

# Nikkalite

Ultralite Grade N500 SERIES

## 1. DESCRIPTION

Nikkalite™ Brand Ultralite Grade (ULG) encapsulated lens retroreflective sheeting was developed to provide greater reflectivity and durability when used for traffic signs and other types of traffic control and safety devices.

ULG is made with high refractive index beads that are uniform in size and a high percentage of perfect roundness. Each bead is coated on ½ of its sphere with approximately 100% pure aluminum. Each aluminum coated half is embedded in synthetic resin.

The top film of ULG sheeting is extra strong, dimensionally stable, and flexible. It is strongly fused to a synthetic resin based film, causing the retroreflective sheeting to resist delamination and render up to ten years of effective performance.

ULG is a Pressure Sensitive adhesive (PS) which, is protected with an easily removable plastic liner.

## 2. ULG RETROREFLECTIVE SHEETING IS AVAILABLE IN THE FOLLOWING:

| COLOR  | ITEM NUMBER<br>SUPER HIGH TACK PS |
|--------|-----------------------------------|
| White  | N512                              |
| Yellow | N504                              |
| Red    | N505                              |
| Blue   | N506                              |
| Orange | N507                              |
| Green  | N508                              |
| Brown  | N509                              |

## 3. PROPERTIES

### 3-1 Photometries

The retroreflectivity of ULG sheeting meets or exceeds all retroreflective sheeting standards worldwide. Typical standards are listed in the tables below.

ASTM D 4956 Type III

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

| OBSERVATION ANGLE | ENTRANCE ANGLE | WHITE | YELLOW | RED | BLUE | ORANGE | GREEN | BROWN |
|-------------------|----------------|-------|--------|-----|------|--------|-------|-------|
| 0.2               | -40            | 250   | 170    | 45  | 20   | 100    | 45    | 12    |
|                   | 300            | 150   | 100    | 25  | 11   | 60     | 25    | 8.5   |
| 0.5               | -40            | 95    | 62     | 15  | 7.5  | 30     | 15    | 5     |
|                   | 300            | 65    | 45     | 10  | 5    | 25     | 10    | 3.5   |

# Nikkalite

Ultralite Grade N500 SERIES

### 3-2 Typical Coefficient of Retroreflection of ULG Sheeting

ULG is manufactured using the highest quality raw materials and the most modern technology, producing the following typical reflectivity values.

| Typical Coefficient of Retroreflection |                           |       |        |      |      |        |       | (cd/lux/m <sup>2</sup> ) |
|--|---------------------------|-------|--------|------|------|--------|-------|--------------------------|
| $\alpha$                               | $\beta_1$ ( $\beta_2=0$ ) | WHITE | YELLOW | RED  | BLUE | ORANGE | GREEN | BROWN                    |
| 0.2°(12')                              | -4°/5°                    | 320.0 | 225.0  | 65.0 | 28.0 | 139.0  | 67.0  | 21.0                     |
|  | 30°                       | 266.0 | 175.0  | 54.0 | 22.0 | 115.0  | 55.0  | 17.0                     |
|  | 40°                       | 192.0 | 127.0  | 42.0 | 17.0 | 88.0   | 43.0  | 13.0                     |
| 0.33°(20')                             | 5°                        | 226.0 | 196.0  | 49.0 | 21.0 | 105.0  | 48.0  | 16.0                     |
|  | 30°                       | 194.0 | 166.0  | 41.0 | 17.0 | 88.0   | 40.0  | 12.0                     |
|  | 40°                       | 152.0 | 131.0  | 33.0 | 13.0 | 68.0   | 31.0  | 10.0                     |
| 0.5°                                   | -4°/5°                    | 112.0 | 91.0   | 27.0 | 11.0 | 57.0   | 26.0  | 9.4                      |
|  | 30°                       | 100.0 | 76.0   | 24.0 | 9.5  | 49.0   | 23.0  | 7.7                      |
| 2.0°                                   | 5°                        | 5.5   | 3.3    | 1.1  | 0.5  | 2.0    | 0.9   | 0.3                      |
|  | 30°                       | 4.2   | 2.5    | 0.8  | 0.3  | 1.7    | 0.7   | 0.2                      |
|  | 40°                       | 3.3   | 2.0    | 0.7  | 0.2  | 1.3    | 0.5   | 0.2                      |

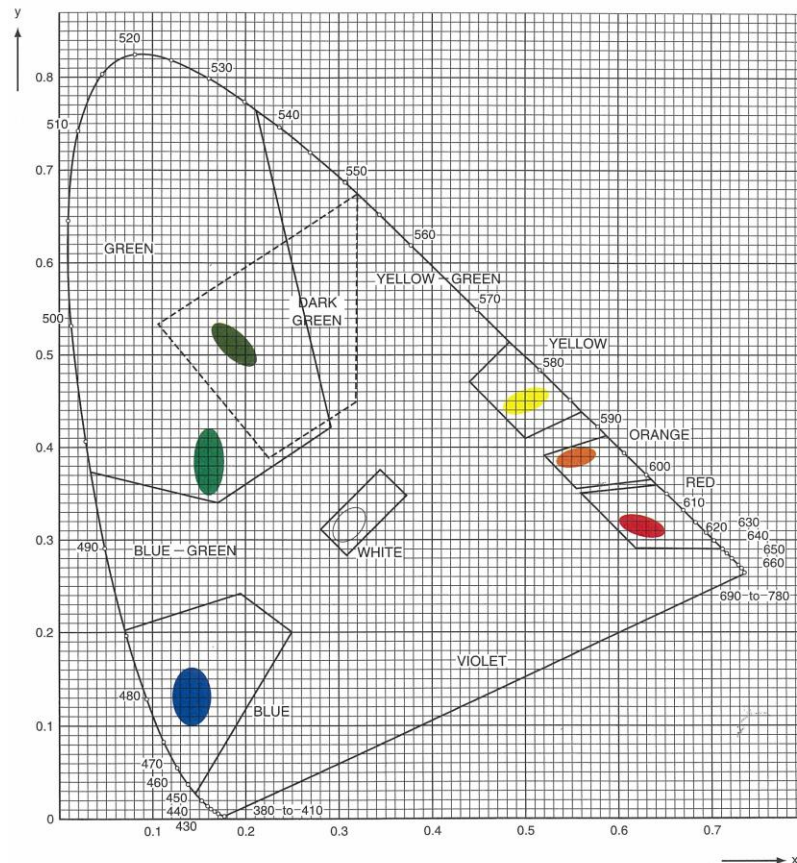
### 3-3 Color

ULG sheeting is available in eight colors conforming to all worldwide retroreflective sheeting standards. The colored materials used in ULG are highly transparent and durable ensuring long life and no fading.

### 3-4 Average Color Coordinates of ULG

Each color position of ULG sheeting appears in the C.I.E. Chromaticity Diagram in Figure 2 below.

C.I.E. Chromaticity Diagram



# Nikkalite

Ultralite Grade N500 SERIES

### 3-5 Adhesives

ULG N500 Series sheeting are coated with a Pressure Sensitive adhesive that must be applied to the substrate at room temperature ranging from 68°F to 79°F (20°C to 26°C) using a hand squeegee, a hand-operated roller applicator, or an automatic laminator.

N500 Series should always be applied to clean and flat surfaces.

### 3-6 Others

ULG sheeting conforms to all requirements specified in ASTM D 4956.

## 4. APPLICATION TO SUBSTRATES

ULG N500 Series sheeting is coated with a pressure-sensitive (PS) adhesive that, when applied at room temperatures of 68°F to 79°F (20°C to 26°C) is easy to handle and apply.

## 5. APPLICATION OF SCREENING INKS ON ULG IT SHEETING

### 5.1 Transparent and Opaque Colors

Two types of Nikkalite™ Brand Process Colors are available for screen processing on ULG: (1) N3600 Series and (2) N3800 Series as listed below. All colors except Black are transparent.

| 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                          | Dihydroturpenyl acetate        |
| Mixing ratio                   | N3600 ink: 100 parts by weight | N3800 ink: 100 parts by weight |
|                                | N3631: 7-8 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                       |

- (a) Toner may be used to lighten the color of the inks, or to clear coat (by screening) the inks in rare instances when necessary. In most applications, Nikkalite™ Brand Inks do not need to be clear coated.
- (b) None of the inks above normally require thinning for the screen processing. However, when required, The N3600 Series inks may be thinned to the desired viscosity with Nikkalite™ Brand N3611 thinner, T-900 or T-910 thinner (NAZDAR products), Xylene Cyclohexanone, Solvesso 150 (Esso Standard product), or Supersol1500 (Mitsubishi Oil product).
- (c) The N3800 Series inks may only be thinned with N3811. When screening, do not apply two different series of Nikkalite™ inks or other manufacturers ink on the same sheeting surface.
- (d) Both the N3600 and N3800 series inks can also be used as one component ink without the addition of the hardener. However, the resistance to solvents will decrease the durability compared to the addition of the hardener.
- (e) Nikkalite™ Brand inks are the only recommended inks for use on Nikkalite™ Brand sheeting.

# Nikkalite

Ultralite Grade N500 SERIES

## 5-2 Drying

N3600 Series inks may be pre-screened (screening must be complete before application to the substrate) on ULG using a157 to 196 mesh/inch (62 to 77 mesh/cm) screens. Before printing, set the fans 1.5 to 2 meters away from the drying racks and direct the air slightly downward towards the surface of the screened signs.

Immediately after screening, place each sign face on the drying rack with the air from the electric fans blowing across the screened surface. This drying process should continue until the ink becomes tack-free. Additional drying may be required at temperatures of more than 20°C (68°F) before the ink on the sign faces has dried enough for stacking, packaging or applying to substrates in a vacuum applicator. Up to 50 ULG sheets may be stacked.

Place sheets, face to face, and press it by hand firmly if no sound is heard when these two faces are separated drying is complete.

N3800 Series inks have been developed for PRE-SCREENING (screened on the sheeting) and POST-SCREENING (screened on the sheeting already applied to a substrate) on ULG.

The drying method for pre-screened sign faces on item N3600 will also apply to post-screened sign faces. **DO NOT STACK** the finished signs. Stand them on edge during storage or shipment. (See Para.5-4, below)

## 5-3 Application of Sign Faces to Substrates

When applying ULG sign faces with a vacuum applicator, place a sheet of polyester film or paper having a mirror surface coated with heat-resistant plastic over the screened faces to protect the screened ink from damage by the vacuum applicator diaphragm.

## 5-4 Packing and shipping Sign Faces and Signs

When packing and shipping finished signs (after the ULG sign faces are applied to substrates), place the signs face to face with a sheet of protective liner against each face and a sheet of polypropylene foam at least 1/8"(3mm) thick between the two signs to protect the capsules in the ULG from being crushed.

Care must be taken not to damage ULG sheeting when binding for shipping or storage. The edges of ULG sheeting are easily damaged. In addition to binding ULG sheeting, during storage or transportation, ULG sheeting must be stored on edge vertically. Never stack, store, or ship finished ULG signs in a horizontal position.

## 5-5 Cutting

Several sheets of ULG may be stacked for cutting at the same time with a guillotine cutter; however, the sheets must be cut individually when cut by knife or die-cut.

**DO NOT CUT ULG WHEN THE SHOP TEMPERATURE IS BELOW 65°F (18°C).** Doing so will cause ULG to crack or shatter.

## 5-6 Color-Matching

When applying more than two sheets on the same sign, care must be taken to match the daytime color and the night reflected color of the sheeting. The same edges (left or right edge) of the sheeting must be butted against each other. Use sheeting from the same roll for best results; however, color matching must still be visually confirmed when using this method.

# Nikkalite

Ultralite Grade N500 SERIES

## 6. EFFECTIVE PERFORMANCE LIFE

The effective performance life of ULG is greatly effected by(1) the type of substrate,(2) preparation of the substrate surface, (3) conditions of application, and(4) climatic and exposure conditions. When proper substrates are used, and their surface preparation and application methods are in accordance with Nikkalite™ Bulletins, the ULG sheeting can be expected to emit the amount of retroreflectivity (cd/lux/m2) at Observation Angle 0.20 and Entrance Angle -40 or 50 when exposed at 900 south facing for the number of years listed below.

| ITEM NUMBER AND COLOR | AVERAGE (CD/LUX/M2) | EFFECTIVE PERFORMANCE LIFE |
|-----------------------|---------------------|----------------------------|
| N512 White            | 200                 | 10 Years                   |
| N504 Yellow           | 136                 | 10 Years                   |
| N505 Red              | 36                  | 10 Years                   |
| N506 Blue             | 16                  | 10 Years                   |
| N507 Orange           | 80                  | 3 Years                    |
| N508 Green            | 36                  | 10 Years                   |
| N509 Brown            | 10                  | 10 Years                   |

It is estimated that the effective performance life of ULG sheeting will be about two years shorter than as shown above in areas where there is high exposure to ultraviolet sunlight, high temperatures, or high humidity. Furthermore, the effective performance life will be further reduced if the sheeting is subjected to abrasion caused by desert and lava sandstorms. In addition, the effective performance life of the sheeting will be decreased if the sheeting is exposed to the sun at angles less than 900 or when the sheeting surface is subjected to abrasion including flying sand or pebbles, which may occur when mounted on moving vehicles.

## 7. APPLICATION OF ULG II AND OTHER GRADES OF SHEETING ON THE SAME SUBSTRATE

When ULG and other grades of retroreflective sheeting are applied on the same substrate, the instructions appearing below should be followed.

EG=Engineering Grade SEG=Super Engineering Grade

| BACKGROUND SHEETING                | LETTERS, NUMERALS, SYMBOLS, BORDERS | APPLICATION PROCEDURES   |
|------------------------------------|-------------------------------------|--|
| EG 8100 Series<br>SEG 15000 Series | ULG N500 Series                     | After applying the background sheeting with a roller applicator, apply the letters, numerals, symbols, etc. with a hand-roller or a squeegee. If possible, accelerate curing of the adhesive with <u>heat-pressure treatment with a vacuum applicator.</u> |
| ULG N500 Series                    | ULG N500 Series                     | After applying the background sheeting with a roller applicator, apply the letters, numerals, symbols, etc. with a hand-roller or a squeegee. If possible, accelerate curing of the adhesive with <u>heat-pressure treatment with a vacuum applicator.</u> |
| ULG N500 Series                    | EG 8100 Series<br>SEG 15000 Series  | Not Recommended  |

## 8. MAINTENANCE (CLEANING)

A mixture of a mild detergent in water is recommended for cleaning ULG signs. The detergent must be non-abrasive, free of any strong aromatic solvents or alcohols, and chemically neutral. Rinse thoroughly after washing. NEVER CLEAN THE SURFACE OF ULG WITH ANY KIND OF SOLVENT.

# Nikkalite

Ultralite Grade N500 SERIES

## 9. STORAGE

ULG Retroreflective Sheeting should be stored in a cool, dry area, preferably at 68°F to 79°F (20°C to 26°C) with 30% to 60% relative humidity, away from direct sunlight. It should be used within one year of purchase. Used rolls should be returned into their original carton boxes, suspended properly and always in a horizontal position, or an iron bar should be inserted inside the roll core and hung in mid-air by suspending both ends of iron bar horizontally.

Never allow ULG rolls to lie horizontal unsuspended for a prolonged period or to stand vertically on end. If a roll is allowed to lie horizontally and unsuspended, the portions of the sheeting upon which the weight of the roll rests will be damaged. If the roll is allowed to stand on end, the bottom edges of the roll will chip and crack.

Up to 50 cut sheets may be stacked and stored on a clean flat surface. Curls in sheets, cut from rolls, may be removed by stacking two sheets face-to-face for approximately 24 hours at room temperature.

Cut-out letters and shapes should be placed in plastic bag (free of moisture) and stored in a cool dry area. Sheets and cutouts should be applied/used within the specified shelf life of the product.

## 10. RELIABILITY OF INFORMATION

All recommendations and technical information contained herein is based on experiences and tests, which the manufacturer believes to be reliable. However, their accuracy and completeness are not warranted. The user is requested to conduct tests, at their cost, to determine the fitness of the product for the intended application.

## 11. WARRANTY

Nikkalite™ Products are warranted to be free from defects in materials and workmanship at the time of sale; except herein expressly warranted. NCI's (Nippon Carbide Industries Co., Inc.) liability is limited to the replacement of the defective material, solely as stated herein. NCI shall not be liable for any loss, damage or injury, direct or indirect or incidental, arising from the use or inability to use said products, and the warranties of merchantability or fitness for a particular purpose as well.

## 12. WARNING

Failure to comply with the explicit instructions in this bulletin will result in voiding all warranties express or implied for the use of this product. If retroreflective sheeting is to be applied to a surface other than conventional sign blank materials, prospective users should contact technical representatives of Nippon Carbide Industries Co., Inc. for advice before such application.