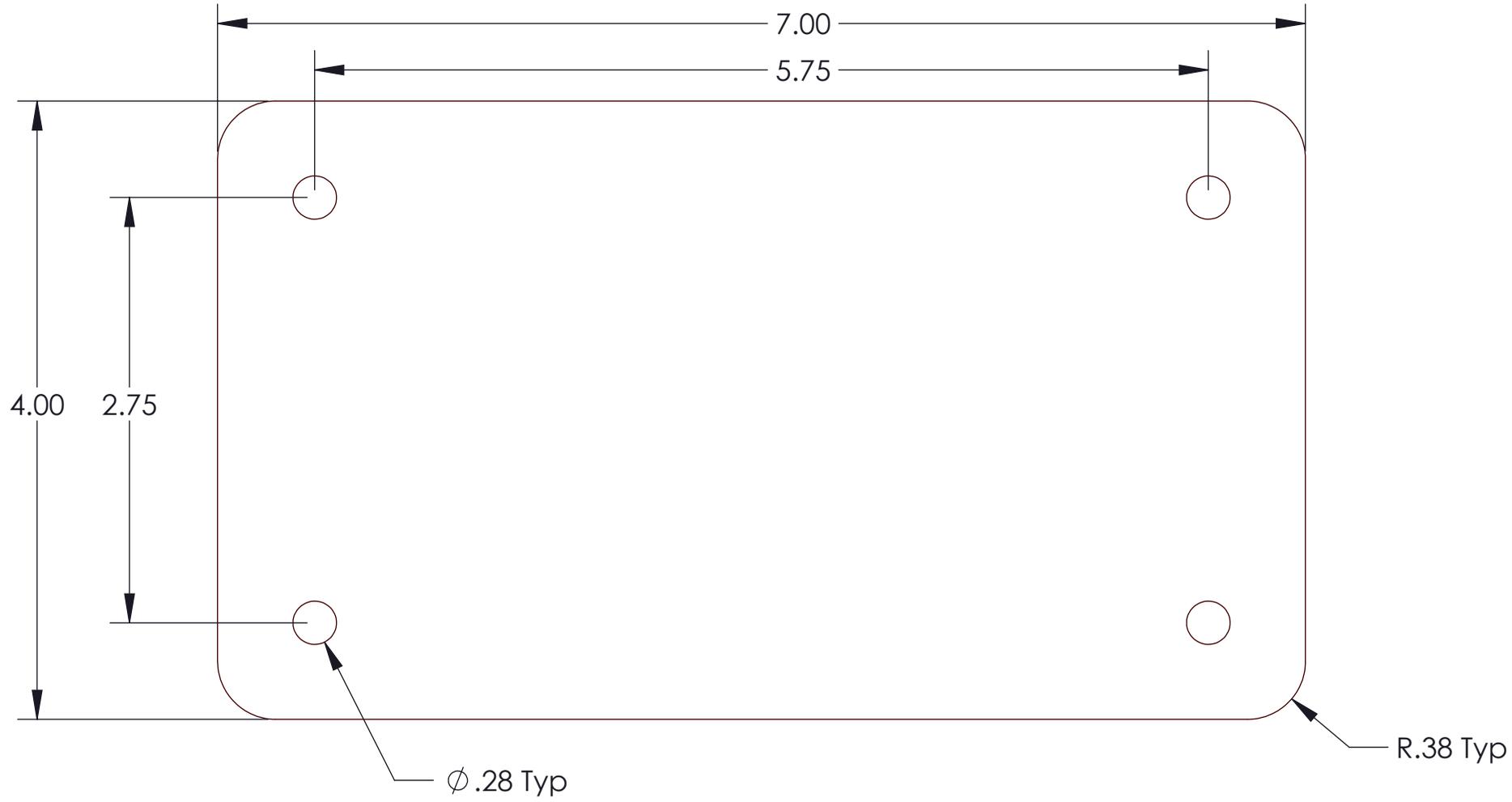
**BLACK** **032**



1-1/8 x 4-1/2  
L:7/8 B:1/2

**BLACK**  
SCREENED 50%

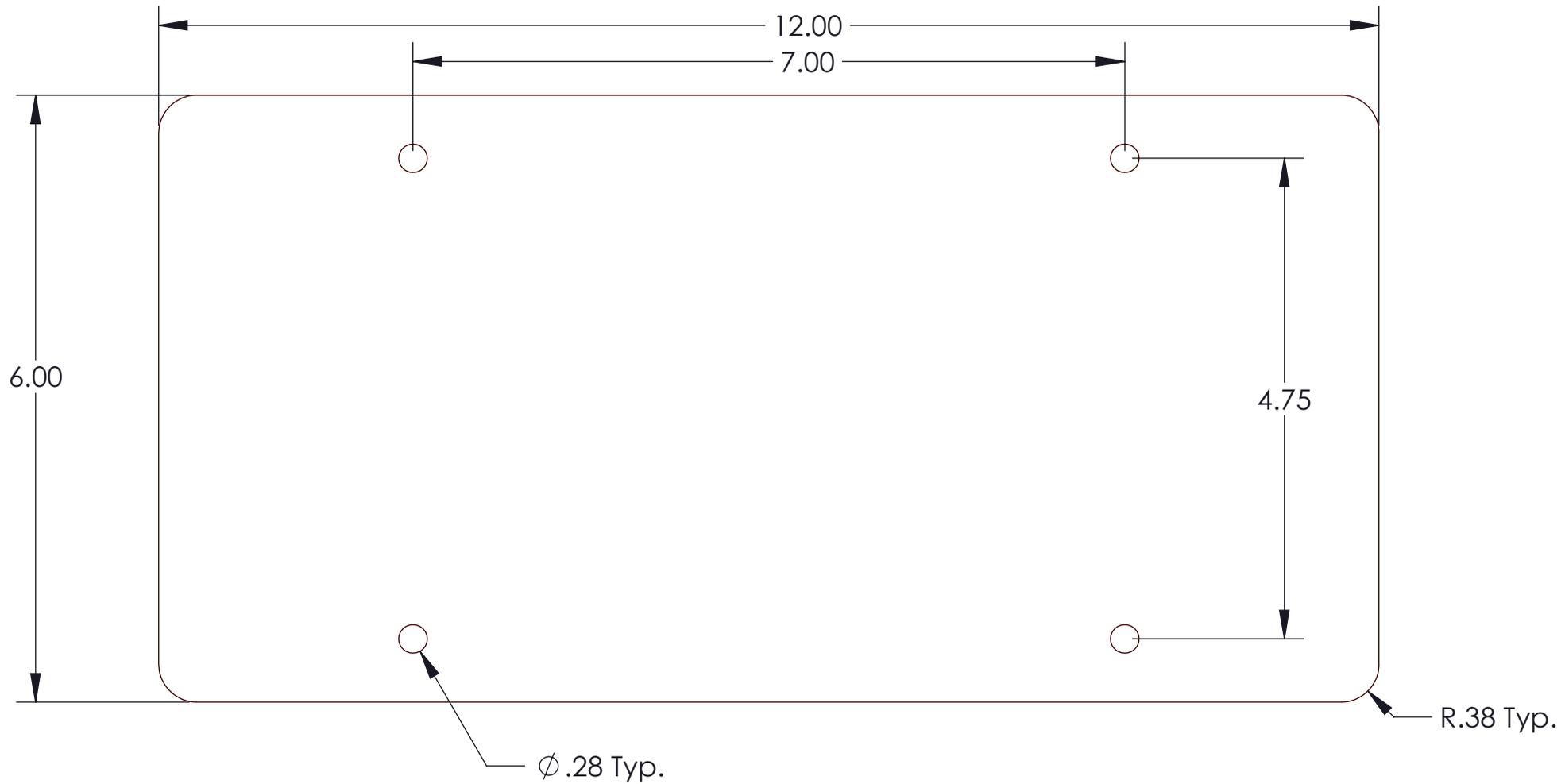
SIZE: 4-1/8 x 9-1/2  
WEB: 8-3/16  
CO: 11-1/4  
FLAP: 2-3/8 2"dc  
Rotate: +23.35



DRAWN by:		IRWIN HODSON GROUP	
DATE: 28/10/2016		2980 E. Coliseum Blvd. ,Suite 102 Fort Wayne, Indiana, 46805	
Approved by:			
DATE:		DWG. Name: Indiana 4x7 Blank	
COMMENTS:			
MATERIAL		SHEET	OF

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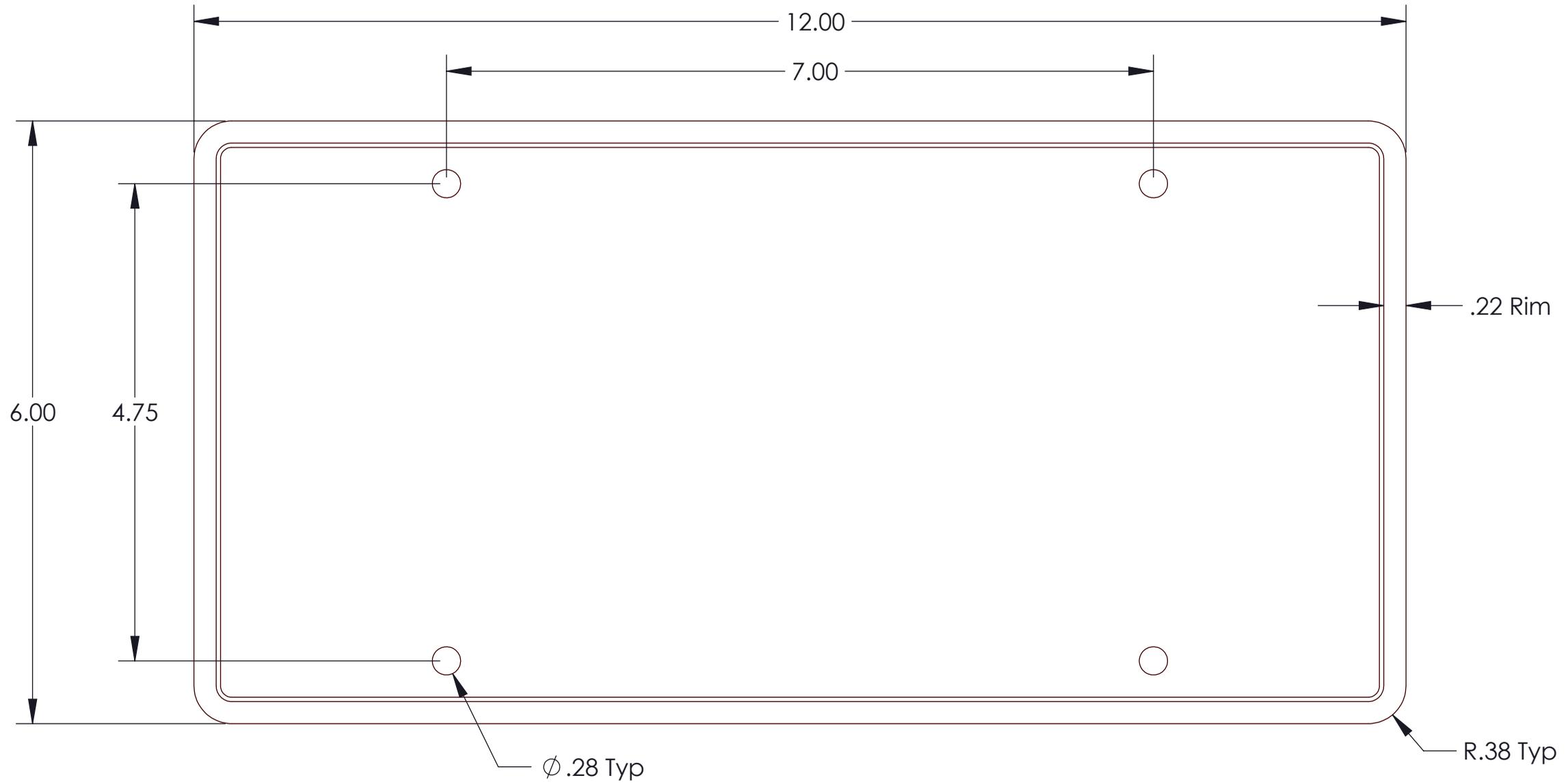
REV	DESCRIPTION	DATE	APPROVED
REVISIONS			



DRAWN by:		IRWIN HODSON GROUP	
DATE: 28/10/2016		2980 E. Coliseum Blvd. ,Suite 102 Fort Wayne, Indiana, 46805	
Approved by:			
DATE:		DWG. Name: Indiana 6x12 Blank	
COMMENTS:			
MATERIAL		SHEET	OF

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REV	DESCRIPTION	DATE	APPROVED
REVISIONS			



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Approved by:			
DATE:			
COMMENTS:			
MATERIAL		SIZE A	DWG. Name: Indiana 6x12 DOR Plate
		SHEET	OF

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REVISIONS			

Traffic Safety and Security Division

# 3M™ Digital License Plate Reflective License Plate Sheeting Series 9250E/9250T

**For use on Multi-Year License Plates With Ensure™ Image**

**Product Bulletin Series 9250E/9250T  
April 2017**

Replaces PB Series 9250E/9250T dated August 2016

## **Description**

3M™ Digital License Plate (DLP) Reflective License Plate Sheeting Series 9250E/9250T consists of lens elements enclosed within a transparent resin. The sheeting is designed for use in the fabrication of multi-year reflective license plates using the DLP System.

The sheeting can be digitally printed with background graphics and variable plate messages, with background graphics only, or with variable plate messages on pre-printed background graphics using 3M™ Thermal Transfer Ribbons Series TTR1300. 3M™ Clear Protective Film 9097 is applied in the DLP Print Station after printing. After application to aluminum substrate, plates may be blanked flat or with a debossed rim. Plates may optionally be embossed with plate messages and coated using 3M™ Roll Coat Colors Series 4850 or 4950, or 3M™ HSF 100/200 and DRF 300/400 Series hot stamp foils.

Finished license plates made with the 3M DLP System function 24 hours a day to enhance nighttime visibility and legibility of the vehicle identification system. The sheeting appears similar during the day and at night (when viewed by reflected light) and is highly reflective when viewed at both head-on and wide entrance angles.

The backside of the reflective sheeting is pre-coated with a pressure sensitive adhesive, protected by a removable liner, for application to aluminum license plate substrates.

Series 9250E/9250T sheeting is available with pre-printed graphics that offer a unique opportunity to promote a country, state or national attraction, event or image while continuing to provide the driving public with the safety aspects of fully reflective license plates.

## 3M™ Ensure™ Image

Series 9250E sheeting with Ensure image contains directional positive identification images or marks that are an integral part of the sheeting and are visible only within a specific viewing angle range. The marks are extremely difficult to counterfeit and facilitate visual examination of the finished license plates for specified purposes of:

- A. Inventory control.
- B. Production traceability.
- C. Identification of year of manufacture.
- D. Identification of sheeting manufacturer.
- E. Positive field verification of license plate authenticity.

The Ensure image may be generic, or a custom design mutually agreed upon by the purchaser and 3M. The Ensure image size and spacing depend on the width of the sheeting purchased. Contact your 3M Traffic Safety and Security Division application development engineer for further information.

Directional identification marks allow for easy visual verification of license plate authenticity as follows:

- A. The centermost mark on the plate is visible to a viewer standing directly in front of the plate at a distance of 4-8 feet (1.2-2.5 meters). This represents an angle of 30° above the perpendicular to the plate.
- B. The centermost mark on the plate is not visible to a viewer:
  - 1. Standing at a distance of either 2 feet (0.6 m) or 20 feet (6.1 m) directly in front of the plate.
  - 2. When the viewer has stepped from the head-on viewing position to either side thus forming an angle greater than 45° to the plate.

The directional identification marks are visible in either diffuse daylight or by retroreflected light at night. The marks do not alter the color of the sheeting, reduce the sheeting brightness below the minimum specified levels, or interfere with appearance and legibility of finished license plates. The directional identification marks are equally visible in all standard colors.

The marks cannot be removed by chemical or physical means from the sheeting or the finished license plate without visibly damaging the reflective sheeting.

## Optional 3M™ Ensure™ Virtual Security Thread

Series 9250T sheeting with Ensure Virtual Security Thread contains a second mark that runs vertically or horizontally through standard vehicle registration plates for purposes of security and anti-counterfeiting. The virtual security thread is buried beneath the surface of the sheeting and consists of two sinusoidal waves where one wave appears to float above and one wave appears to float below the retroreflective sheeting. The virtual security thread is durable for the service life of the license plate.

The virtual security thread is visible in the unprinted areas of the plate from inside a standard police vehicle under high beam headlight illumination, as well as outside of the vehicle, on a license plate properly affixed to a vehicle's designated mounting area, from an approximate distance of 0 to 50 feet (0 to 15 meters) at a head-on viewing angle. The two sinusoidal wave images are visibly distinct from an approximate distance of 0 to 20 feet (0 to 6 meters). The virtual security thread is not visible when viewed from an angle greater than 45 degrees from the head-on viewing position.

The virtual security thread is verifiable under both diffuse daylight and retroreflected light at night. The virtual security thread does not alter the color of the sheeting, reduce sheeting brightness below minimum specified brightness levels, or interfere with appearance and legibility of finished license plates. The virtual security thread is visible in all standard sheeting colors.

## Performance Characteristics

### Reflectivity

The minimum reflectivity values of Series 9250E/9250T sheeting covered with 3M™ DLP Clear Protective Film Series 9097 are given below in terms of candlepower per foot-candle per square foot (Candelas per lux per square meter (cd/lux/m<sup>2</sup>)). Measurements should be conducted in accordance with ASTM E810, “Standard Test Method for Coefficient of Retroreflection of Retroreflective Sheeting Utilizing the Coplanar Geometry.”

To measure the reflectivity values of applied sheeting and clear protective film, prepare test plates as follows. Test plates of the same size and format as the actual issue must be produced of the same materials, on the same equipment, and by the same general process of metal cleaning, laminating, embossing or debossing and roll coating as the production plates. The plates must be designed to have a minimum of 36 square inches (230 sq. cm) of flat area in one section of the plate to facilitate photometric testing. All test plates should be conditioned for 24 hours at 72° F ± 5° F (22° C ± 3° C) and 50 ± 5% relative humidity (R.H.) prior to testing and each plate must be thoroughly hand washed (see Cleaning) prior to testing.

Measurements on reflective sheeting with a preprinted graphic design should be taken in an unprinted sheeting area.

When subjected to a simulated rainfall, the reflectivity of the retroreflective surface of the plate shall not be less than 90% of the values specified in Table 1 below.

### Coefficient of Retroreflection

**Table 1. Minimum Coefficient of Retroreflection**  
[Candlepower per Foot Candle per Square Foot,  
or Candelas per Lux per Square Meter] (cd/lux/m<sup>2</sup>)

Ob. Angle <sup>1</sup>	Entr. Angle <sup>2</sup>	White 9250E/ 9250T	Yellow 9251E/ 9251T	Red 9252E/ 9252T	Gold 9253E/ 9253T	Orange 9254E/ 9254T	Blue 9256E/ 9256T	Green 9257E/ 9257T	Lemon Yellow 9259E/ 9259T
0.2°	-4°	50	25	9	25	25	18	18	25
	40°	16	10	3	10	10	7	7	10

*Note: All measurements shall be conducted in accordance with ASTM E810, “Standard Test Method for Coefficient of Retroreflection of Retroreflective Sheeting.” All sheetings covered by 3M Series 9097 film.*

### Adhesive

Test plates as prepared above will resist peeling, scuffing, and marring during normal handling.

Prior to application, the protective paper liner can be removed from the adhesive by peeling without soaking in water or other solvents. The liner can be removed after accelerated storage for 4 hours at 150° F (65° C) under a weight of 2.5 pounds per square inch (0.18 kg/cm<sup>2</sup>).

## Fabrication of Reflective License Plates

### Substrates

The pre-coated adhesive will form a durable bond to properly cleaned, chemically treated aluminum surfaces normally used in the manufacture of license plates. Contact your 3M Traffic Safety and Security Division application development engineer for specific substrate information.

<sup>1</sup> Observation Angle – The angle between the illumination axis and the observation axis.

<sup>2</sup> Entrance Angle – The angle from the illumination axis to the retroreflector axis. The retroreflector axis is an axis perpendicular to the retroreflective surface.

## Application

DLP sheeting Series 9250E/9250T, with Protective Film Series 9097 applied, is designed for application to flat coil or sheet stock by continuous squeeze roll application. Sheeting should be stretched to a maximum of 1% during application to the substrate. A minimum of 48 hours of storage after application of sheeting is recommended before the embossing of legends. Laminated blanks must be stored on edge and used within one year after date of receipt of the sheeting for best embossing results.

## Embossing and Debossing

The reflective sheeting as applied to flat metal is sufficiently flexible to permit the embossing or de-bossing requirements of most conventional license plate designs. Sheeting may be embossed up to 1.7 mm (0.067 inches) with standard embossing equipment and dies used for license plate production. Minimum embossing temperature is 70° F (21° C).

## Color Processing

The legend is applied to the sheeting primarily by digital printing in the DLP Print Station with the thermal transfer ribbons described below. A secondary method would be to digitally print the background graphic only and then emboss and coat the legends with the 3M™ recommended inks or foils described below.

**Note:** Care should be taken in choosing color combinations to ensure maximum legibility. This is especially true with graphic design sheetings. To assure suitable contrast for maximum legibility and safety, 3M recommends use of dark color digitally printed or coated characters on a white or yellow reflective sheeting background. If coated, the license plates need to be cooled to room temperature before packaging.

## Thermal Transfer Ribbons:

### 3M™ Thermal Transfer Ribbons Series TTR1300

For specific color availability, refer to [Product Bulletin TTR1300](#).

## Oven Dried Inks:

### 3M™ Roll Coat Inks Series 4850 Opaque and 3M™ Roll Coat Inks Series 4950 Transparent

For specific color availability or for assistance with roll coat processing and oven drying, refer to [Product Bulletin 4850/4950](#), or contact your 3M application development engineer.

## Dry Roll Coat Foils

### 3M™ Dry Roller Coat Foil Series HSF 100/200 and DRF 300/400

For specific color availability or for assistance with roll coat processing and oven drying, refer to [Product Bulletin HSF 100/200 and DRF 300/400](#), or contact your 3M application development engineer.

## Printer and Ribbon Compatibility

The Sheeting is compatible with printers and ribbons as shown in Table 2.

**Table 2. Ribbons Qualified under 3M™ Warranty**

3M DLP Printer TTR Ribbons		Matan SpringG3 Printing System IIMAK 12" Ribbons (for Digitag 1650)	
ITEM NUMBER	DESCRIPTION	ITEM NUMBER	DESCRIPTION
TTR 1303	Process Black	MAT-AR12PC56	Process CYAN
TTR 1304	Process Cyan	MAT-AR12PK56	Process BLACK
TTR 1305	Process Magenta	MAT-AR12PM56	Process MAGENTA
TTR 1306	Process Yellow	MAT-AR12PY56	Process YELLOW
TTR 1301	SPOT Dark Blue	MAT-AR12SSB56	SPOT Sapphire Blue
TTR 1302	SPOT Dark Red	MAT-AR12SIR56	SPOT Intense Red
TTR 1307	SPOT Forest Green	MAT-AR12SG56	SPOT Green

<b>TTR 1308</b>	SPOT Bright Blue	<b>MAT-AR12SRR56</b>	SPOT Ruby Red
<b>TTR 1309</b>	SPOT Ocean Blue	<b>MAT-AR12STR56</b>	SPOT Tomato Red
<b>TTR 1310</b>	SPOT Blue	<b>MAT-AR12SBY56</b>	SPOT Burgundy
<b>TTR 1312</b>	SPOT Green	<b>MAT-AR12SB56</b>	SPOT Blue
<b>TTR 1313</b>	SPOT Pine Green	<b>MAT-AR12SBB56</b>	SPOT Bright Blue
<b>TTR 1314</b>	SPOT Leaf Green	<b>MAT-AR12SRB56</b>	SPOT Reflex Blue
<b>TTR 1315</b>	SPOT Orange	<b>MAT-AR12SOB56</b>	SPOT Ocean Blue
<b>TTR 1316</b>	SPOT Intense red	<b>MAT-AR12OLB56</b>	SPOT Olympic Blue
<b>TTR 1317</b>	SPOT Tomato Red	<b>MAT-AR12SPG56</b>	SPOT Pine Green
<b>TTR 1318</b>	SPOT Burgundy	<b>MAT-AR12SFG56</b>	SPOT Forest Green
<b>TTR 1319</b>	SPOT Light Gray	<b>MAT-AR12SLG56</b>	SPOT Leaf Green
<b>TTR 1321</b>	SPOT White	<b>MAT-AR12SO56</b>	SPOT Orange
<b>TTR 1322</b>	SPOT Golden Yellow	<b>MAT-AR12SDG56</b>	SPOT Dark Gray
<b>TTR 1323</b>	SPOT Sunflower Yellow	<b>MAT-AR12SGR56</b>	SPOT Gray (AKA Light Gray)
		<b>MAT-AR12SY56</b>	SPOT Yellow
		<b>MAT-AR12SSY56</b>	SPOT Sunflower Yellow
		<b>MAT-AR12UVY56</b>	SPOT Ultra UV Yellow
		<b>MAT-AR12SGY56</b>	SPOT Golden Yellow
		<b>MAT-AR12SW40</b>	SPOT WHITE

## Cleaning

For maximum service, do not use abrasive, or chemically concentrated harsh cleaners. Use the same care as is used in cleaning the paint surface on the vehicle. The license plate surface can be cleaned of normal use dirt accumulation by washing with a mild detergent and water using a soft bristle brush or cloth.

To remove tar, oil, or road dirt, cautious use of mild solvents such as mineral spirits, turpentine, or kerosene may be employed. Use of aromatic solvents and ketones or solvent mixtures containing them should be avoided. Following cleaning, the plate should be thoroughly rinsed with water.

## Storage

DLP sheeting, clear protective film and thermal transfer ribbons must be stored in their original package in a cool, dry area and should be used within one year after date of receipt. For best printing results, it is recommended that the sheeting be digitally printed in the DLP Print Station within 6 months of date of receipt.

## General Characteristics and Packaging

The reflective sheeting as supplied will be of good appearance, free from ragged edges and cracks, and packaged according to commercial standards. The sheeting will be spliced for continuous roll application. Additional sheeting is supplied to compensate for splices.

## Specifications

The information contained herein on reflective sheeting series 9250E/9250T is considered to describe typical minimum requirements for an effective reflective license plate material. As such, the information may be incorporated into a product purchase specification to be used in conjunction with a specification for finished retroreflective license plates.

## Health and Safety Information

Read all health hazard, precautionary and first aid statements found in the Safety Data Sheets, Article Information Sheets, and/or product label of chemicals prior to handling or use. Consult local regulations and authorities for possible restrictions. To obtain SDS sheets for 3M™ products, go to 3M.com/SDS, or by mail, or for more information, call 1-800-3MHELPS (1-800-364-3577).

## Warranty

3M Company warrants that (“3M Warranty”), Digital License Plate (DLP) Reflective License Plate Sheeting Series 9250E/9250T (“Sheeting”) imaged as recommended by 3M in this product bulletin, and overlaminated with 3M™ Digital License Plate Clear Protective Film 9097 (“Overlamine”) as recommended by 3M, will:

- remain legible by resisting excessive fading, cracking, blistering or peeling, and
- the unprinted areas<sup>3</sup> of the Sheeting applied on a license plate (“Plate”) will retain a coefficient of retroreflection for the number of years (“Warranty Period”) as given in Table 3 measured from the Plate fabrication date (“Fabrication Date”).

**Table 3. Sheeting Colors and Warranty Period\***

Base Sheeting Color	Retained Coefficient of Retroreflection* [cd/m <sup>2</sup> /lux]	Warranty Period (Years)
White	18	5
Gold	18	3
Yellow	18	5
Lemon Yellow	18	5
Orange	18	3
Blue	18	2
Green	18	2
Red	6	1

*\*All measurements are at 0.2 degrees observation angle and -4 degrees entrance angle. All measurements shall be made after cleaning the plate according to 3M recommendations and in accordance with ASTM E810 “Standard Test Method of Coefficient of Retroreflective Sheeting,” except that the coefficient of luminous intensity shall be determined in accordance with ASTM E808-01 Para. 3.2.2 and ASTM E809-02 Para. 12.3.*

## Warranty Terms and Conditions

- A failure to meet the 3M™ Warranty must be solely the result of design or manufacturing defects in the Sheeting and not of (a) outside causes including: improper fabrication, handling, maintenance or installation; (b) use of inks, roll coat inks, overlay films, sheetings or other components not listed as a component of 3M system of matched components; (c) exposure to temperatures beyond 3M recommendations; (d) use of a reflective sheeting applicator, brake table or corresponding registry feed controls not provided and installed by 3M; (e) stretching more than the maximum percent recommended by 3M during application; (f) failure of plate substrate; (g) exposure to chemicals, abrasion, or damage from fasteners used to mount the plate; (h) collisions, vandalism or malicious mischief; (i) or an act of God.
- All 3M recommendations in this bulletin and relevant 3M Information Folders, 3M Technical Memos and Manufacturing Manuals must be followed for all 3M components involved in the 3M Warranty.
- Claims made under this warranty will be honored only if the Plates have been marked with a 3M Ensure™ Image that includes 3M production run numbers from which the material originated or the Plates must have a clear record of the Fabrication Date either on the Plate or in an auditable records database.
- Claims made under this warranty will be honored only if 3M is notified of a failure within 30 days, reasonable information requested by 3M is provided, and 3M is permitted to verify the cause of the failure.

<sup>3</sup> Areas of the sheeting without preprinted graphics, or customer digitally printed graphics.

## Exclusive Limited Remedy

If the Sheeting on a Plate is shown to not meet the 3M Warranty during the Warranty Period, 3M's sole and exclusive remedy is, at 3M's option, to replace the Plate, or reimburse the Plate's issuing agency ("Agency") up to a maximum of \$5.00 per Plate. Reimbursement to the Agency will be in dollars and/or materials, as determined by the needs of the Agency. Replacement Sheeting will carry the unexpired warranty period of the Sheeting it replaces.

## Disclaimer

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Except for the limited remedy stated above, and except where prohibited by law, 3M will not be liable for any loss or damage arising from the Plates or any 3M product, whether direct, indirect, special, incidental or consequential damages (including but not limited to lost profits, business or revenue in any way), regardless of the legal theory asserted including warranty, contract, negligence or strict liability.

## Literature Reference

<a href="#">PB 9097</a>	3M™ Digital License Plate Clear Protective Film 9097 for use on Multi-Year License Plates
<a href="#">PB TTR1300</a>	3M™ Digital License Plate Thermal Transfer Ribbons Series TTR1300 for use on Multi-Year License Plates
<a href="#">PB Chiller</a>	3M™ DLP Cooling System for use on DLP Printing Systems
<a href="#">PB 4850/4950</a>	3M™ Roll Coat Inks
<a href="#">PB HSF 100/200</a> <a href="#">DRF 300/400</a>	3M™ Dry Roller Coat Foils

## For Information or Assistance

Call: 1-800-553-1380

In Canada Call:

1-800-265-1840

## Internet:

<http://www.3m.com/roadwaysafety>

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### Traffic Safety and Security Division

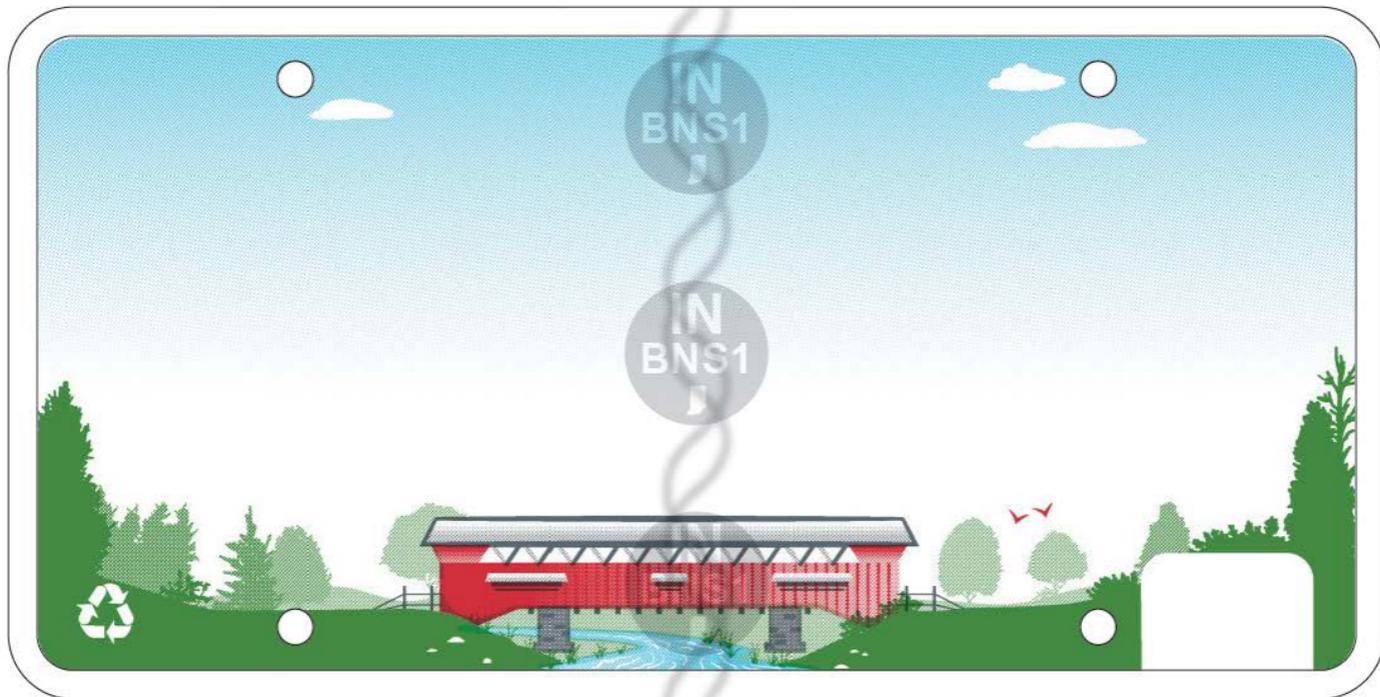
3M Center, Building 0225-04-N-14  
St. Paul, MN 55144-1000 USA

Phone 1-800-553-1380

Web [3M.com/roadwaysafety](http://3M.com/roadwaysafety)

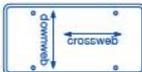
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# IN Passenger Ensure + VST Layout



**IMPORTANT NOTICE:** Please reference relevant product bulletin and information folders for technical sheeting specifications and processing recommendations.

June 2, 2020



This proof is for concept only. Colors and resolution of production plates may differ from print. Security images are registered to graphic print in the crossweb direction only, with a tolerance of  $\pm 0.25$  Inches (6.4 mm). Final size of all graphic print and security images can vary up to 0.2% of targeted dimensions.

## NOTICE OF RIGHT, TITLE AND INTEREST

Upon final approval of 3M's designs, 3M will require an authorized representative of the Agency to warrant that the Agency has all right, title and interest in the images, logos, drawings, designs and text ("Artwork") provided to 3M for the purpose of creating and issuing vehicle license plates and that the Agency has the right to provide such Artwork to 3M.

- The number of Ensure Images and their position on the plate will be variable.
- VST centered on plate.
- Dimensions may vary due to printing tolerances and stretch during the blanking process.

Traffic Safety and Security Division

# 3M™ Digital License Plate Clear Protective Film 9097

**For Use On Multi-Year License Plates**

**Product Bulletin 9097**  
**April 2016**

Replaces PB 9097 dated May 2014

## **Description**

3M™ Digital License Plate (DLP) Clear Protective Film Series 9097 is used in conjunction with either 3M™ Digital License Plate Reflective License Plate Sheeting Series 9250 and 3M™ Thermal Transfer Ribbons Series TTR1300, 3M™ High Definition License Plate Sheeting Series 6700 and 3M™ Thermal Transfer Ribbons Series TTR1300, or 3M™ Digital License Plate Sheeting Series 3750P and 3M™ UV Ink Jet Inks Series 1500UV to produce fully reflective vehicle registration plates for multi-year use.

## **Application**

DLP Clear Protective Film Series 9097 is applied to the printed 3M™ License Plate Sheeting through the roll handling unit of the 3M™ Digital Printing System/Precision Plate System (PPS) printer. The roll handling unit removes the liner and applies the film onto the printed sheeting with pressure at a nip roller.

## **Storage**

Series 9097 must be stored in its original package in a cool, dry area and should be used within one year after date of receipt.

## **Health and Safety Information**

Read all health hazard, precautionary and first aid statements found in the Safety Data Sheets, Article Information Sheets, and/or product label of chemicals prior to handling or use. Consult local regulations and authorities for possible restrictions. To obtain SDS sheets for 3M products, go to [3M.com/SDS](http://3M.com/SDS), or by mail, or in case of an emergency, call 1-800-364-3577.

## 3M Basic Product Warranty and Limited Remedy

3M™ DLP Clear Protective Film Series 9097 is warranted to be free of defects in materials and manufacture at the time of shipment and to meet the requirements stated in the product bulletin. If Series 9097 is proven not to have met the basic warranty on its shipment date, then a buyer's exclusive remedy, and 3M's sole obligation, at 3M's option, will be to refund or replacement of Series 9097.

### Literature Reference

<a href="#">PB 9250E/9250T</a>	3M™ DLP Reflective License Plate Sheeting With Ensure™ Image for use on Multi-Year License Plates
PB 3750/3750P	3M™ Reflective License Plate Sheeting
<a href="#">PB TTR1300</a>	3M™ Digital License Plate Thermal Transfer Ribbons Series TTR1300 for use on Multi-Year License Plates
PB 1500UV	3M™ Precision Plate System Series 1500 UV Ink Jet Inks for 3M Precision Plate System Printer
PB 6700	3M™ High Definition Reflective License Plate Sheeting Series 6700
PB Chiller	3M™ DLP Cooling System for use on DLP Printing Systems

## For Information or Assistance

Call: 1-800-553-1380

In Canada Call:

1-800-265-1840

Internet:

[www.3M.com/vehiclereg](http://www.3M.com/vehiclereg)

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### Important Notice

All statements, technical information and recommendations contained herein are based on tests we believe to be reliable, but the accuracy or completeness thereof is not guaranteed, and the following is made in lieu of all warranties, or conditions express or implied. Seller's and manufacturer's only obligation shall be to replace such quantity of the product proved to be defective. Neither seller nor manufacturer shall be liable for any injury, loss or damage, direct, special or consequential, arising out of the use of or the inability to use the product. Before using, user shall determine the suitability of the product for his/her intended use, and user assumes all risk and liability whatsoever in connection therewith. Statements or recommendations not contained herein shall have no force or effect unless in an agreement signed by officers of seller and manufacturer.



**Traffic Safety and Security Division**  
3M Center, Building 0225-04-N-14  
St. Paul, MN 55144-1000 USA  
Phone 1-800-553-1380  
Web [www.3M.com/vehiclereg](http://www.3M.com/vehiclereg)

3M Canada Company  
P.O. Box 5757  
London, Ontario N6A 4T1  
1-800-3MHELPS

3M México, S.A. de C.V.  
Av. Santa Fe No. 55  
Col. Santa Fe, Del. Alvaro Obregón  
México, D.F. 01210

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# Digital License Plate Thermal Transfer Ribbons

## Series TTR 1300

### For use on Multi-Year License Plates

Product Bulletin TTR1300

May 2014

Replaces PB TTR1300 dated July 2012

#### Description

3M™ Digital License Plate (DLP) Thermal Transfer Ribbons Series TTR1300 are used in conjunction with 3M™ DLP Reflective License Plate Sheeting Series 9250 and 3M™ Clear Protective Film Series 9097 to produce fully reflective vehicle registration plates for multi-year use.

#### Application

3M™ DLP Thermal Transfer Ribbons are applied to the 3M™ License Plate Sheeting through the 3M™ Digital Printing System. This system utilizes heat, applied selectively by a thermal transfer print head, and pressure to transfer the colorant from the ribbon backing to the surface of the reflective sheeting.

#### 3M Basic Product Warranty and Limited Remedy

3M™ Digital License Plate (DLP) Thermal Transfer Ribbons Series TTR1300 is warranted to be free of defects in materials and manufacture at the time of shipment and to meet the requirements stated in the Product Bulletin. If Series TTR1300 is proven not to have met the Basic Warranty on its shipment date, then a buyer's exclusive remedy, and 3M's sole obligation, at 3M's option, will be to refund or replacement of Series TTR1300.

#### Colors

Spot Colors	
TTR1301	Dark Blue
TTR1302	Dark Red
TTR1307	Forest Green
TTR1308	Bright Blue
TTR1309	Ocean Blue
TTR1310	Blue
TTR1312	Green
TTR1313	Pine Green
TTR1314	Leaf Green
TTR1315	Orange
TTR1316	Intense Red
TTR1317	Tomato Red
TTR1318	Burgundy
TTR1319	Light Gray
TTR1321	White
TTR1322	Golden Yellow
TTR1323	Sunflower Yellow

Process Colors	
TTR1303	Black
TTR1304	Cyan
TTR1305	Magenta
TTR1306	Yellow

## Storage

3M™ DLP Thermal Transfer Ribbons Series TTR1300 must be stored in their original package in a cool, dry area and should be used within one year after date of receipt. For best printing results, it is recommended that the sheeting be digitally printed in the 3M™ Digital Printing System within six months of date of receipt.

## Health and Safety Information

Read all health hazard, precautionary, and first aid statements found in the Material Safety Data Sheet, and/or product label of any chemicals prior to handling or use.

## Literature Reference

- PB 9250E/  
9250T      DLP Reflective License Plate  
                  Sheeting With Ensure™ Image  
                  For use on Multi-Year License  
                  Plates
- PB 9097      Digital License Plate Clear  
                  Protective Film 9097  
                  For use on Multi-Year License  
                  Plates
- PB Chiller    DLP Cooling System  
                  For use on DLP Printing Systems

## FOR INFORMATION OR ASSISTANCE

**CALL:**  
**1-877-777-3571**

**IN CANADA CALL:**  
**1-800-265-1840**

**Internet:**  
**www.3M.com/mvss**

3M assumes no responsibility for any injury, loss or damage arising out of the use of a product that is not of our manufacture. Where reference is made in literature to a commercially available product, made by another manufacturer, it shall be the user's responsibility to ascertain the precautionary measures for its use outlined by the manufacturer.

### Important Notice

All statements, technical information and recommendations contained herein are based on tests we believe to be reliable, but the accuracy or completeness thereof is not guaranteed, and the following is made in lieu of all warranties, or conditions express or implied. Seller's and manufacturer's only obligation shall be to replace such quantity of the product proved to be defective. Neither seller nor manufacturer shall be liable for any injury, loss or damage, direct, special or consequential, arising out of the use of or the inability to use the product. Before using, user shall determine the suitability of the product for his/her intended use, and user assumes all risk and liability whatsoever in connection therewith. Statements or recommendations not contained herein shall have no force or effect unless in an agreement signed by officers of seller and manufacturer.

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### Traffic Safety and Security Division

3M Center, Building 225-04-N-14  
P.O. Box 33225  
St. Paul, MN 55144-1000  
www.3M.com/mvss

### 3M Canada Company

P.O. Box 5757  
London, Ontario N6A 4T1  
1-800-3MHELPS

### 3M México, S.A. de C.V.

Av. Santa Fe No. 55  
Col. Santa Fe, Del. Alvaro Obregón  
México, D.F. 01210

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**DATE:** October 12, 2010  
**REVISED:** October 27, 2010

662 Cromwell Avenue  
Saint Paul, MN 55114  
USA

Telephone : (651) 645-3601  
Toll Free : (888) 645-TEST  
Telefax : (651) 659-7349  
Website : www.storktci.com

Investigative Chemistry  
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**PERFORMANCE TESTING OF  
REFLECTIVE SHEETING FOR LICENSE PLATES  
ACCORDING TO  
ISO 7591-1982(E) "ROAD VEHICLES – RETRO-REFLECTIVE  
REGISTRATION PLATES FOR MOTOR VEHICLES AND  
TRAILERS – SPECIFICATION"**

**Prepared for:**  
**3M Traffic Safety Sys. Div.**  
**Attn: Warren Johnson**  
**3M Center**  
**Bldg 235-3B-55**  
**St. Paul, MN 55144**

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**Client Purchase Order Number: TBD**

**Prepared By:**



**Briana Hinrichs**  
**Testing Technician**  
**Product Evaluation Department**

**Reviewed By:**



**William Stegeman**  
**Advanced Materials Mgr.**  
**Phone: 651-659-7230**

The test results contained in this report pertain only to the samples submitted for testing and not necessarily to all similar products.

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Stork Twin City Testing Corporation is an operating unit of Stork Materials Technology B.V., Amsterdam, The Netherlands, which is a member of the Stork Group

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October 12, 2010

REVISED:

October 27, 2010

**EAR-CONTROLLED DATA****INTRODUCTION:**

This report presents the results of performance tests conducted on one sample of reflective sheeting for license plates. The testing was authorized by Warren Johnson of 3M Traffic Safety Sys. Div. on September 29, 2010. The testing and data analysis were completed on October 7, 2010.

The scope of our work was limited to witnessing performance tests on the samples identified below and reporting the results.

**SAMPLE IDENTIFICATION:**

The sample was identified as reflective sheeting for license plates, labeled as follows:

Sample ID	Lot #	Overlaminat #	Color
9250	BPS5	NLC5	White

The sheeting was applied to a substrate identified by the customer as Aluminum Alloy: 3105, Hardness H12, surface finish top and bottom, chrome free conversion coating, supplied by Jupiter Aluminum Corporation. 3M RM number 11-0021-5967-8.

**SUMMARY OF RESULTS:**

The requirements are laid out in the Test Data Section below, followed by complete test results.

**TEST METHODS:**

All testing was conducted at 3M Center, Building 235, Maplewood, Minnesota, on October 5, 2010.

Ms. Briana Hinrichs of Stork Twin City Testing witnessed and assisted with the testing. All testing was conducted by Mr. Warren Johnson of 3M Company. Stork Twin City Testing personnel were not present when exposures over 1 hour were started and did not perform them.

All testing was conducted in accordance with the ISO 7591-1982 (E) – “Road vehicles – Retro-reflective registration plates for motor vehicles and trailers – Specification” unless noted.

**REMARKS:**

The test materials were retained at customer site.

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EAR-CONTROLLED DATA

**TEST EQUIPMENT:**

Photometric Meter, GS940D5, calibrated before use  
 Retro-Meter 2, S/N 503, 3M Asset # 753757, calibrated before use  
 Colorflex CX1689, 3M Asset # 1507080  
 PR650, S/N 60980405, with a Lamp Model HM160  
 So-Low Freezer chamber to reach -20°C  
 25mm diameter steel ball  
 50mm diameter mandrel (pole)  
 Salt-Spray Chamber

**TEST DATA:**

Photometric Properties: Section 6

Coefficient of Retro-Reflection: Section 6.1

CIE Standard illuminant A

Requirements: minimum  $R_A$  values shown below and maximum  $R_A = 250 \text{ cd}\cdot\text{lx}^{-1}\cdot\text{m}^{-2}$

Sample Identification	Observation Angle	Entrance Angle	$R_A \text{ cd}\cdot\text{lx}^{-1}\cdot\text{m}^{-2}$		Pass / Fail
			Reading	Required Minimum	
9250 (White)	0°12'	5°	70.2	45.0	Pass
		30°	48.5	18.0	Pass
		40°	34.2	8.0	Pass
	0°20'	5°	55.3	30.0	Pass
		30°	39.8	12.0	Pass
		40°	29.0	6.0	Pass
	1°30'	5°	9.6	3.5	Pass
		30°	8.5	2.0	Pass
		40°	7.1	0.7	Pass

Uniformity of Retro-Reflection: Section 6.2

Requirement: The ratio of the highest to the lowest reading shall not exceed 2 when measuring several adjacent areas. Measured at 0°12' Observation and -4° Entrance.

Sample Identification	Highest Reading	Lowest Reading	Ratio	Pass / Fail
9250 (White)	84.4	77.8	1.1	Pass

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EAR-CONTROLLED DATA

**TEST DATA Continued:**

Colorimetric Properties: Section 7

By Day: Section 7.1

45/0 (0/45) geometry, CIE illuminant D65 and the 1931 CIE 2° standard observer

Requirement:

**Minimum Cap Y, % = 35 for White**

**Shall fit into the Daytime Color box according to ISO 7591-1982 Section 7.1-Table 2**

Sample Identification	Y, %	x	y
9250 (White)	47.40	0.3064	0.3229

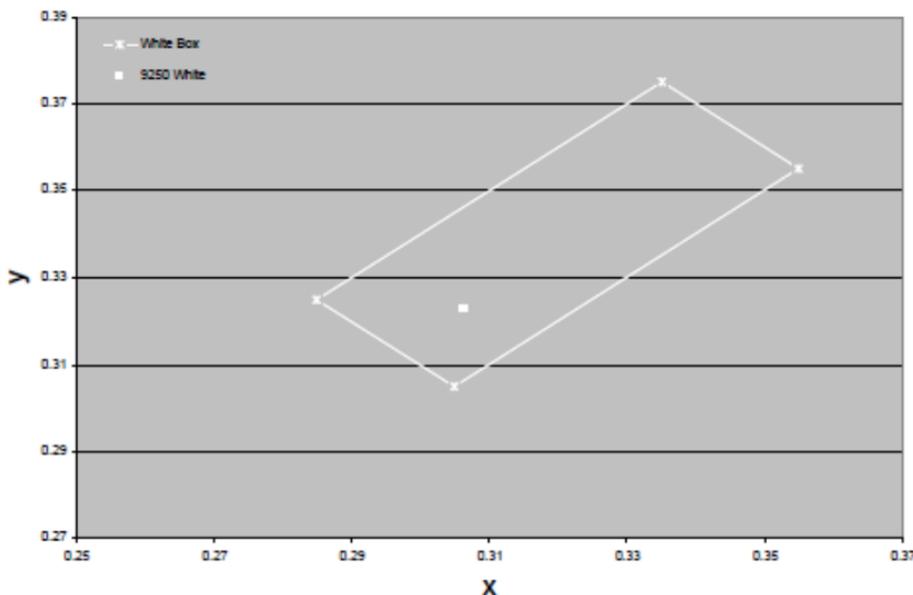


Figure 1: Daytime Color Boxes w/ Reflective Sheeting Plotted according to ISO 7591-1982

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EAR-CONTROLLED DATA

**TEST DATA Continued:**

At Night: Section 7.2

Requirement: **Shall fit into the Nighttime Color box** according to ISO 7591-1982 Section 7.2 – Table 3

Sample Identification	x	y
9250 (White)	0.451	0.434

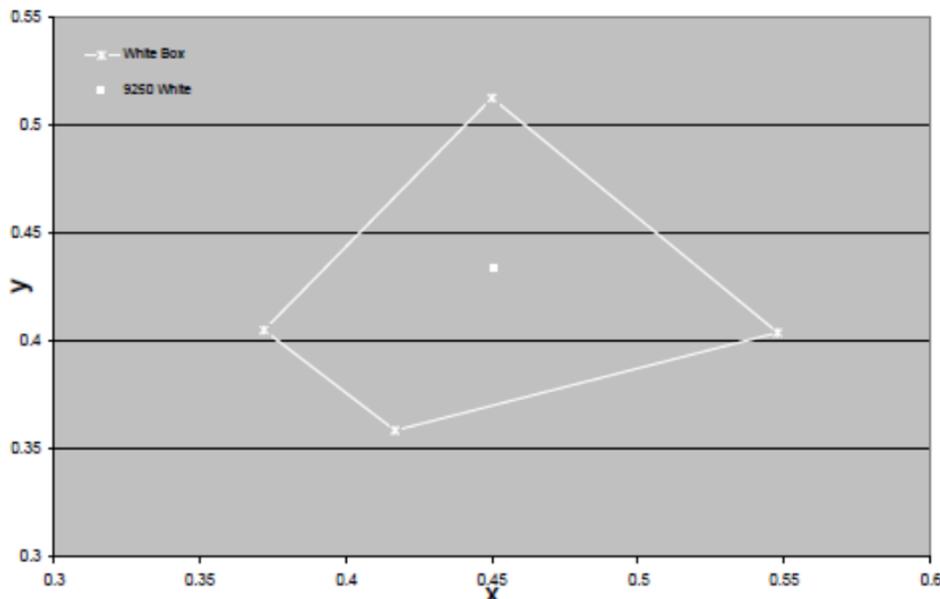


Figure 2: Nighttime Color Boxes w/ Reflective Sheeting Plotted according to ISO 7591-1982

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**TEST DATA Continued:**

Temperature Resistance: Section 8

Requirement: The reflective material shall show no peeling off the substrate, no cracking, blistering or appreciable discoloration.

Sample Identification	Observation after Temp Cycle	Pass / Fail
9250 (White)	No peeling, cracking, or blistering seen. There was also no discoloration compared to unexposed sample.	Pass

Note: Stork Twin City Testing personnel did not witness exposure.

Adhesion to Substrate: Section 9

Requirement: It shall not be possible to remove the retroreflective material physically in one piece from substrate immediately after removal from cold store.

Sample Identification	Observation (Amount removed)	Pass / Fail
9250 (White)	Immediately upon removing from cold store, a peel was started at a corner of the plate. It was not possible to remove the sheeting in one solid piece.	Pass

Note: Sample was in cold store overnight and not just 1hr.

Impact Resistance: Section 10

25mm steel ball dropped from height of 2m in -20°C

Requirement: No cracking or separation from the substrate outside of a distance of 5mm from the impact area.

Sample Identification	Observation after 2m impact	Pass / Fail
9250 (White)	No cracking was seen outside of the impact area. There was also no separation visible.	Pass

Note: Sample was in cold store overnight and not just 1hr.

Bending Resistance: Section 11

Requirement: No cracking after bending the test panel.

Sample Identification	Observation after 90° Bend	Pass / Fail
9250 (White)	No cracking seen.	Pass

Note: Sample was bent >90°.

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**EAR-CONTROLLED DATA**

**TEST DATA Continued:**

Water Resistance: Section 12

Requirement: The sample shall show no evidence of deterioration which could reduce its efficiency.

Sample Identification	Observation after Exposure	Pass / Fail
9250 (White)	There was no evidence of any deterioration.	Pass

Note: Stork Twin City Testing personnel did not witness start of water exposure.

Cleanability: Section 13

Lubricating Oil with Graphite, Heptane and a neutral detergent

Requirement: Sample shall be easily cleaned without damage to reflective surface.

Sample Identification	Observation after Cleaning	Pass / Fail
9250 (White)	After cleaning with the heptane and washing with a detergent, the graphite oil was removed.	Pass

Resistance to Fuel: Section 14

70% n-heptane and 30% toluol (by volume)

Requirement: No visible change to the surface that will reduce the efficiency of it.

Sample Identification	Observation after 1 min. in Fuel	Pass / Fail
9250 (White)	There was no visible change to the surface.	Pass

Resistance to Saline Mist: Section 15

Requirement: No corrosion which would reduce its efficiency.

Sample Identification	Observation after Saline Mist Cycle	Pass / Fail
9250 (White)	No corrosion visible at all.	Pass

Note: Stork Twin City Testing personnel did not witness exposure.

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EAR-CONTROLLED DATA

**TEST DATA Continued:**

Durability: Section 16

Subjected to 250hrs in a Xenon arc lamp apparatus which best matches the exposure described in this standard, however not in accordance with ISO 105.

Requirement: -Coefficient of Retro-Reflection shall not be less than 50% of the values in table 1 at the 0°20' observation and 5° entrance angles. (Used 0°12' observation and -4° entrance angles)

-Shall still fit into the Daytime Color box according to ISO 7591-1982 Section 7.1- Table 2

-The luminance factor shall not be lower than 80% of the values in table 2.

Sample Identification	Observation Angle	Entrance Angle	R <sub>a</sub> cd·lx <sup>-1</sup> ·m <sup>-2</sup>		Percent Change	Pass / Fail
			Initial Reading	After Exposure		
9250 (White)	0°12'	-4°	71.6	84.4	+18%	Pass

Sample Identification	Y, %	x	y	Luminance factor Y compared to before exposure	Pass / Fail
9250 (White)	45.09	0.3069	0.3259	95%	Pass

Note: Stork Twin City Testing personnel did not witness exposure.

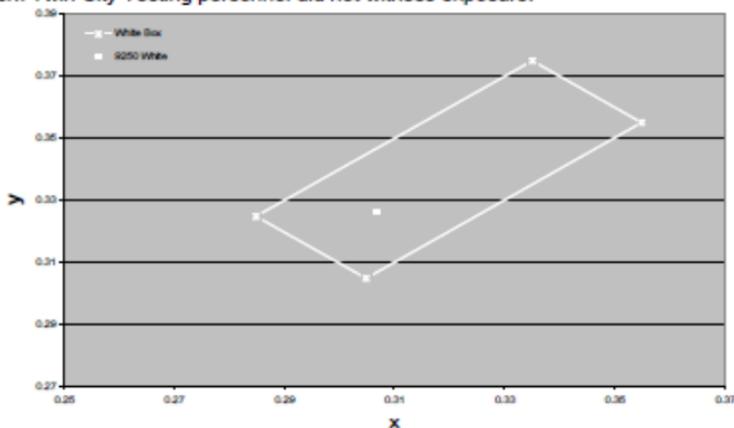


Figure 3: Daytime Color Boxes w/ Reflective Sheeting Plotted after exposure

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# Ensure™ Directional Image

## Ensure™ Virtual Security Thread

Law Enforcement License Plate Verification Procedures

Jan. 2009

### *Counterfeiting is a threat to public safety*

Rather than stealing a plate, sophisticated criminals will go to the added effort of creating a counterfeit because there is a much lower risk of detection.

### *License plates may be vulnerable to security breaches*

- Conventional printed graphics and embossed characters are easy to duplicate.
- Printed watermarks are easy to duplicate and difficult to see at a distance.
- Holograms are readily available, easy to simulate and difficult to verify.

### *3M Security Marks*

License plates with 3M security marks offer up to two features for double protection: The 3M™ Ensure™ Directional Image and 3M™ Ensure™ Virtual Security Thread

3M's Ensure directional image consists of a circular security and warranty image that repeats and runs vertically through the center of the license plate. It is visible only when viewed head-on at about a 30 degree angle to horizontal. It "disappears" from view at other angles.



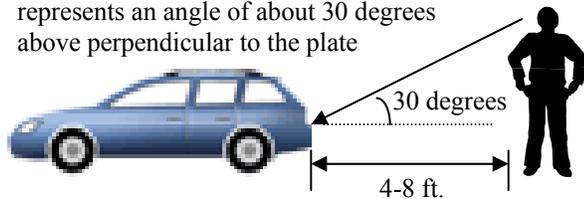
3M's Ensure virtual security thread consists of a three-dimensional security image that runs vertically through the center of the license plate. The image consists of two "threads." One thread appears to float above and the other below the surface of the plate. It is visible head-on at distances of up to 50 feet or more.



### **3M™ Ensure™ Directional Image**

- Customized for each jurisdiction
- Visible only within a range of angles
- Easy verify, day or night
- Difficult to duplicate

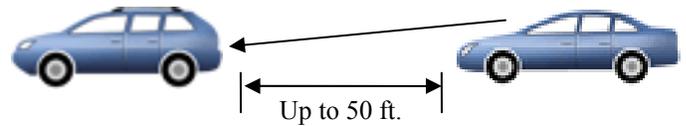
Visible to a viewer standing directly in front of the plate at a distance of 4-8 feet. This represents an angle of about 30 degrees above perpendicular to the plate



### **3M™ Ensure™ Virtual Security Thread**

- Unique three-dimensional appearance
- Visible head-on up to 50 feet or more
- Easy to verify, day or night
- Difficult to duplicate

Visible to a viewer standing (or in a vehicle) directly in front of the plate at a distance of up to 50 feet.



### **Demonstration Procedure**

1. Park the object car with the license plate (front or back plate) facing north (away from direct exposure to sun) during the day or night.
2. Position the viewing car about 50 feet directly behind the object car. Turn on high beam headlights if viewing the license plate at night.
3. Slowly approach the object car until the individual “threads” of the Ensure virtual security thread is clearly in view and you can see the double “thread” pattern (this occurs within 20 feet).
4. Get out of the viewing car and observe the Ensure directional image and virtual security thread at different distances and angles.
5. You should now be ready to visually verify these security marks in actual situations.



Transportation Safety Division

# **3M™ High Definition Reflective License Plate Sheeting Series 6700**

**With Optional Dynamic Security Script Technology for Use on  
Multi-Year License Plates**

**Product Bulletin Series 6700  
July 2018**

**Replaces Product Bulletins 6700 Dated April 2017**

## **1 Description**

3M High Definition License Plate Sheeting Series 6700 is a durable, all-weather, retroreflective sheeting consisting of micro-replicated optical elements protected by a durable top film. Series 6700 sheeting is designed for use in the fabrication of multi-year reflective license plates that help enhance the nighttime visibility and legibility of the vehicle identification system. Series 6700 sheeting appears similar during the day and at night (when viewed by reflected light) and is highly reflective when viewed both head-on and at entrance angles important for safety and legibility. The backside of the reflective sheeting is pre-coated with a pressure sensitive adhesive, protected by a removable liner, for application to license plate substrates. Personalized graphic designs are available for Series 6700 sheeting and offer a unique opportunity to promote a county, state, or national attraction, event, or image while continuing to provide the motorist with the safety aspects of fully reflective license plates. Additional stretch and registry control equipment is required to process graphic printed sheetings.

Plates can be embossed and roll coated with either transparent or opaque roll coating inks.

When printed with the 3M Digital License Plate System, TTR1300 Ribbons will be used with Series 6700 sheeting to print background graphics and variable plate messages, background graphics only, or variable plate message only. 3M Digital License Plate Clear Protective Film 9097 must be applied after printing. Plates may optionally be rim embossed or debossed.

## 2 Dynamic Security Script Technology

Series 6700 sheeting with Dynamic Security Script Technology can include a range of very secure, tamper-resistant retroreflective security marks that can help defend against counterfeiting, provide production traceability, and help authorities assure authenticity. Under retroreflection, some elements of the security mark will appear slightly brighter than the background sheeting while other elements will appear slightly darker than the background sheeting. This property remains but shows a reversal of contrast under daylight viewing conditions. This contrast property also allows security marks to be seen from long distances (greater than 20 ft.) using a standard light source (i.e. headlights or flashlights).

Dynamic Security Script Technology is a unique feature that is very difficult to duplicate. The marks are integral to the reflective layer of the sheeting, can only be introduced at the time of sheeting manufacture, and cannot be modified without damaging the sheeting.

Sheeting can be provided with no mark, a standard mark, or a mark that has been designed with specific customer input. Dynamic Security Script Technology marks will have a repeat pattern in the roll direction.

## 3 Performance Considerations

Series 6700 license plate sheeting is designed for multi-year applications. Experience indicates that finished plates, processed and applied as recommended, will perform without appreciable fading, cracking, blistering, or peeling for the period specified in Section 11.

### 3.1 Retroreflectivity

The typical minimum coefficients of retroreflection of White 3M Series 6700 sheeting are shown in Table 1. The Coefficients of Retroreflection of Gold, Orange, Blue, Yellow, Green, and Red are available upon request. Finished license plates applied per 3M recommendations shall meet the brightness requirements of ISO 7591.

**Table 1. Typical Minimum Coefficient of Retroreflection RA [cd/lux/m<sup>2</sup>] (Average of 0° and 90° values)**

Observation Angle <sup>a</sup>	Entrance Angle <sup>b</sup>	White
		Min
0.2°	-4°	150
	30°	26
0.5°	-4°	45
	30°	13
1.0°	-4°	20
	30°	7

- a. Observation Angle - The angle between the illumination axis and the observation axis.
- b. Entrance Angle - The angle from the illumination axis to the retroreflector axis. The retroreflector axis is an axis perpendicular to the retroreflective surface.

All measurements shall be conducted in accordance with ASTM E810, "Standard Test Method for Coefficient of Retroreflection of Retroreflective Sheeting."

### 3.2 Daytime Color (x,y,Y)

The chromaticity coordinates and total luminance factors of Series 6700 license plate sheeting conforms to the limits presented in Table 2.

**Table 2. CIE Daytime Chromaticity Coordinate Limits<sup>a</sup> and Total Luminance Factor Minimum**

Color	1		2		3		4		Daytime Luminance Limit (Y%)
	x	y	x	y	x	y	x	y	Min.
White	0.355	0.355	0.305	0.305	0.285	0.325	0.335	0.375	55

- a. The four pairs of chromaticity coordinates define the acceptable color limits for CIE D65 illumination in terms of the CIE 1931 Standard Colorimetric System, when measured using a 2-monochromator spectrophotometer employing an annular 45/0 illuminating and viewing geometry.

### 3.3 Adhesive

3M Series 6700 sheeting is provided with a pressure sensitive adhesive and an easy to remove liner that protects the adhesive until it can be laminated to the license plate substrate.

## 4 Fabrication of Reflective License Plates

For recommended license plate manufacturing procedures, refer to [3M Information Folder 9.8](#).

### 4.1 Substrates

The pre-coated adhesive will form a permanent bond to the surfaces of clean, chemically treated or conversion coated aluminum substrates normally used in the manufacture of license plates and as recommended by 3M.

### 4.2 Application

3M sheeting has been designed for application to clean, flat coil or sheet stock by continuous squeeze roll application.

Sheeting should be stretched to a maximum of 1% during application to the substrate. Once the 3M reflective sheeting has been applied, it is recommended that laminated blanks be stored for a minimum of 48 hours before being embossed or debossed. For best embossing results, laminated blanks must be stored on edge and used within one year of date of receipt of the 3M sheeting.

### 4.3 Embossing and Debossing

3M reflective sheeting, as applied to flat metal, is sufficiently flexible to satisfy the embossing and debossing requirements of most conventional license plate designs. 3M reflective sheeting may be embossed or debossed to a height of up to 0.080" (2mm) using standard embossing equipment and dies used for license plate production. Minimum embossing temperature is 70°F (21°C).

Roll coating embossed or debossed license plates within 24 hours of embossing or debossing greatly improves license plate printability and quality.

### 4.4 Color Processing

Apply legends to embossed or debossed plates by roller coating with the 3M recommended high quality transparent or opaque inks listed in Section 4.5.

**Note:** Care should be taken when choosing color combinations to ensure attractiveness and maximum legibility. This is especially true with graphic design sheetings. To assure suitable contrast for maximum legibility and safety, 3M recommends the use of dark color roll coated characters on a white or yellow reflective sheeting background. Opaque inks are preferred for use with camera reading systems.

## 4.5 Oven Dried Inks

3M Series 4850 Opaque  
3M Series 4950 Transparent

Contact your 3M Technical Representative for assistance with oven drying conditions. Cool license plates to room temperature before packaging.

## 4.6 Dry Roll Coat Foils

For recommended dry roller coating practices refer to [3M Product Bulletin HSF100/200 and DRF 300/400](#).

Contact your 3M Technical Service Representative for additional information on dry roller coating foils.

## 4.7 Printer Ribbon Compatibility

Series 6700 sheeting is compatible with the printers and ribbons shown in Table 3.

**Table 3. Ribbons Qualified Under the 3M Warranty**

3M DLP Printer TTR Ribbons		Matan SpringG3 Printing System IIMAK 12" Ribbons (for Digitag 1650)	
ITEM NUMBER	DESCRIPTION	ITEM NUMBER	DESCRIPTION
TTR 1303	Process Black	MAT-AR12PC56	Process CYAN
TTR 1304	Process Cyan	MAT-AR12PK56	Process BLACK
TTR 1305	Process Magenta	MAT-AR12PM56	Process MAGENTA
TTR 1306	Process Yellow	MAT-AR12PY56	Process YELLOW
TTR 1301	SPOT Dark Blue	MAT-AR12SSB56	SPOT Sapphire Blue
TTR 1302	SPOT Dark Red	MAT-AR12SIR56	SPOT Intense Red
TTR 1307	SPOT Forest Green	MAT-AR12SG56	SPOT Green
TTR 1308	SPOT Bright Blue	MAT-AR12SRR56	SPOT Ruby Red
TTR 1309	SPOT Ocean Blue	MAT-AR12STR56	SPOT Tomato Red
TTR 1310	SPOT Blue	MAT-AR12SBY56	SPOT Burgundy
TTR 1312	SPOT Green	MAT-AR12SB56	SPOT Blue
TTR 1313	SPOT Pine Green	MAT-AR12SBB56	SPOT Bright Blue
TTR 1314	SPOT Leaf Green	MAT-AR12SRB56	SPOT Reflex Blue
TTR 1315	SPOT Orange	MAT-AR12SOB56	SPOT Ocean Blue
TTR 1316	SPOT Intense red	MAT-AR12OLB56	SPOT Olympic Blue
TTR 1317	SPOT Tomato Red	MAT-AR12SPG56	SPOT Pine Green
TTR 1318	SPOT Burgundy	MAT-AR12SFG56	SPOT Forest Green
TTR 1319	SPOT Light Gray	MAT-AR12SLG56	SPOT Leaf Green
TTR 1321	SPOT White	MAT-AR12SO56	SPOT Orange
TTR 1322	SPOT Golden Yellow	MAT-AR12SDG56	SPOT Dark Gray
TTR 1323	SPOT Sunflower Yellow	MAT-AR12SGR56	SPOT Gray (AKA Light Gray)
		MAT-AR12SY56	SPOT Yellow
		MAT-AR12SSY56	SPOT Sunflower Yellow
		MAT-AR12UVY56	SPOT Ultra UV Yellow
		MAT-AR12SGY56	SPOT Golden Yellow
		MAT-AR12SW40	SPOT WHITE

## 5 Cleaning

For maximum service life, do not use abrasive or chemically concentrated harsh cleaners. Use the same care as is used in cleaning the paint surface on the vehicle. License plate surfaces should be cleaned of normal use dirt accumulation by washing with a mild detergent and water using a soft bristle brush or cloth. Following cleaning, plates should be thoroughly rinsed with water.

To remove tar, oil, or road film, cautious use of mild solvents, such as mineral spirits, turpentine, or kerosene, may be employed. Use of aromatic solvents and ketones, or solvent mixtures containing them, should be avoided.

## 6 Storage

Sheeting and roll coat inks must be stored in their original package in a cool, dry area and should be used within one year of date of receipt.

## 7 General Characteristics and Packaging

The reflective sheeting as supplied will be of good appearance, free from ragged edges and cracks, and packaged according to commercial standards. The sheeting will be spliced for continuous roll application. Additional sheeting is supplied to compensate for splices.

## 8 Specifications

The information concerning 3M Reflective Sheeting Series 6700 contained herein is considered to describe typical minimum requirements for an effective reflective license plate material. As such, the information may be incorporated into a product purchase specification to be used in conjunction with a specification for finished retroreflective license plates. For detailed product specifications, contact your 3M Technical Representative.

## 9 Fabrication Lines

The manufacturing process for prismatic sheeting results in periodic lines in the product. Fabrication lines may be noticeable in shop light but do not impact license plate functionality on the road, either in daylight or at night, under typical use conditions.

## 10 Health and Safety Information

Read all health hazard, precautionary, and first aid statements found in the Safety Data Sheets, and product labels for all chemical products prior to handling or use.

3M Series 6700 sheeting does not require a Safety Data Sheet, however, an Article Information Letter is available upon request.

## 11 Warranty Information

### 11.1 3M Warranty

3M warrants (“3M Warranty”) that 3M High Definition License Plate Sheeting Series 6700 (with 3M Dynamic Security Script) (“Sheeting”) imaged as recommended by 3M in this product bulletin will:

- Remain legible by resisting excessive fading, cracking, blistering or peeling, and
- The unprinted areas of the Sheeting (those without preprinted graphics or customer-printed graphics) applied on a license plate (“Plate”) will retain a coefficient of retroreflection for the number of years (“Warranty Period”) as given in Table 3, measured from the Plate fabrication date (“Fabrication Date”).

**Table 4. Sheeting Colors and Warranty Period for Series 6700**

Base Sheeting Color	Retained Coefficient of Retroreflection <sup>a</sup> [cd/m <sup>2</sup> /lux]	Warranty Period (Years)
White	18	5
Yellow	18	5
Gold	18	3
Orange	18	3
Light Blue	18	2
Green	18	2
Red	18	1

- a. All measurements taken at 2° observation angle and -4° degrees entrance angle. All measurements shall be made after cleaning the Plate according to 3M recommendations and in accordance with ASTM E810 “Standard Test Method of Coefficient of Retroreflective Sheeting,” except that the coefficient of luminous intensity shall be determined in accordance with ASTM E808-01 Para. 3.2.2 and ASTM E809-02 Para. 12.3.

### 11.2 Warranty Terms and Conditions

- A failure to meet the 3M Warranty must be solely the result of design or manufacturing defects in the Sheeting and not of (a) outside causes including improper fabrication, handling, maintenance or installation; (b) use of roll coat pastes, overlay films, or sheetings not listed herein; (c) Plate exposure to temperatures beyond 3M's recommendations; (d) use of a reflective Sheeting applicator, stretch control mechanism, brake table, or corresponding registry feed controls not provided and installed by 3M; (e) failure of Plate substrate; (f) exposure to chemicals, abrasion, or damage from fasteners used to mount the Plate; (g) collisions, vandalism, or malicious mischief; or (h) an act of God.
- Claims made under this warranty will be honored only if the Plates have been marked with a Dynamic Security Script mark that includes the month/year date that the material originated from 3M or there is a clear record of the Fabrication Date either on the Plate or in an auditable records database; records must be maintained showing that the profile settings and procedures used in the production of the Plates conform to 3M recommendations.
- Sheeting must be stored, applied, installed, processed, and used in accordance with all 3M application procedures found in 3M's product bulletins, information folders, manufacturing manuals, Digital License Plate System User Manual, and technical memos (which will be furnished upon request), including the appropriate use of components listed in Section 13 of this product bulletin and recommended application equipment.
- Claims made under this warranty will be honored only if 3M is notified of a failure within 30 days, reasonable information requested by 3M is provided, and 3M is permitted to verify the cause of the failure.

### 11.3 Exclusive Limited Remedy

If the Sheeting on a Plate is shown to not meet the 3M Warranty during the Warranty Period, 3M's sole and exclusive remedy is, at 3M's option, to replace the Plate, or reimburse the Plate's issuing agency (“Agency”) at a rate of no more than \$5.00 per Plate. Reimbursement to the Agency will be in dollars and/or materials, as determined by the needs of the Agency. Replacement Sheeting will carry the unexpired warranty period of the Sheeting it replaces.

## 11.4 Disclaimer

THE 3M WARRANTY IS MADE IN LIEU OF ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE, OR ANY IMPLIED WARRANTY ARISING OUT OF A COURSE OF DEALING OR OF PERFORMANCE, CUSTOM, OR USAGE OF TRADE.

## 11.5 Limitation of Liability

Except for the limited remedy stated above, and except where prohibited by law, 3M will not be liable for any loss or damage arising from Plates or any 3M product, whether direct, indirect, special, incidental, or consequential damages (including but not limited to lost profits, business, or revenue in any way), regardless of the legal theory asserted including warranty, contract, negligence, or strict liability.

## 12 Other Product Information

Always confirm that you have the most current version of the applicable product bulletin, information folder, or other product information from 3M's Website at <http://www.3M.com/vehicleregistration>.

## 13 Literature References

<a href="#">3M IF 9.8</a>	Preclear Reflective License Plate Sheeting Recommended Manufacturing Procedures
<a href="#">3M PB HSF100/200 and DFR 300/400</a>	Dry Roller Coat Foil Series HSF100/200 and DRF300/400
<a href="#">3M PB 4850/4950</a>	Roll Coat Inks Series 4850/4950
<a href="#">3M PB 9097</a>	3M™ Digital License Plate Clear Protective Film 9097 for Use on Multi-Year License Plates

ASTM Test Methods are available from ASTM International, West Conshohocken, PA.

**For Information or Assistance**

**Call: 1-800-553-1380**

**In Canada Call:**

**1-800-3M HELPS (1-800-364-3577)**

**Internet:**

<http://www.3M.com/vehicleregistration>

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**Transportation Safety Division**  
3M Center, Building 0225-04-N-14  
St. Paul, MN 55144-1000 USA

Phone 1-800-553-1380

Web <http://www.3M.com/vehicleregistration>

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# IN Passenger DSS Layout Approval Document (US DSS Mark+Thread+Warranty Mark)



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April 19, 2018

- The number of US DSS images and their position on the plate will be variable (spacing will not vary).
- Dimensions may vary due to printing tolerances and stretch during the blanking process.

• Note: spacing of DSS images is dependent on flexo sleeve diameter.

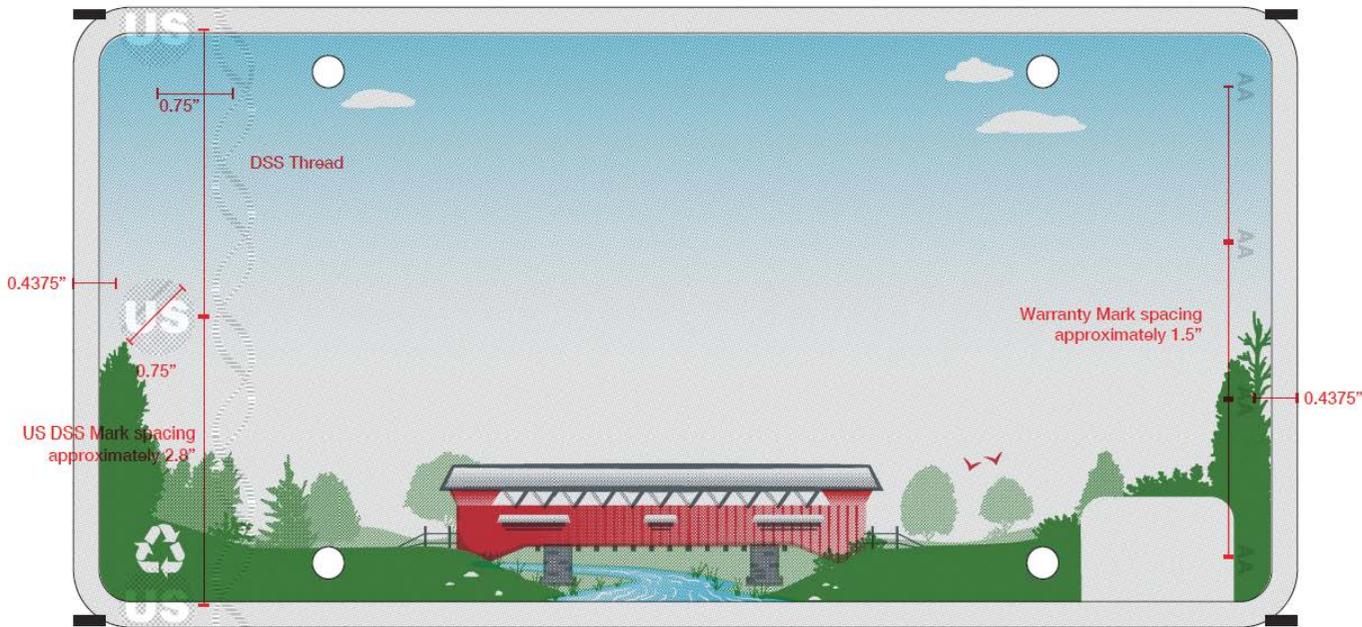
**If position and spacing of images is approved, please print name, sign and date:**

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April 19, 2018

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- Note: spacing of DSS images is dependent on flexo sleeve diameter.

If position and spacing of images is approved, please print name, sign and date:

\_\_\_\_\_  
(Print Name)

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Date)

2185958-PHO 15-206-1

**Compliance testing of retro-reflective  
registration plate according to ISO 7591  
make 3M (white) type 6700.**

Arnhem, 3 December 2015  
Author M.F.H. Klein Gebbink  
DEKRA Certification B.V. - Photometry

By order of 3M Traffic Safety & Security Division, 3M Center in St. Paul, USA.

---

Author : M.F.H. Klein Gebbink 03-12-2015  
16 pages 3 annexes KG/RvdV

Reviewed : G.C. Muda

03-12-2015

A handwritten signature in blue ink, consisting of a circular loop followed by a long horizontal stroke.A handwritten signature in blue ink, featuring a large, sweeping horizontal stroke with a smaller loop above it.

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## **SUMMARY**

The tested white retro-reflective registration plates type 6700 were found to comply with the requirements of ISO 7591-1982.

## 1 APPLICATION FOR APPROVAL TESTING

On 27 August 2015, 3M Traffic Safety & Security Division, 3M Center in St. Paul, USA, submitted samples of retro-reflective registration plates make 3M type 6700 (white). Seven complete plates with- and one plate without embossing, sized 30.5x15.4 cm. The test samples were cut from these plates.

The applicant desired an examination, whether these types of retro-reflective registration plates comply with the requirements of ISO 7591-1982

## 2 EXAMINATION

The examination has been carried out in accordance with the relevant clauses of the standard concerned.

The coefficient of retro-reflection  $R'$  in candelas per square metre per lux of the white retro-reflective material was determined by illuminating samples of the material, with known area dimensions. The samples were measured with a homogeneous nearly parallel beam of a tungsten filament lamp, corresponding with CIE Standard Illuminant A as recommended by CIE Publication 54, 1984.

The observation angles were  $0^\circ 12'$ ,  $0^\circ 20'$  and  $1^\circ 30'$  as specified in table 1 of clause 6.1. After the samples have been subjected to a simulated rainfall, the reflectivity of the retro-reflective surface of the plates was measured again.

The measurements of the colour and the luminance factor of the white retro-reflective material in the 45/0 geometry have been performed using a spectroradiometer and a xenon light source including optics and filters.

By measurement of the spectral reflection factor, using a Barium-sulphate-standard ( $\text{BaSO}_4$ ) with a known spectral reflection factor as a reference, the chromaticity co-ordinates and the luminance factor could be computed for the 45/0 geometry for CIE Standard Illuminant  $D_{65}$ , as specified in clause 7.1 of the standard concerned.

The measurements of the colour of the white retro-reflective material at an 5° entrance angle and an observation angle of 20' have been performed using a spectroradiometer, calibrated for relative sensitivity, and a tungsten filament lamp with a colour temperature of 2856 K, which corresponds with CIE Standard Illuminant A.

By measurement of the spectral emissivity of the retro-reflective material in the geometry as specified in clause 7.2 of the standard concerned, the chromaticity co-ordinates could be computed.

The accelerated weathering test according to ISO 105, as described in clause 16 of ISO 7591 "durability", has been performed by DEKRA Automobil GmbH in Saarbrücken, Germany.

### **3 RESULTS OF EXAMINATION**

The results of the test are summarized in Annex 2. Detailed results concerning the colorimetric and photometric measurements are recorded in the tables 1 up to 5 of Annex 3.

- Table 1: Coefficients of retro-reflection R'of type 6700 (white)
- Table 2: Uniformity of retro-reflection
- Table 3: Chromaticity co-ordinates and luminance factors sample no. 1
- Table 4: Chromaticity co-ordinates and luminance factors sample no. 2
- Table 5: Chromaticity co-ordinates in diagrams



# High Definition Reflective License Plate Sheeting

With optional Dynamic Security Script Technology  
For Use on Multi-Year License Plates

Product Bulletin Series 6700 Sheeting

June 2013

## Description

3M™ High Definition License Plate Sheeting Series 6700 is a durable, all-weather, retroreflective sheeting consisting of micro-replicated optical elements protected by a durable top film. Series 6700 sheeting is designed for use in the fabrication of multi-year reflective license plates. Plates can be embossed and roll coated with either transparent or opaque roll coating inks to produce attractive license plates which function 24 hours a day to enhance nighttime safety and the legibility of the vehicle identification system. Series 6700 sheeting appears similar during the day and at night (when viewed by reflected light) and is highly reflective when viewed both head-on and at entrance angles important for safety and legibility. The backside of the reflective sheeting is pre-coated with a pressure sensitive adhesive, protected by a removable liner, for application to license plate substrates. Series 6700 sheeting is available with personalized graphic designs which offer a unique opportunity to promote a country, state or national attraction, event or image while continuing to provide the motorist with the safety aspects of fully reflective license plates. Additional stretch and registry control equipment is required to process graphic printed sheetings.

3M sheetings, processing materials and equipment provide flexibility in the design of a license plate system, specific to the desires and requirements of plate issue relative to color, reflectivity, durability, design and plate manufacture.

## Optional Dynamic Security Script Technology

Series 6700 sheeting with Dynamic Security Script Technology can include a range of very secure tamper-resistant security marks that can help authorities assure authenticity, defend against counterfeiting and provide production traceability. They have the unique feature of being retroreflective when a light is directed towards it. As a result, some elements of the image will appear slightly brighter than the general background sheeting while other elements will appear slightly darker than the background sheeting. This also allows it to be seen from larger distances (greater than 20 ft) with a light source (i.e. headlights or flashlights).

This unique feature is very difficult to duplicate. The marks are integral to the sheeting, can only be introduced at the time of sheeting manufacture and cannot be modified without damaging the sheeting. Sheeting can be provided with no mark, a standard mark, or a mark that has been designed with specific customer input. Marks will have a repeat pattern in the roll direction.

## Performance Considerations

Series 6700 license plate sheetings are designed for multi-year applications. Experience indicates that finished plates, processed and applied as recommended, will perform without appreciable fading, cracking, blistering or peeling for the specified warranty period.

### A. Reflectivity

The minimum reflectivity values of 3M series 6700 sheeting (white only) are shown in Table A. Reflectivity values of other colors will be provided upon request. Other colors that will be made available include: Yellow, Red, Gold, Orange, Blue, Lt. Blue, Lt. Green, Lemon Yellow.

Table A  
Minimum Coefficient of Retroreflection  
Candlepower per foot candle per Square Foot  
Candelas per lux per Square Meter  
(0.2° Observation Angle<sup>1</sup>)

Color	Observation Angle <sup>1</sup>	Entrance Angle <sup>2</sup>		Maximum
		-4.0	30	
White	0.2° (0° 12'')	150	26	400
White	0.5° (0° 30'')	45	13	400
White	1.0° (1° 0'')	20	7	400

<sup>1</sup>Observation (Divergence) Angle — The angle between the illumination axis and the observation axis.

<sup>2</sup>Entrance (Incidence) Angle — The angle from the illumination axis to the retroreflector axis. The retroreflector axis is an axis perpendicular to the retroreflective surface.

*All measurements shall be conducted in accordance with ASTM E-810, "Standard Test Method for Coefficient of Retroreflection of Retroreflective Sheeting."*

**B. Adhesive**

3M Series 6700 sheetings are provided with a pressure sensitive adhesive that has an easy to remove liner that protects the adhesive until it can be laminated to the license plate substrate.

**Fabrication of Reflective License Plates**

**Note:** For recommended manufacturing procedures used in the fabrication of license plates refer to Information Folder 9.8.

**A. Substrates**

The pre-coated adhesive will form a permanent bond to the surface of clean, chemically treated or conversion coated aluminum substrates normally used in the manufacture of license plates and as recommended by 3M. Contact your 3M Technical Representative for specific substrate recommendations.

**B. Application**

3M sheeting is designed for application to clean flat coil or sheet stock by continuous squeeze roll application. A minimum of 48 hours storage after application of sheeting is recommended before embossing or debossing. Laminated blanks must be stored on edge and used within one year after date of receipt of the 3M sheeting for best embossing results.

**C. Embossing and Debossing**

The reflective sheeting as applied to flat metal is sufficiently flexible to permit the embossing or debossing requirements of most conventional license plate designs. 3M sheeting may be embossed or debossed up to 2mm or 0.080 inches with standard embossing equipment and dies used for license plate production. Minimum embossing temperature is 70°F (21°C). To enhance the printability and quality of the embossed or debossed license plates, they must be roll coated within 24 hours.

**D. Color Processing**

The legend is applied to embossed or debossed plates by roller coating with the following 3M recommended high quality transparent or opaque inks.

**Note:** Care should be taken in choosing color combinations to ensure attractiveness and maximum legibility. This is especially true with graphic design sheetings. To assure suitable contrast for maximum legibility and safety, 3M recommends use of dark color roll coated characters on a white or yellow reflective sheeting background. Opaque inks are preferred for use with camera reading systems.

**E. Oven Dried Inks:**

3M™ Series 4850 Opaque  
3M™ Series 4950 Transparent  
Contact your 3M Technical Representative for assistance with oven drying conditions.

*Cool the license plates to room temperature before packaging.*

**F. Dry Roll Coat Foils**

**Note:** Use series HSF100 or 200 dry roller coat foils. For recommended dry roller coating practices, refer to Product Bulletin HSF100/200. Contact your 3M Technical Service Representative for additional information on dry roller coating foils.

**Cleaning**

For maximum service, do not use abrasive, or chemically concentrated harsh cleaners. Use the same care as is used in cleaning the paint surface on the vehicle. The license plate surface should be cleaned of normal use dirt accumulation by washing with a mild detergent and water using a soft bristle brush or cloth. Following cleaning, the plate should be thoroughly rinsed with water.

To remove tar, oil, or road film, cautious use of mild solvents such as mineral spirits, turpentine, or kerosene may be employed. Use of aromatic solvents and ketones or solvent mixtures containing them should be avoided.

### Storage

Sheeting and roll coat inks must be stored in their original package in a cool, dry area and should be used within one year after date of receipt.

### General Characteristics and Packaging

The reflective sheeting as supplied will be of good appearance, free from ragged edges and cracks, and packaged according to commercial standards. The sheeting will be spliced for continuous roll application. Additional sheeting is supplied to compensate for splices.

### Specifications

The information contained herein on 3M reflective sheeting Series 6700 is considered to describe typical minimum requirements for an effective reflective license plate material. As such, the information may be incorporated into a product purchase specification to be used in conjunction with a specification for finished retroreflective license plates. For detailed product specifications, contact your 3M Technical Representative.

### Health and Safety Information

Read all health hazard, precautionary, and first aid statements found in the Material Safety Data Sheet, and/or product label of chemicals prior to handling or use.

### Warranty

3M warrants that 3M™ High Definition License Plate Sheeting Series 6700 (with 3M Dynamic Security Script) sold by 3M for fabrication of reflective safety plates in the United States, Mexico and Canada will remain effective for its intended use and retain a coefficient of retroreflection of at least nine (9) candlepower per foot candle per plate<sup>3</sup> for the number of years indicated in the following table and subject to the following provisions:

Sheeting Color	Years
White	5
Yellow	5
Lemon Yellow	5
Gold	3
Orange	3
Blue	2
Green	2
Red	1

**Notes:** All measurements are at .2 degrees observation angle and -4 degrees entrance angle.

*All measurements shall be made after cleaning the plate according to 3M recommendations and in accordance with ASTM E 810 "Standard Test Method of Coefficient of Retroreflective Sheeting," except that the coefficient of luminous intensity shall be determined in accordance with ASTM E 808-01 Para. 3.2.2 and ASTM E 809-02 Para. 12.3. Graphic preprinted transparent colored areas are warranted for the same number of years as the background sheeting as stated above. If 3M preclear reflective license plate sheeting is applied to 3M-approved substrate materials in accordance with all 3M application procedures found in 3M's product bulletins, information folders, and technical memos (which will be furnished to the agency upon request), including the appropriate use of 3M matched component systems, roll coat inks, and recommended application equipment; and If at any time during the period specified in the table above: a) plates show fading, cracking, blistering or peeling which will significantly impair the intended visibility or legibility of the plate; or b) a one-half of one percent sample of clean, rear plates provided from a given production run (which may be identified by the optional Dynamic Security Script mark) reveals that 10 percent or more of that sample fails to retain at least nine (9) candlepower per foot candle per plate<sup>3</sup> (0.84 candelas per lux per plate) as defined herein; 3M will reimburse the agency for the manufacturing cost of all of the plates from that specific lot of material, up to a maximum of \$5.00 per plate. Reimbursement to the using agency will be in dollars and/or materials, as determined by the needs of the using agency.*

<sup>3</sup>Graphic printed reflective plates may not meet this requirement as large graphic printed areas can affect the reflectivity values of the finished license plates.

### Conditions

Such failure must be solely the result of design or manufacturing defects in the 3M Series 6700 license late sheeting and not of outside causes such as: improper fabrication, handling, maintenance or installation; use of roll coat pastes or overlay films and sheetings not made by 3M; exposure to oven temperatures beyond 3M recommendations; use of a reflective sheeting applicator, stretch control mechanism, brake table or corresponding registry feed controls not provided and installed by 3M; failure of plate substrate; exposure to chemicals, abrasion, or damage from fasteners used to mount the plate; collisions, vandalism or malicious mischief. Replacement sheeting will carry the unexpired warranty period of the sheeting it replaces. Claims made under this warranty will be honored only if the plates have been marked with

a Dynamic Security Scriptmark that includes 3M production run numbers from which the material originated.

**Limitation and Liability**

3M's liability under this warranty is limited to replacement as stated herein, and 3M assumes no liability for any incidental or consequential damages, such as profits, business or revenues in any way related to the product regardless of the legal theory on which the claim is based. This warranty is made in lieu of all other warranties, express or implied, including but not limited to the implied warranties of merchantability, fitness for a particular purpose, and any implied warranty arising out of a course of dealing or of performance, custom usage or trade.

**FOR INFORMATION OR ASSISTANCE**

**CALL:**  
**1-877-777-3571**

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**Traffic Safety and Security Division**  
3M Center, Building 235-3A-09  
P.O. Box 33225  
St. Paul, MN 55133-3225  
[www.3M.com/mvss](http://www.3M.com/mvss)

**3M Canada Company**  
P.O. Box 5757  
London, Ontario N6A 4T1  
1-800-3MHELPS

**3M México, S.A. de C.V.**  
Av. Santa Fe No. 55  
Col. Santa Fe, Del. Alvaro Obregón  
México, D.F. 01210

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Examination of retro-reflective registration plates for motor vehicles and trailers make 3M type 6700 (white), carried out in accordance with the relevant clauses of standard ISO 7591.

clause (C)	title or subject of the relevant clause or annex	judgement	remarks
C5	Test samples Minimum area for retro-reflection test and colorimetric properties	complies	
C6.1	Minimum values of coefficient of retro-reflection in new condition When subjected to rainfall	complies complies	see table 1 see table 1
C6.2	Uniformity of retro-reflection	complies	see table 2
C7	Colorimetric properties		
C7.1	By day (45/0 geometry)	complies	see tables 3 up to 5
C7.2	At night (0/0 geometry)	complies	see tables 3 up to 5
C8	Temperature resistance	complies	
C9	Adhesion to the substrate	complies	
C10	Impact resistance	complies	
C11	Bending resistance	complies	(embossed plates 30.5x15.4 cm)
C12	Water resistance	complies	
C13	Cleanability	complies	
C14	Resistance to fuel	complies	
C15	Resistance to saline mist	complies	
C16	Durability	complies	see tables 1, 4 and 5

Measured coefficients of retro-reflection R' of the **white** retro-reflective registration plates make 3M **type 6700**, as specified in clause 6 of ISO 7591.

The minimum required values are shown between brackets.

Cl. 6.1 in new condition. The coefficient of retro-reflecton (R') in  $\text{cd.lx}^{-1}.\text{m}^{-2}$ .

Colour	Observation angle	Entrance angle $\beta_1$ (vertical) (plate is standing on narrow side, so the entrance angles are in the same plane as the observation angle)						
		+5°	Minimum required	+30°	Minimum required	+40°	Minimum required	Maximum
Sample White 1	0° 12'	207	(45)	91	(18)	61	(8)	(250)
	0° 20'	114	(30)	75	(12)	55	(6)	
	1° 30'	14.1	(3.5)	6.5	(2)	3.8	(0.7)	
Sample White 2	0° 12'	211	(45)	91	(18)	63	(8)	(250)
	0° 20'	115	(30)	75	(12)	57	(6)	
	1° 30'	14.6	(3.5)	7.3	(2)	4.5	(0.7)	

Cl. 6.1 after simulated rainfall. The coefficient of retro-reflecton (R') in  $\text{cd.lx}^{-1}.\text{m}^{-2}$ .

Colour	Observation angle	Entrance angle $\beta_1$ (vertical) (plate is standing on narrow side, so the entrance angles are in the same plane as the observation angle)						
		+5°	Minimum required	+30°	Minimum required	+40°	Minimum required	Maximum
Sample White 1	0° 12'	171	(40.5)	83	(16.2)	54	(7.2)	(250)
	0° 20'	103	(27)	69	(10.8)	49	(5.4)	
	1° 30'	14.8	(3.15)	6.2	(1.8)	4.0	(0.63)	

Cl. 6.1 after durability (sample 2) . The coefficient of retro-reflecton (R') in  $\text{cd.lx}^{-1}.\text{m}^{-2}$ .

Colour	Observation angle	Entrance angle $\beta_1$ (vertical) (plate is standing on narrow side, so the entrance angles are in the same plane as the observation angle)						
		+5°	Minimum required	Maximum				
Sample white 2	0° 20'	97	(15)	(250)				

**Uniformity of retro-reflection**

The completely finished plate (with no legend) is slid behind a mask with an opening of 5x5 cm. The entrance angle ( $\beta_2$ ) is 5° and the observation angle is 20' (the plate is tilted 5° forward). The coefficient of retro-reflection ( $R'$ ) of each area measured is shown in the table below (these values have not been corrected). Maximum allowed ratio is 2.

Type 6700 white (ratio <1:2).

The coefficient of retro-reflection ( $R'$ ) in  $\text{cd.lx}^{-1}.\text{m}^2$ .

35.1	35.1	35.8	35.5	34.5	35.0
35.0	34.9	35.4	35.7	34.9	35.5
33.7	34.1	34.6	34.7	33.2	33.5

The plate complies with the ratio requirements

Measured chromaticity co-ordinates x and y and luminance factors  $\beta$  of the retro-reflective registration plates make 3M (white) type 6700, as specified in clause 7 of ISO 7591.

**Sample no. 1 in new condition.**

Material	geometry	CIE Standard Illuminant	chromaticity c-ordinates		luminance factor $\beta$ (minimum required)
			x	y	
<u>Cl. 7.1 (By day)</u>					
White 6700 no.1	45/0	D <sub>65</sub>	0.321	0.332	0.60 (≥ 0.35)
<u>Cl.7.2 (At night) entrance angle 5°</u>					
White 6700 no. 1	0/20'	A	0.461	0.422	-

Measured chromaticity co-ordinates x and y and luminance factors  $\beta$  of the retro-reflective registration plates make 3M (white) type 6700, as specified in clause 7 of ISO 7591.

**Sample no. 2 in new condition.**

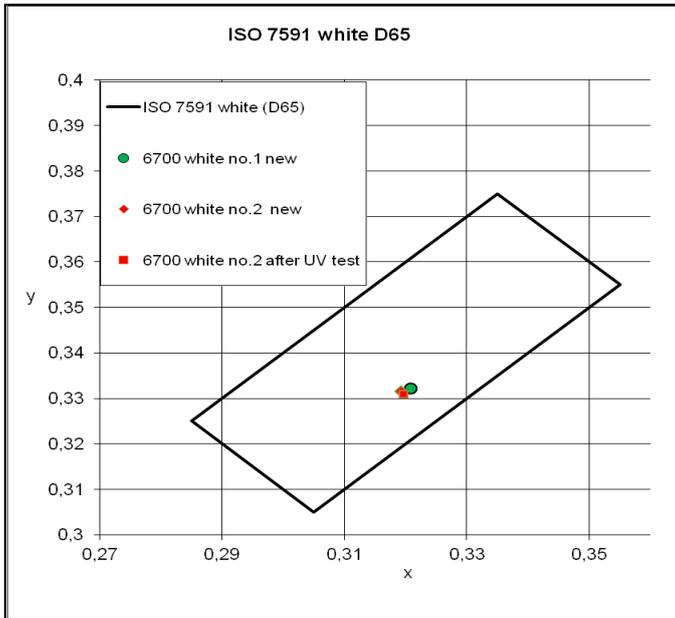
Material	geometry	CIE Standard Illuminant	chromaticity c-ordinates		luminance factor $\beta$ (minimum required)	
			x	y		
<u>Cl. 7.1 (By day)</u>						
White 6700 no.2	45/0	D <sub>65</sub>	0.319	0.332	0.57	( $\geq 0.35$ )
<u>Cl.7.2 (At night) entrance angle 5°</u>						
White 6700 no. 2	0/20'	A	0.462	0.422	-	

**Sample no. 2 after durability (UV test).**

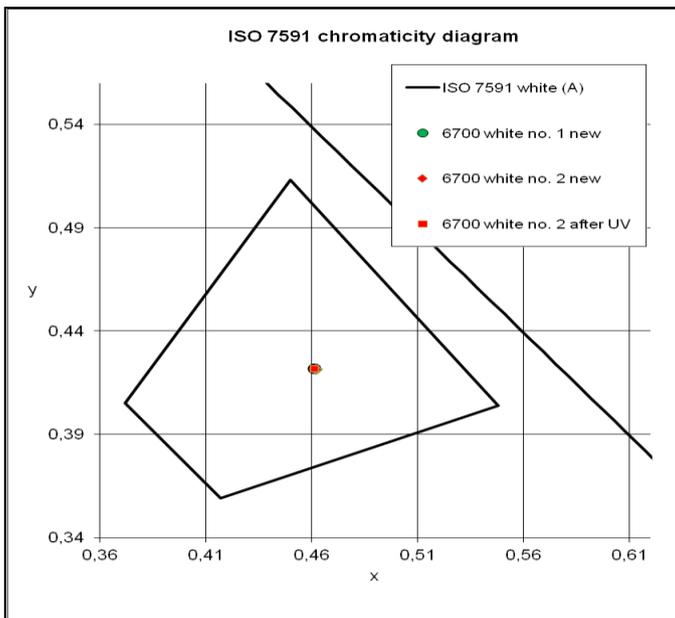
Material	geometry	CIE Standard Illuminant	chromaticity c-ordinates		luminance factor $\beta$ (minimum required)	
			x	y		
<u>Cl. 7.1 (By day)</u>						
White 6700 no.2	45/0	D <sub>65</sub>	0.320	0.331	0.57	( $\geq 0.28$ )
<u>Cl.7.2 (At night) entrance angle 5°</u>						
White 6700 no. 2	0/20'	A	0.462	0.422	-	

Chromaticity diagrams

By day (D65)            WHITE



At night (A)            WHITE



As shown in the above diagrams, the colour coordinates are within the required boundaries as mentioned in clause 7 of ISO 7591-1982.

# Certificate of Registration

QUALITY MANAGEMENT SYSTEM - ISO 9001:2015

This is to certify that:

3M Company  
3M Brownwood Plant  
4501 Highway 377 South  
Brownwood  
Texas  
76801  
USA

Holds Certificate No:

**FM 540202**

and operates a Quality Management System which complies with the requirements of ISO 9001:2015 for the following scope:

The manufacture of reflective and non-reflective films, finishing solutions and glass beads to specifications agreed to with 3M Divisions.

For and on behalf of BSI:

  
\_\_\_\_\_  
Carlos Pitanga, Chief Operating Officer Assurance – Americas

Original Registration Date: 2008-07-29

Effective Date: 2017-11-29

Latest Revision Date: 2018-07-16

Expiry Date: 2020-11-28



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...making excellence a habit.™

## Stocked DLP Replacement Parts:

78-8133-7306-1	Cca-Power Supply Enable-Datametrics #118395-100 Rev A
78-8133-7307-9	Cca-Options-Datametrics #118367-100
78-8133-7308-7	Cca-Printhead Interface-Datametrics #114776-100 Rev C
78-8133-7309-5	Cca-960 Processor-Datametrics #115213-100 Rev H
78-8133-7310-3	Cca-Memory-Datametrics #118100-100 Rev A
78-8133-7311-1	Cca-Western Servo Amplifier-Datametrics #118255-100 Rev A
78-8133-7312-9	Cca-Platen Pmac-Datametrics #118262-100
78-8133-7313-7	Cca-Ribbon Pmac-Datametrics #118263-100
78-8133-7314-5	Cca-Single Brd Pci Interface Datametric #701519-00001
78-8133-7315-2	Platen Roller
78-8133-7316-0	Idler Roller
78-8133-7317-8	Brake Roller
78-8133-7318-6	Bearing-Nhbb-#Ssri-1038zzra7p25lo-Flangeless, .375 X .625
78-8133-7319-4	Bearing-Nhbb-#Ssri-1438zzra7p25lo-Flanged, .375 X .875
78-8133-7320-2	Bearing-Nhbb-#Ssri-814zzra7p25lo-Flanged, .250 X .500
78-8133-7321-0	Ribbon Supply Belt-Stock Drive #A6r3-060037
78-8133-7322-8	Ribbon Take-up Belt-Stock Drive #A6r3-086037
78-8133-7323-6	Platen Roller Timing Belt-Stock Drive #A6r3042037
78-8133-7324-4	Platen Long Spring-Associated Spring #C0300-045-1500s
78-8133-7325-1	Platen Long Short Spring-Associated Spring
78-8133-7326-9	Fuse-Ferraz Shawmut-Part # Trm2/10-Time Delay, 1 1/2 X 13/32, 250vac, .3 Amp
78-8133-7327-7	Fuse-Ferraz Shawmut-Part #Gab4-Fast Acting, 1 1/4 X 1/4, 250 Vac 4 Amp
78-8133-7328-5	Fuse-Ferraz Shawmut-Part #Gdl3-Time Delay, 1 1/4 X 1/4, 250vac, 3 Amp
78-8133-7329-3	Fuse-Ferraz Shawmut-Part #Gdl4-Fast Acting, 1 1/4 X 1/4, 250 Vac, 4 Amp
78-8133-7330-1	Fuse-Ferraz Shawmut-Part #Gab1-Time Delay, 1 1/4 X 1/4, 250 Vac, 1 Amp
78-8133-7331-9	Fuse-Ferraz Shawmut-Part #Gab3-Time Delay, 1 1/4 X 1/4, 250 Vac, 3 Amp
78-8133-7332-7	Fuse-Ferraz Shawmut-Part #Gab2-1/2-Fast Acting, 1 1/4 X 1/4, 250 Vac, 2.5 Amp
78-8133-7334-3	Motor Gear 19.1 Vdc Pittman 701010-006
78-8133-7335-0	Dc Converter-24v Input, 10v Output, Acopian #24eb10e30
78-8133-7336-8	Dancer Follower Sensor (1000 Ohms) Magpowr #Dfp2
78-8133-7337-6	Temp Controller-32 To 600 F, 240vac, 10va, Watlow #146e-2601-3000
78-8133-7338-4	Platen Assembly Gas Spring, 56lbs (250n) Associated Spring #G0819-200-250-4-4
78-8133-7339-2	Platen Assembly Gas Spring, 89.9 Lbs (400) Associated Spring #G0819-200-400-4-4
78-8133-7340-0	Power Supply-24v, Datametric #701520-001
78-8133-7341-8	Power Supply-12v, 30a, 375w, Power One #Pfc375-1012f
78-8133-7342-6	Thermocouple Ir, Exergen #1rt/C.03-J-140f
78-8133-7343-4	Switch-Mc-Ke Seriesmag Coded Safety Switch, Scientific Technologies #Mck1-Pc6
78-8133-7344-2	Plc Discret I/O Module-24vdc, Sourcing Output,16pt, Allen Bradley #1746-Ib16
78-8133-7345-9	Plc Discrete I/O Module-24vdc, Sourcing Output, 16pt, Allen Bradley #1746-Ob16
78-8133-7346-7	Plc Analog I/O Module-4 Channel, Input, Allen Bradley #1746-Ni4
78-8133-7347-5	Plc Analog I/O Module-4 Channel, Output, Allen Bradley #1746-No4v
78-8133-7348-3	Plc Power Supply-24vdc, Allen Bradley #1746-P3
78-8133-7349-1	Photoeye-Banner #Sme312fvqd
78-8133-7350-9	Glass Fiber Optic, Banner #Ita23s

78-8133-7351-7	Ultrasonic Sensor, Banner #Q45uliu64acrq
78-8133-7352-5	Air Cylinder, Bimba #F0-312.000-Mt
78-8133-7353-3	Firerod Heater, 240vac, Watlow #N12a15-1e12-UI
78-8133-7354-1	Inductive Prox Pnp 24vdc, Turck #Bi 3u-M12-Ap6x-H1141
78-8133-7355-8	Inductive Prox Pnp 24vdc, Turck #Bi 2-Eg08k--Ap6x-H1341
78-8133-7356-6	PROX CABLE, 10m LONG, 3 WIRE, TURCK #WK-4T-10
78-8133-7357-4	PROX CABLE, 10m LONG, 3 WIRE, TURCK #RK-4T-10
78-8133-7358-2	Dc Regenerative Drive, Kb Electronics #Kbmg-212d
78-8133-7359-0	Plc S/04 Processor, 16k Memory, Allen Bradley #1747-L541
78-8133-7360-8	Extension Spring, 2.500" Length, 1/2" Od, .063 Dia Wire, Music Wire, Lee #Le-063e-6-Mw
78-8133-7361-6	Extension Spring 2.25" Length, 1/2" Od, .055 Dia Wire, Music Wire, Lee #Le-055e-5-Mw
78-8133-7362-4	Hard Disk Drive-Dmc #701529-002
78-8133-7363-2	Printhead Adjustment Block Left-Datametric #116302
78-8133-7364-0	Printhead Adjustment Block Right-Datametric #116303
78-8133-7365-7	Floppy Drive-Datametric #701530-0001
78-8133-7366-5	Brake Assembly
78-8133-7368-1	Motor-42rpm, 213 In-Lbs, 60:1, 1/4hp, Bodine #42a5bepm-Gb, Model 4060
78-8133-7369-9	Thermocouple-Watlow #70xjsub120a
78-8133-7370-7	Panelview 600-Color And Touch, Allen Bradley #2711-T6c811
78-8133-7371-5	Quick Disconnect Cable-Banner #Mbcc2-530
78-8133-7372-3	Quick Disconnect Cable-Banner #Mqdc1-530ra
78-8133-7373-1	Power Supply, 24v, 10 Amp, Seimans #6ep1334-1sl11
78-8133-7374-9	Signal Isolator-Kb Electronics #Simg
78-8133-7375-6	Bearing, 1" Bore, Mb #Er-16mhff
78-8133-7376-4	Solenoid-24v Dc, (Includes Valve Assy), Numatics #082sa43am000061
78-8133-7377-2	Bearing-Sealed, 1/4" Id, 3/4" Od, .9/32 W, Fafnir #S1pp
78-8133-7378-0	Bearing-3/4" Id, 1 5/8" Od, 7/16w, Fafnir #S8pp
78-8133-7379-0	Bearing-1" Id, 2" Od, Fafnir #S10kdd
78-8133-7380-6	Bearing, 1" Id, 2 Od, 1/2w, Fafnir #S10pp2
78-8133-7381-4	Bearing, 3/4" Id, 7/8" Od, 1/2" Lg, Boston #B1214-4
78-8133-7382-2	Bearing, 3/8" Id, 7/8" Od, 9/32"W. Fafnir #S3pp
78-8133-7383-0	Cca-Quad Servo Amp, Datametrics #115930-100, Rev H
78-8133-7384-8	Roller-Film Separator, Eagle Tool #B-12-3163-1307-6
78-8133-7385-5	Nip Roller-Eagle Tool #B12-3163-1211-0
78-8133-7386-3	Motor-19.1v Dc.5.9:1, 500 Cpr, Pittman #Gm14904d852
78-8133-7388-9	Ribbon Guide Bar-Eagle Tool #118110
78-8133-7389-7	Monitor-17", Model S7500, Hp #261606-001
78-8133-7392-1	Incandescent Light Unit-Includes A T3-1/4 (Bas) Bayonet Base Lamp, 24v, Cutler-Hammer #E22d24
78-8133-7393-9	Incandescent Light Unit-Includes A T3-1/4 (Bas) Bayonet Base Lamp, 24v, Cutler-Hammer #E22d24c (For Use With Illuminated Pushbutton Operators- Includes Pre-Wired 1no-1nc Contact Blocks)
78-8133-7394-7	22.5 Mm, Non-Metallic Heavy-Duty Pushbutton Operator, Illuminated, Flush, White, Momentary, Light Unit Not Included, Cutler-Hammer #E22nb5
78-8133-7395-4	Assembled, 22.5 Mm, Non-Metallic Pushbutton, Chrome Bezel, Non-Illuminated, Red Plastic Mushroom Head Operator With Maintained Latching, Twist-To-Release Action, None Light Unit, 1nc Contacts, Cutler-Hammer #E22II2b
78-8133-7396-2	22.5 Mm, Non-Metallic Heavy-Duty Standard Contact Block, Contact Configuration: 1nc, Cutler-Hammer #E22b1
78-8133-7405-1	Static String, 72ft (22m) Roll. Alpha Innovation Inc #Ss2000-72

78-8133-7438-2	Network Interface Card 3com-36515-7x
78-8133-7445-7	Bodine Motor Clockwise Rotation
78-8133-7446-5	Bodine Motor Counter-Clockwise Rotation
78-8133-7489-5	Encoder - 1000
78-8133-7493-7	Battery-Plc5/04 Processor, Allen Bradley #1747-Ba
78-8133-7513-2	Cca-Junction Board, Datametrics #118240-100 (For Machine Without Options Card)
78-8133-7514-0	Cca-Junction Board, Datametrics #118398-100 (For Machine With Options Card)
78-8133-7518-1	Harrier Pmac, Dmc #118274-100 Rev A
78-8133-7519-9	Cables-Condor Printer
78-8133-7520-7	Sensor Wiring (UNIT=1 BANNER 50838 & 1 BANNER 45091) 2 PARTS= ASSEMBLED UNIT
78-8133-7521-5	Opto Wiring
78-8133-7525-6	Bearing, Rulon Sleeve, Drs #242812, 1 1/2" Id, 1 3/4" Od, 1 1/2" Length
78-8133-7526-4	Cable Assembly, Platen Cable Extension 9 THIS ITEM**
78-8133-7527-2	Cable Assembly, Platen Servo Control 9 THIS ITEM **
78-8133-7529-8	Bulb-Cutler-Hammer, Part #1819, T3-1/4(Ba9) Bayonet Type For Indicating Lights And Pushbuttons Switches
78-8133-7530-6	Watlow 93ab1cd000rr
78-8133-7531-4	Push-Pull Operator, Cutler-Hammer E-Stop Button
78-8133-7532-2	Control Relay, 24vdc, 700dc-Pk400z24
78-8133-7533-0	Scientific Technologies Mck-Series Control Unit 24v Ac/Dc
78-8133-7472-1	Air Chuck-Roll Drive (Slotted Hole)
78-8133-7473-9	Air Chuck-Liner Rewind (Round Hole)
12-3163-1212-8	Roller
12-3163-1254-0	Bushing, Air Chuck
12-3163-1255-7	Clamp Bushing, Air Chuck
12-3163-1273-0	Plug For Core Chucks
12-3163-1279-7	Support - Side Lay
12-3163-1283-9	Roll Stop**2 Refurbished
12-3163-1287-0	1/2 Roll Stop**2 Refurbished
26-1017-1794-5	RHU Door Switch Mc-S2pc10
26-1017-1795-2	RHU Door Switch Controller Mc-S2
26-1017-1798-6	Solid State Relay Rssdn-10a