

# Nikkalite

## FMG M8500 Series – Fleet Marking Grade

### INTRODUCTION

Nikkalite™ Brand M8500 Series Fleet Marking Grade (FMG) retroreflective sheeting is a product manufactured for use as fleet marking, vehicle markings, sticker, decal, etc. which can be either digital-printed or screen-printed with multi-colored inks that will adhere very well to this sheeting. Coated with a pressure sensitive adhesive protected with an easily removable liner, this sheeting is easy to handle because of its great flexibility and is capable of giving high retroreflectivity, even when totally wet. Best results are obtained when applied to flat surfaces, but it can be applied successfully to corrugated surfaces. It is also used on commercial signs and various labels and highly resistant against the extremes of hot, cold, dry, and humid weathering conditions.

### AVAILABLE COLOR, WIDTH AND LENGTH

Available width: 24", 30", 36" and 48"  
Available length: 50 Yards  
Available color: White

### PERFORMANCE MEASUREMENTS

The minimum retroreflective values of the Nikkalite™ M8500 sheeting are given in Table-1 below. Measurements shall be conducted in accordance with ASTM E-810 (Standard Test Method for coefficient of Retroreflection of Retroreflective Sheeting). The reflective value of M8500 series sheeting, totally wet by rain, will not be reduced by more than 10% of the values specified in Table-1 below. Rain fall performance measurement shall be conducted at 0.2° observation and -4° entrance angle in accordance with ASTM E-810.

Table-1 Minimum values of Retroreflectivity (cd/lux/m2)

Color	O.A.	Entrance Angle	
		-4°	30°
White	0.2°	70	30
	0.5°	30	15

O.A.; Observation Angle

Table-2 Color limits (Daytime) (CIE Standard Illuminant D65, 45/0 geometry)

Color	Item No.	1		2		3		4		Luminance factor (β)
		x	y	x	y	x	y	x	y	
White	M8512W	.355	.355	.305	.305	.285	.325	.335	.375	≥0.35

Color coordinates of Nikkalite™ M8512 White conforming to the color limits of Table-2 above. (The four pairs of chromaticity coordinates determine the acceptable color in terms of the CIE 1931 Standard Colorimetric System measured with CIE Standard Illuminant D65.)

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Table-3 Physical Properties of the sheeting (Before applying to the substrate)

Property	Test Method	Results
Average Thickness	Micrometer	160 $\mu$ m
Average Gloss	Gloss Meter	85 at 60°
Average Strength	Instron Tester	22.5 N/1" width
Average Elongation	Instron Tester	120%

Table-4 Chemical Tests Performance (After applying to the aluminum plate)

Chemical Composition	Test Performed	Results
Water Resistance	24 hours at 73±9F =>48 hours	No defects
Cleaning	Wiping with heptanes after smearing with a mixture of lubricating oil and graphite.	No defects
Resistance to Fuel	Immerse the sample for 1 minute in 70% n-heptanes + 30% touol.	No defects
Saline Mist Test	ISO 7591, item 15: Resistance to saline mist	No corrosion or defects

Table-5 Physical Properties of the sheeting (After applied to the aluminum plate)

Type of Test	Test Method	Result
Temperature resistance	7 hours in 149±3.6F, RH 10±5% => 1 hour in 73±9F, RH 50±10% => 15 hours in -4F	No peeling, cracking, blistering or discoloration
Adhesion	Peel sheeting after 1 hour, -4F	Sheet will not break when peeling
Flexibility	Bend the flat sample 90° along with the 50mm mandrel within 2 seconds at 73±9F	No cracking

*The test of Table-4 and Table-5 above are based on the tests conducted on Nikkalite™ M8500 sheeting applied to chemically treated aluminum panels and conditioned for 24 hours at a temperature 73±3.6F and 50±5% relative humidity before testing.*

*All the aforementioned figures in the tables are based on our experience and actual measurements of our own tests. However, these figures may not be guaranteed.*

### DURABILITY

Nikkalite™ M8500 series retroreflective sheeting, processed and applied to Nippon Carbide Industries' approved substrates in accordance with the manufacturer's instructions, SHALL HAVE A PERFORMANCE LIFE OF 7 YEARS when exposed vertically. The M8500 retroreflective sheeting shall be considered as performing satisfactorily if the sign has not deteriorated, due to natural causes, to the extent that the sign is ineffective for its intended purpose when viewed from the vehicle.

### CUTTING and GRAPHIC CUTTING

Several sheets of M8500 may be stacked for cutting at the same time with a guillotine cutter; however, the sheets must be cut individually when knife-cut or die-cut. Friction or sprocket driven rotary plotters, flat bed plotters or craft type cutting knives are all suitable for cutting M8500 Series materials. The material must be allowed to condition, out of its box and correctly supported, ideally in a room with an ambient temperature of 64F to 77F (18°C to 25°C).

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## SCREEN PRINTING

M8500 Series sheeting can be screened using the inks of the Nikkalite™ N3500 Series and N3600 Series (two-component). These inks have good transparency and durability, and provide high reflectivity even after printing; also it excels in adhesion, anti-scratch and solvent resistance.

Use inks (two-component) within 5 hours after mixing. Mix sufficient ink for a half-day use in the morning and prepare another new lot for the afternoon work. N3600 series can also be used as one-component inks without the addition of hardener, however, solvent resistance will be weaker than the usage of with hardener a little bit. Normally, Nikkalite™ ink does not require dilution with thinner due to its pre-adjusted viscosity. However, when it is necessary, use only Nikkalite™ thinner.

Clear coating or edge sealing is not normally required for either ink; however, if it is specified use the appropriate N3512 or N3612 clear toner to the relevant series ink being used. For screen printing sign boards, labels, stickers, etc. a 62T-77T/cm mesh (157-180/in. mesh) polyester mono-filament plain weave mesh is recommended to achieve the correct depth of color and durability required. When screen printing with other manufacturer's ink, thinner, etc. onto Nikkalite™ sheeting, the users should take full responsibility themselves.

### Available ink, mixing ratio and time

Color	N3500 Series	N3600 Series
Black (opaque)	N3503	N3603
Yellow	N3504	N3604
Traffic Sign Red	N3515	N3615
Blue	N3506	N3606
Orange	N3507	N3607
Green	N3508	N3608
Brown	N3529	N3609
Toner	N3512	N3612
Hardener	-	N3631
Thinner	3511	3611
Mixing Ratio	-	N3600 ink: 100 parts by weight
	-	N3631: 7-8 parts by weight
Mixing time by putty knife	-	3 minutes
Mixing time with motorized mixer	-	1 minute

## DIGITAL PRINTING

M8500 is characterized with excellent printability, and compatible with most digital printers. Contact manufacturer for more details.

## DRYING

The drying space or room should always be kept clean and free from dust. Drying can be accomplished with natural drying, air blast drying or heat-oven drying. When natural drying, allow good ventilation through the drying racks. For air blast drying, set the fans at 5 to 7 feet (1.5 to 2 meters) apart from the drying racks and let it blow slightly downward towards all the surfaces of the screened sheets. When using a heat-oven dryer, we recommend an oven dryer with controls for temperature, velocity and volume of wind for both inhale and exhale, and drying temperature is up to 158F (70°C). After heat-oven drying, printed sheets must be cooled to room temperature before stacking to prevent blocking due to post heating. Before stack printed sheets after drying, confirm dryness by placing two printed faces, face

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to face, and press firmly together by hand and place near your ear and then begin to pull them apart. If no sound is heard then they are dry enough for stacking up to 50 pieces high. It is recommended that each printed sheet be provided with a slip sheet on the printed side.

### SUBSTRATE TREATMENT

Nikkalite™ M8500 Series retroreflective sheeting is provided with a strong pressure-sensitive adhesive with good durability and it can be laminated on a flat substrate and corrugated surface. When laminating on coated steel or plastic substrates, particularly on new type of substrates, confirm there is no trouble in adhesion, peel-off, swelling, discoloration and reflectivity degradation of sheeting, before starting mass production. Note that the adhesion of any substrate material can be expected to be improved by wiping with solvents or sanding; confirm by testing in advance.

### APPLICATION PROCESS

Since Nikkalite™ M8500 Series retroreflective sheeting often is applied to vehicles outdoors, special care must be taken to clean the application surface immediately prior to application of the sheeting. Use neutral detergent solution or mild solvents to remove oil, stain and other similar types of petroleum-based contaminants. M8500 sheeting can be applied successfully to the substrate in an area having an ambient temperature of between 59F to 77F (15°C to 25°C).

### APPLICATION TO FLAT SURFACES

Nikkalite™ M8500 Series retroreflective sheeting can be applied using a hand roller in the case of small signs, cutout letters, and legends, and can be applied on substrates with hand or motor-driven roller applicator. If air bubbles form under the sheeting, puncture the sheeting with a pin and squeeze out the air through the perforations. When using transfer tape, low tack transfer tape is recommended to avoid damaging the sheeting.

### APPLICATION TO IRREGULAR SURFACES

The application of M8500 Series sheeting to bodies of vehicles often requires application to a combination of flat, corrugated and riveted surfaces. In such cases the following steps are recommended:

- (a) When applying M8500 sheeting on the irregular surface, first, apply application tape on the M8500 sheeting entirely.
- (b) Position the entire sheet of M8500 over the application surface without removing the protective liner and holding it in place with pre-masking tapes.
- (c) After satisfactory positioning, hold the sheeting in place with pre-masking along the edge of the sheeting only. Then peel off the protective liner little by little, pressing the sheeting against the vehicle body with a hand squeegee or a stiff-haired brush as the adhesive becomes exposed.
- (d) After the entire sheet has been applied, remove the pre-masking and application tape along the sheeting surface at a 180° angle, squeegee the sheeting again. Squeegee out the air trapped under the sheeting through pin-hole perforations, especially around the heads of the rivets. A stiff-haired brush placed over the rivet heads and stroked with circular motions will facilitate this task. When necessary, a heat-gun should be used to warm the sheeting in such areas to give the sheeting greater flexibility, stretching, and adhesion.

During the application using a heat-gun, attention must be paid not to stretch the sheeting excessively, otherwise it could result in color-change of the sheeting, as well as physical damage and performance degradation.



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### CLEANING

During its lifetime the M8500 marking may require cleaning at some stage. The M8500 marking will probably have sand/grit stuck on the surface, therefore it is recommended that to use a low-pressure flow of water to help removing the loose dirt and sand/grit from the M8500 marking first. Never use high pressure water or hard brush. Rubbing the sand/grit into the M8500 marking during the cleaning procedure may cause irreparable damage to the sheeting. Therefore, care must be taken during the cleaning process. A small solution of a mild detergent in clean warm water is recommended for cleaning the material surface. The detergent and cloth must be non-abrasive, free of any strong aromatic solvents or alcohol and chemically neutral. Rinse the whole area thoroughly after washing and allow to dry naturally or use a lint free cloth.

### STORAGE

M8500 sheeting should be stored between 59°F to 77°F (15°C to 25°), ideally with a relative humidity of 30% to 60%, and out of direct sunlight. Store full and open rolls horizontally, above the floor, in the carton as they were supplied and suspended on the plastic supports, or suspended through the core with a suitable bar. Do not leave full or open rolls of material resting on hard surface; this may cause bruising to the reflective material, which may not be seen until exposed to a light source. Do not stand full or partial rolls vertically on their end. M8500 sheeting should be used within one year after purchased.

### CAUTION

Read through First Aid, Health Hazard and Precautionary statements mentioned in the Material Safety Data Sheet (MSDS) of related products such as printing inks prior to handling or use.

### RELIABILITY

All recommendations and technical information contained herein are based on experience and tests, which the manufacturer believes to be reliable, but their accuracy and completion are not warranted. The user is cautioned to undertake their own test/tests to determine the suitability of a particular product for the intended application.

### WARRANTY

Nikkalite™ Products are warranted to be free from defects in materials and workmanship at the time of their sale. Except as herein above expressly warranted, Nikkalite™ products are sold without any warranty whatsoever, including warranties of merchantability or fitness for a purpose. The sole remedy for failure of Nikkalite™ products to conform to said warranty is the replacement of the defective products; neither the manufacturer nor the seller shall be liable for any loss, damage or injury, direct or indirect or incidental, arising from the use or inability to use said Nikkalite™ products.