

## Nikkalite™ Brand Flexible Engineering Grade 48000 Series

### Retroreflective Sheeting for Use on Fleet Markings

#### 1. INTRODUCTION

Nikkalite™ Brand 48000 Series Flexible Engineering Grade (ELG) retroreflective sheeting is a product manufactured for use as fleet marking, vehicle markings, sticker, decal, etc. which can be 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.

#### 2. AVAILABLE COLOR, STANDARD WIDTH AND LENGTH

Width: 1220mm (48")  
 Length: 45.7m (50 Yards)  
 Color: See Table-1 below.

#### 3. PHOTOMETRIC PERFORMANCE

Typical coefficient of retroreflection of each colors of 48000 series sheeting, when measured with methods specified in the European Standard EN 12899-1 and

ASTM D 4596, and expressed in candlepower per lux per square meter, are shown in Table-1 below.

Table-1

(cd/lux/m<sup>2</sup>)

Item Number	Color	Observation Angle/Entrance Angle					Luminance factor (β)
		12°/5°	12°/30°	20°/5°	0.5°/5°	2.0°/5°	
48012	White	121	48	92	49	10	0.430
48003	Black	4	3.2	3	1.6	0.34	0.009
48004	Yellow	88	38	71	40	6.4	0.280
48034	Lemmon Yellow	74	41	61	36	6.8	0.480
48005	Red	14	6	11	6	1.8	0.054
48025	Dark Red	14	6.0	11	6.6	1.5	0.038
48035	Ruby Red	18	6.8	13	7.9	1.9	0.062
48045	Violet	21	4.0	9.7	6.6	1.5	0.064
48006	Blue	12	5.8	9.0	5.0	0.8	0.032
48026	Light Blue	35	11	24	13	3.6	0.130
48036	Navy Blue	3.8	1.5	2.7	1.6	0.4	0.013
48046	Sky Blue	12	4.2	8.8	4.5	0.7	0.051
48077	Orange	62	23	49	29	4.5	0.190
48008	Green	21	5.9	15	9.0	1.1	0.034
48018	Light Green	48	24	32	14	3.9	0.180
48010	Gold	78	24	59	35	5.8	0.160

**4. TECHNICAL DATA**

Properties	Test Method	Results and others
Average Thickness (without liner)	Micrometer	158 μm
Average Gloss	Gloss-meter	87 at 60°
Shrinkage	Sheet size: 225mm X 225mm Condition: 23°C (74°F), 60% RH	0.52mm/MD, 0.30mm/TD after 10 min. 0.24mm/MD, 0.12mm/TD after 24 hrs.
Adhesion*	90° peeling with 800g weight for 5 min.	Aluminum: 0.2mm Overlap: 19.2mm
Tensile strength	Tensile tester at 30cm(12")/min.	26.4 N/25mm width
Elongation at break	Tensile tester at 30cm(12")/min.	169 %
Solvent resistance after applied on the treated aluminum plate	Toluene 1 min. Methanol 1 min.	No evidence dissolving, puckering, blistering
Minimum application temperature	Flat and smooth surface	15°C (59°F)
Maximum application temperature	Corrugated surface	25°C (77°F)
Service temperature range	After applied on the treated aluminum	-30°C to 80°C (-22°F to 176°F)

Adhesion\*: Peeling distance must be less than 50mm. MD: Machine Direction, TD: Transverse Direction

**5. DURABILITY**

**Nikkalite™** 48000 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 5 YEARS when exposed vertically.

The ELG 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.

**6. COLOR MATCHING**

When it is necessary to use more than one sheet of **Nikkalite™** Brand sheeting on one sign, care should be taken to use sheeting cut from the same roll. If, however, sheeting from different rolls is used, care must be taken to ensure that the daytime and nighttime colors of the sheeting used are matched. Color matching should be done in daytime away from colored walls or other objects that can affect the color of the sheeting.

To match night color, examine the sheeting in a dark room or area with a light directed on the surface. The light source (flashlight, spotlight, etc.) should be held at eye level and observation should take place from behind the light, as far away from the sheeting as practical. Every other piece of material should be rotated by 180°, so the same roll edges come together. Color matching is the responsibility of the sign manufacturer.

**7. CUTTING and GRAPHIC CUTTING**

Several sheets of ELG 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 48000 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 18°C to 25°C (64°F to 77°F).

**8. SCREEN PRINTING**

ELG 48000 Series sheeting can be screen printed using the two component inks of the **Nikkalite™** N3600 Series and N3800 Series. These two-component 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. Both the N3600 and N3800 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 N3612 or N3812 clear toner to the relevant series ink being used. For screen printing sign boards, labels, stickers, etc. a 62T-77T/cm mesh (157-200/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	N3600 Series	N3800 Series
Black (Opaque)	N3603	N3803
Yellow	N3604	N3804
Traffic Sign Red	N3625	N3825
Blue	N3606	N3806
Orange	N3607	N3807
Green	N3608	N3808
Brown	N3609	N3809
Toner	N3612	N3812
Hardener	N3631	N3830
Thinner	3611	Dihydroturpenyl acetate
Mixing ratio	N3600 Ink: 100 parts by weight N3631: 7-8 parts by weight	N3800 Ink: 100 parts by weight N3830: 14 parts by weight
Mixing time by putty knife	3 minutes	3 minutes
Mixing time by motorized mixer	1 minute	1 minute

**9. 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 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 70°C (158°F). 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 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.

## 10. SUBSTRATE TREATMENT

**Nikkalite™** 48000 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 it by testing in advance.

## 11. APPLICATION PROCESS

Since **Nikkalite™** 48000 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. Although this ELG sheeting can be applied successfully to the substrate in an area having an ambient temperature of between 15°C to 25°C (59°F to 77°F).

### 11-1. APPLICATION TO FLAT SURFACES:

**Nikkalite™** 48000 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..

### 11-2. APPLICATION TO IRREGULAR SURFACES:

The application of 48000 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 ELG sheeting on the irregular surface, first, apply application tape on the ELG sheeting entirely.
- (b) Position the entire sheet of ELG 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 of 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.

## 12. CLEANING:

During its lifetime the ELG marking may require cleaning at some stage. The ELG 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 ELG marking first. Never use high pressure water or hard brush. Rubbing the sand/grit into the ELG marking during the cleaning procedure may cause irreparable

## **Nikkalite™ TECHNICAL INFORMATION FOR FLEXIBLE ENGINEERING GRADE**

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 be chemically neutral. Rinse the whole area thoroughly after washing and allow to dry naturally or use a lint free cloth.

### **13. STORAGE and shelf life:**

Retroreflective sheeting should be stored between 15°C to 25°C (59°F to 77°F), 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. Retroreflective sheeting should be used within one year after purchased. The shelf life of the sheeting is 12 months after delivery.

### **14. 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.**

### **15. 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.

### **16. 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. However, for those approved claim, Nippon Carbide Industries will also compensate reasonable labor cost incurred in fabrication. Performance durability is warranted for sheeting exposure less 45°. Exposure angle larger than 45° will reduce the durability proportionally.

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