

Nikkalite®

Retroreflective Products

PB NO.500/800

Nikkalite® BRAND ULTRALITE 500 AND 800 SERIES



1. DESCRIPTION

Nikkalite® Brand Ultralite Series (UL) 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.

UL is made with high refractive index beads that are uniform in size and with a high percentage of perfect roundness. These beads are coated on half of their spheres with almost 100% pure aluminum, and the coated halves of every bead are embedded in synthetic resin.

The top film of UL sheeting is extra strong, dimensionally stable, and flexible. It is strongly fused to the synthetic resin base film, so the retroreflective sheeting resists delamination and renders up to ten years of effective performance.

UL is available with either Pressure Sensitive (PS) (800 Series) or Super High Tack PS (500 Series), which are protected with an easily removable plastic liner.

2. UL RETROREFLECTIVE SHEETING IS AVAILABLE IN THE FOLLOWING TYPES:

Table 1

Color	Item No.	Adhesive
White	812 & 512	PS & Super High Tack PS
Yellow	804 & 504	PS & Super High Tack PS
Red	805 & 505	PS & Super High Tack PS
Blue	806 & 506	PS & Super High Tack PS
Orange	807 & 507	PS & Super High Tack PS
Green	808, 818 & 518	PS & Super High Tack PS
Dark Green	828 & 528	PS & Super High Tack PS
Brown	809 & 509	PS & Super High Tack PS

3. PROPERTIES

3-1 Photometrics

Retroreflectivity of UL sheeting meets or exceeds standards are listed in Table 2 and 3 below.
retroreflective sheeting standards worldwide. Typical

Table 2 : ASTM D 4956 Type III (USA)

(cd/lux/m²)

O.A.	E.A.	White	Yellow	Red	Blue	Orange	Green	Brown
0.2°	-4°	250.0	170.0	45.0	20.0	100.0	45.0	12.0
	30°	150.0	100.0	25.0	11.0	60.0	25.0	8.5
0.5°	-4°	95.0	62.0	15.0	7.5	30.0	15.0	5.0
	30°	65.0	45.0	10.0	5.0	25.0	10.0	3.5

Note : O.A. = Observation Angle and E.A. = Entrance Angle

Table 3 : EN12899-1(European Standard)

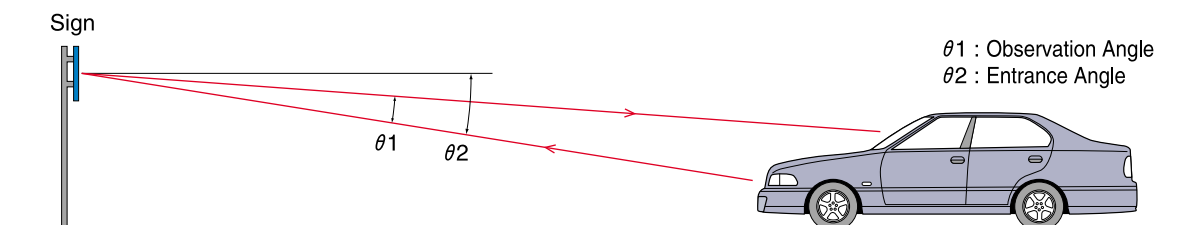
(cd/lux/m²)

α	$\beta 1(\beta 2=0)$	White	Yellow	Red	Blue	Orange	Green	*D.Green	Brown
12'	5°	250.0	170.0	45.0	20.0	100.0	45.0	20.0	12.0
	30°	150.0	100.0	25.0	11.0	60.0	25.0	15.0	8.5
	40°	110.0	70.0	15.0	8.0	29.0	12.0	6.0	5.0
20'	5°	180.0	120.0	25.0	14.0	65.0	21.0	14.0	8.0
	30°	100.0	70.0	14.0	8.0	40.0	12.0	11.0	5.0
	40°	95.0	60.0	13.0	7.0	20.0	11.0	5.0	3.0
2°	5°	5.0	3.0	1.0	0.2	1.5	0.5	0.5	0.2
	30°	2.5	1.5	0.4	#	1.0	0.3	0.3	#
	40°	1.5	1.0	0.3	#	#	0.2	0.2	#

*D.Green : Dark Green

Indicates Value greater than zero but not significant or applicable.

Figure 1



3-2 Typical Coefficient of Retroreflection of UL Sheeting

UL is manufactured using the highest quality raw materials and most modern technology, which produces the following typical reflectivity values as shown in Table 4.

Table 4 : Typical Coefficient of Retroreflection

(cd/lux/m²)

α	$\beta_1 (\beta_2=0)$	White	Yellow	Red	Blue	Orange	Green	D.Green	Brown
0.2° (12')	-4°/5°	343.0	218.0	49.0	29.0	107.0	69.0	40.0	31.0
	15°	336.0	213.0	47.0	28.0	106.0	67.0	39.0	30.0
	30°	308.0	193.0	42.0	25.0	92.0	60.0	34.0	25.0
	40°	258.0	159.0	34.0	21.0	68.0	49.0	28.0	18.0
0.33° (20')	-4°/5°	233.0	152.0	33.0	19.0	76.0	45.0	34.0	21.0
	15°	228.0	149.0	32.0	18.0	70.0	44.0	33.0	20.0
	30°	212.0	136.0	29.0	16.0	67.0	40.0	29.0	17.0
	40°	184.0	116.0	24.0	14.0	52.0	34.0	24.0	13.0
0.5°	-4°/5°	109.0	74.0	15.0	8.0	40.0	19.0	25.0	10.0
	30°	103.0	69.0	14.0	7.2	36.0	17.0	22.0	8.6
1.0°	-4°/5°	23.0	14.0	4.7	1.7	8.0	4.6	4.0	2.8
	15°	22.0	13.0	4.5	1.5	4.4	4.0	3.8	2.7
	30°	20.0	12.0	3.9	1.3	4.0	3.6	3.6	2.2
	40°	16.0	9.0	2.9	1.0	3.4	2.8	3.4	1.6
1.5°	-4°/5°	13.0	9.5	2.3	0.9	6.0	2.3	1.5	1.4
	40°	10.0	6.7	1.6	0.5	4.0	1.5	0.9	0.9
2.0°	-4°/5°	5.8	3.6	1.1	0.6	2.3	1.3	1.6	0.7
	15°	5.4	3.4	1.0	0.4	1.7	1.1	1.4	0.6
	30°	5.0	3.0	0.8	0.4	1.6	1.0	1.3	0.5
	40°	4.0	2.4	0.7	0.3	1.5	0.8	1.0	0.4

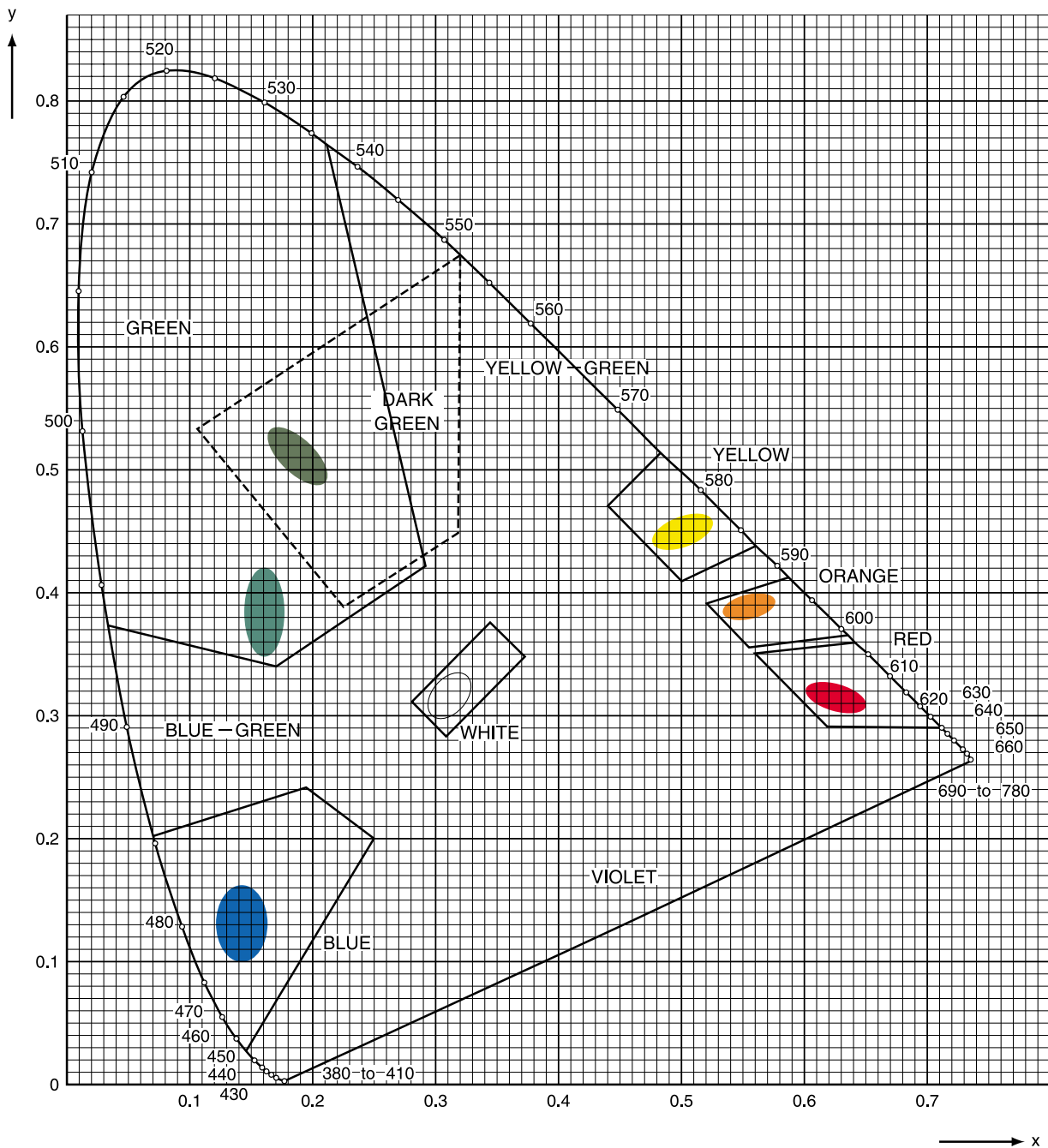
3-3 Color

UL sheeting is available in eight colors conforming to all worldwide retroreflective sheeting standards. The pigments used in UL are highly transparent and durable ensuring long durability without fading.

3-4 Average Color Coordinates of UL

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

Figure 2 C.I.E. Chromaticity Diagram



All the aforementioned figures in the table 4 and figure 2 are based on our experience and actual measurements based on our own tests. However, these figures may not be guaranteed.

3-5 Adhesives

UL 800 Series and 500 Series sheeting are coated with a pressure sensitive (PS) adhesive that, when applied at room temperature of 20°C to 26°C (68°F to 79°F) is easy to handle and apply.

3-6 Others

UL sheeting conforms with all requirements specified in ASTM D 4956, EN 12899-1, etc.

4. APPLICATION TO SUBSTRATES

UL 800 Series sheeting is coated with a Pressure Sensitive type adhesive and must be applied to the substrate at room temperature ranging from 20°C to 26°C (68°F to 79°F) using a hand squeegee, a hand-operated roller applicator, or an automatic laminator. UL 500 Series sheeting is coated with Super High Tack Pressure Sensitive type adhesive for plastic substrate mainly. Application conditions of this sheeting is same to 800

Series. 800 Series and 500 Series should always be applied to clean and flat surfaces.

There are many types of substrates available, which new products coming onto the market all the time. Some will emit plasticizer, release agents, etc. from their surface, which has a detriment effect on the adhesion of retroreflective materials. You should pre-check the quality and suitability of them before use.

5. APPLICATION OF SCREENING INKS ON UL SHEETING

5-1 Transparent and Opaque Colors

Nikkalite® Brand Process Colors are available for screen processing on UL:N3800 Series in the colors listed below. All colors except Black are transparent.

Table 5

COLOR	N3800 Series
Black(Opaque)	N3803
Yellow	N3804
Traffic Sign Red	N3825
Blue	N3806
Orange	N3807
Green	N3808
Brown	N3809
Toner	N3812
Hardener	N3830
Thinner	Dihydroterpenyl acetate

N3800 Series Process color may be ;

- either PRE - SCREENED or POST - SCREENED
- either with N3830 Hardener or without Hardener on UL.

when use N3800 with N3830 Hardener, the following mixture (by weight) must be used.

ink : 100 parts

N 3830 : 14 parts

(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 screen processing, however, when required, N3800 Series inks may be thinned to the desired viscosity with

dihydroxyterphenyl acetate, up to 10 parts by weight.

(c) Only N3800 Series over N3800 Series inks. No other brands or types of ink should be screened over any Nikkalite® Brand inks.

(d) Nikkalite® Brand inks are the only recommended inks for use on Nikkalite® Brand sheeting.

5-2 Drying

The N3800 Series Process Color was developed for PRE-SCREENING (screened on the sheeting) and POST-SCREENING (screened on the sheeting already applied to a substrate) on UL using 62 to 77

mesh/cm (157 to 196 mesh/inch) 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 each sign face, place it on the drying rack with the air from the electric fans blowing across the screened surface 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. Up to 50 UL sign faces may be stacked.

*Place two sign faces, face to face, and press it by hand firmly if no sound heard to your ear when these two faces are separated, drying is enough.

DO NOT STACK the finished signs, stand them on edge during storage or shipment. (see Para. 5-3, below)

5-3 Packing and shipping Sign Faces and Signs

When packing and shipping finished signs(after the UL 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 UL from being crushed.

DO NOT BAND THE FINISHED SIGNS TOGETHER SO TIGHTLY THAT THE UL AT THE EDGES OF THE FINISHED SIGN BECOMES DAMAGED. DO NOT STACK, STORE, OR SHIP FINISHED UL SIGNS IN A HORIZONTAL POSITION, BUT ALWAYS KEEP THE SIGNS ON EDGE VERTICALLY.

Finished signs

KEEP DRY. Store signs and sign packages upright on edge, indoors. Guide signs, if stored outdoors, must be

kept upright on edge, off ground surface and are separated to permit free air circulation.

5-4 Cutting

Several sheets of UL 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.

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

5-5 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.

6. EFFECTIVE PERFORMANCE LIFE

The effective performance life of UL 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 UL sheeting can be expected to emit the amount of retroreflectivity (cd/lux/m²) at Observation Angle 0.2° and Entrance Angle -4° or 5° when exposed vertically for the number of years listed in Table 6.

Table 6 : Effective Performance Life

Item number and color	Average cd/lux/m ²	Effective Performance Life
812/512 White	200	10 Years
804/504 Yellow	136	10 Years
805/505 Red	36	10 Years
806/506 Blue	16	10 Years
807/507 Orange	80	3 Years
808,818/518 Green	36	10 Years
828/528 Brunswick Green	24	10 Years
809/509 Brown	10	10 Years

It is estimated that the effective performance life of UL sheeting will be about two years shorter than as shown above in Table 6 in areas where is high exposure to ultraviolet rays from the sun, high temperatures and high humidity. Furthermore, the effective performance life will be further shortened if the sheeting is subjected to

abrasion caused by desert and lava sandstorms. The effective performance life of the sheeting will be shortened when the sheeting is exposed to the sun at angles less than 90° or when the sheeting surface is subjected to abrasion by flying sand or pebbles, which may occur when mounted on moving vehicles.

7. APPLICATION OF UL AND OTHER GRADES OF SHEETING ON THE SAME SUBSTRATE

When UL 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

Table 7

Background Sheeting	Letters, Numerals, Symbols, Borders	Application Procedures
1. EG 7100 Series or SEG 17000 Series.	UL 800 Series or 500 Series.	After applying the background sheeting in the vacuum applicator, apply the letters, numerals, symbols, etc. with a hand-roller or a squeegee. Whenever possible, accelerate curing of the adhesive by heat-pressure treatment with a vacuum applicator.
2. EG 8100 Series or SEG 18000 Series.	UL 800 Series or 500 Series.	After applying the background sheeting with a roller applicator, apply the letters, numerals, symbols, etc. with a hand-roller or a squeegee.
3. UL 800 Series or 500 Series.	UL 800 Series or 500 Series.	Same as 2, above.
4. UL 800 Series. or 500 Series.	EG 7100, 8100 Series or SEG 17000, 18000 Series.	Not recommended.

8. MAINTENANCE (CLEANING)

A mixture of a mild detergent in water is recommended for cleaning the 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 UL WITH ANY KIND OF SOLVENT.

9. STORAGE

UL Retroreflective Sheeting should be stored in a cool, dry area, preferably at 68°F to 79°F (20°C to 26°C) and 30% to 60% relative humidity, away from direct sunlight. It should be used within one year after purchase.

Used rolls should be returned into their original carton boxes, suspended properly and always in a horizontal position, or iron bar should be inserted inside the roll core and sheeting roll should be hanged in mid-air by suspending both ends of iron bar horizontally. Never allow the rolls to lie for a prolonged period unsuspended or to stand on their ends vertically. 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 allowed to stand on its end, the bottom edges 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.

Cutout letters should be placed in plastic bags and stored in a cool dry area. Sheets and cutout letters cut from rolls should be applied within the shelf life period specified for the roll goods.

Those aforementioned information regarding the processing are based on our own experience and experiments. However, these may not be representative of the actual information that can be guaranteed.

Reliability of Information

All recommendations and technical information contained herein are 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 their own test/tests to determine the fitness of this 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 herein expressly warranted. NCI's (Nippon Carbide Industries Co., Inc.) liability is limited to replace the defective materials 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.

Warning

Failure to comply with the explicit instructions in this bulletin will result in voiding all warranties express or implied for 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.

Safety and Health Information

Read carefully in advance the labels, instruction manuals, material safety data sheets (MSDS), and first aid measures of the retroreflective sheetings supplied by Nippon Carbide Industries Co., Inc. (hereinafter referred

to as "NCI"), the auxiliary materials such as inks and solvents used for NCI's products, and proprietarily used chemicals such as substrate cleansers.



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