

Nikkalite

ELG 48000 Series Flexible Engineering Grade

1. INTRODUCTION

Nikkalite™ Brand 48000 Series Flexible Engineering Grade (ELG) retroreflective sheeting is a product manufactured for use as fleet marking, vehicle markings, stickers, decals, etc. which can be screened with multicolored inks. ELG is coated with a pressure sensitive adhesive protected with an easily removable liner. This sheeting is easy to handle due to its high flexibility. In addition ELG retains its high retroreflectivity, even when totally wet.

Best results of application are obtained when applied to flat surfaces; however, it can be applied successfully to corrugated surfaces. It is also used on commercial signs and various labels. In addition to ELG ability to adhere to a variety of surface conditions, it is also highly resistant to a variety of weather conditions including: extreme heat, extreme cold, and very dry and highly humid climate conditions.

2. AVAILABLE COLOR, WIDTH AND LENGTH

Available width: 24", 30", 36" and 48"

Available length: 50 Yards

Available color: See Table-1 below.

3. PHOTOMETRIC PERFORMANCE

The typical coefficient of retroreflection for 48000 series ELG sheeting, when measured with methods specified in the European Standard EN 12899-1 and The United States Standard ASTM D 4596, is expressed in candlepower per lux per square meter, shown in Table-1 below.

Table-1

| ITEM NUMBER | COLOR | OBSERVATION ANGLE/ENTRANCE ANGLE | | | | | LUMINANCE FACTOR (β) |
|-------------|----------|----------------------------------|---------|--------|---------|---------|----------------------|
| | | 12°/5° | 12°/30° | 20°/5° | 0.5°/5° | 2.0°/5° | |
| 48012 | WHITE | 121.0 | 48.0 | 92.0 | 49.0 | 10.0 | 0.4 |
| 48003 | BLACK | 10.0 | 8.0 | 8.0 | 5.0 | 1.3 | 0.0 |
| 48004 | YELLOW | 88.0 | 38.0 | 71.0 | 40.0 | 6.4 | 0.3 |
| 48005 | RED | 14.0 | 6.0 | 11.0 | 6.6 | 1.5 | .04 |
| 48025 | DARK RED | 14.0 | 6.0 | 11.0 | 6.6 | 1.5 | 0.0 |
| 48035 | RUBY RED | 18.0 | 6.8 | 13.0 | 7.9 | 1.9 | 0.1 |
| 48006 | BLUE | 12.0 | 5.8 | 9.0 | 5.0 | 0.8 | 0.0 |
| 48046 | SKY BLUE | 12.0 | 4.2 | 8.8 | 4.5 | 0.7 | 0.1 |
| 48077 | ORANGE | 62.0 | 23.0 | 49.0 | 29.0 | 4.5 | 0.2 |
| 48008 | GREEN | 21.0 | 5.9 | 15.0 | 9.0 | 1.1 | 0.0 |
| 48009 | BROWN | 3.5 | 1.5 | 2.7 | 1.6 | 0.2 | 0.0 |
| 48010 | GOLD | 78.0 | 24.0 | 59.0 | 35.0 | 5.8 | 0.2 |

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4. TECHNICAL DATA

| PROPERTIES | TEST METHOD | RESULTS |
|--|---|---|
| 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 | Instron Tester | 26.4 N/25mm width |
| Elongation at break | Instron Tester | 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) |

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 7 years when exposed vertically to weather conditions. The ELG retroreflective sheeting shall be considered as performing satisfactorily if the sign has not deteriorated, due to natural causes. Performance is considered unsatisfactory 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 a single 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, match. Color matching should be done in daytime away from colored walls or other objects that can distort the visible 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 while being correctly supported, ideally in a room with an ambient temperature of 18°C to 25°C (64°F to 77°F).

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8. SCREEN PRINTING

ELG 48000 Series sheeting can be screened 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; they also excel in adhesion, anti-scratch and solvent resistance.

Use inks (two-component) within 5 hours of 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 reduced compared with the usage of hardener. 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 for relevant series ink being used. In addition, 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 or thinner on Nikkalite™ sheeting, the users takes full responsibility of work 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 | N3611 | Dihydroterpenyl acetate |
| Mixing ratio | N3600 Ink: 100 parts by weight N361 Ink: 7-8 parts by weight | N3800 Ink: 100 parts by weight N3830 Ink: 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 using natural drying techniques, air blast drying, or heat-oven drying. When natural drying, allow good ventilation through the drying racks. For air blast drying, set fans at 1.5 to 2 meters apart from the drying racks and let it blow slightly downward toward the surface 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. Drying temperature must not exceed 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 stacking the printed sheets, once drying is complete, confirm dryness by placing two printed sheet faces, face to face, and press firmly together by hand. Place near your ear and then begin to pull them apart. If no sound is heard the sheets are dry enough for stacking. Sheets can be stacked up to 50 sheets high. It is recommended that each printed sheet be provided with a slip sheet on its printed side.

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10. SUBSTRATE TREATMENT

Nikkalite™ 48000 Series retroreflective sheeting is provided with a strong pressure-sensitive adhesive with good durability. The adhesive strength allows the sheeting to be laminated on a flat substrate or corrugated surfaces. When laminating on coated steel or plastic substrates, particularly on new type of substrates, confirm there is no trouble in adhesion, test for peel-off, swelling, discoloration and reflectivity degradation of sheeting, before beginning mass production. Although the adhesion of any substrate material can be expected to be improved by wiping with solvents or sanding, confirm the expected increase by thoroughly testing the material 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 a neutral detergent solution or mild solvents to remove oil, stains, tar and other similar types of petroleum-based contaminants. This ELG sheeting can be applied successfully to the substrate, if the ambient temperature is between 15°C to 25°C (59°F to 77°F).

A. 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 through the use of a hand or motor-driven roller applicators. If air bubbles form under the sheeting, puncture the sheeting with a pin and squeeze out the air through the perforations.

B. 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:

- When applying ELG sheeting on the irregular surface, first, apply application tape on the ELG sheeting entirely.
- Position the entire sheet of ELG over the application surface without removing the protective liner and holding it in place with pre-masking tape.
- After satisfactory positioning, hold the sheeting in place with pre-masking tape. Tape along one edge of the sheeting only. Begin peeling off the protective liner little by little, from the opposite edge, pressing the sheeting against the vehicle body with a hand squeegee or a stiff-haired brush as the adhesive becomes exposed.
- 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 rivets. A stiff-haired brush placed over the rivet heads and stroked with circular motions will facilitate this task. As necessary, a heat-gun should be used to warm the sheeting in such areas to give the sheeting greater flexibility, stretching, and adhesion.

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 a low-pressure flow of water is used to help remove loose dirt and sand/grit from the ELG marking first. Never use a strong jet of water. Rubbing the sand/grit into the ELG 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-

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abrasive, free of any strong aromatic solvents or alcohol's and is chemically neutral. Rinse the whole area thoroughly after washing and allow drying to occur naturally or use a lint free cloth.

13. STORAGE

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, off the floor, suspended through the core with a suitable bar. Rolls can also be stored in the carton as they were supplied, being suspended on the plastic supports. Do not leave full or open rolls of material resting on hard surfaces; this may cause bruising of the reflective material, which may not be seen until exposed to a light source. Do not stand full or partial rolls vertically on end; this will cause cracking of the sheeting material. Retroreflective sheeting should be used within one year after purchased.

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 is based on experience and tests, which the manufacturer believes to be reliable. However, their accuracy and completion are not warranted. The user is cautioned to undertake testing the product. These tests should determine the suitability of the particular material and its intended for 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.