



76, Pureundeulpan-ro, 1010beongil,
Paltan-myeon, Hwaseong-si,
Gyeonggi-do, 18525, Rep. of Korea



TEL +82 (0)31-8014-9724
FAX +82 (0)31-8059-2130



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Specifications

Introduction

REFLOMAX GLODIAN™ HIP-4000/4100 series are highly reflective, weatherproof, self-adhesive films with excellent corrosion and solvent resistance. The product was developed specifically for the manufacture of traffic signs intended for long term vertical outdoor use.

REFLOMAX GLODIAN™ HIP-4000/4100 series are composed of a UV stabilized acrylic front film. Its retroreflective system consists of sealed cells of air-backed microprisms, using total internal reflection.

The unique pattern and sealing enable to identify the machine direction and the manufacturer of the sheeting as shown in Figure 1. The sheeting displays a watermark (general colors only) with the product code and service time in a repeat pattern to provide identification to users & visual verification of proper use by inspectors, as shown in Figure 2.

The product complies with the requirements of the ASTM D 4956 Type 4, KS T 3507 Type 4, AS/NZS 1906.1:2017 Class 400, EN12899-1 Class RA2, GB/T 18833 Class 4, GOST 32945 Class 2, JIS Z 9117 Type 2-A-a & 2-A-b in respect of microprismatic materials.

Application | Processing

REFLOMAX GLODIAN™ HIP-4000/4100 series were developed especially for traffic sign applications. Substrate onto which the material will be applied must be thoroughly clean.

The substrate must be free of dust, oil, fats, silicon or other contamination. REFLOMAX GLODIAN™ HIP-4000/4100 series are optimized for the application onto flat substrates of aluminum alloys or galvanized steel.

For other applications, the user is fully responsible for evaluating the suitability of the product, and for any risks associated with that use.

Note

All REFLOMAX GLODIAN™ products are manufactured within an ISO 9001:2015 controlled manufacturing environment.

Retroreflectivity

REFLOMAX GLODIAN™ HIP-4000/4100 series fully meet the minimum performance requirements of ASTM D4956 Type IV. The required minimum retroreflection values, as shown in tables 1, which are measured in accordance with the corresponding specifications using CIE54:1982.

Adhesive

REFLOMAX GLODIAN™ HIP-4000/4100 series have a pressure-sensitive adhesive which is recommended under room temperature application. Room temperature application is defined as 18°C~25°C(64°F~77°F).

Service Colors

REFLOMAX GLODIAN™ HIP-4000/4100 series are available in white (01), yellow (03), orange (05), red (07), green (09), blue (11) and brown (15), as well as fluorescent yellow-green (02) and fluorescent orange (04).

The sheeting conforms to the daytime color requirements as specified in Table 2 and nighttime color requirements as specified in Table 3. It must comply with the specifications of ASTM D4956.

Figure 1 - Sealing patterns and application directions

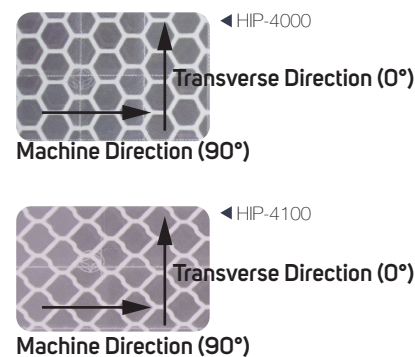


Figure 2 - Watermark

HIP
10 Years



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Product Data

Retroreflectivity for new sheeting (cd/lx/m²) as per ASTM D4956

Table 1 – Specific coefficient of retroreflection (ASTM D4956-17 Type IV sheeting)

Observation angle	0.1°		0.2°		0.5°	
Entrance angle	-4°	30°	-4°	30°	-4°	30°
White	500	240	360	170	150	72
Yellow	380	175	270	135	110	54
Orange	200	94	145	68	60	28
Red	90	42	65	30	27	13
Green	70	32	50	25	21	10
Blue	42	20	30	14	13	6
Brown	25	12	18	8.5	7.5	3.5
Fl.Yellow-Green	400	185	290	135	120	55
Fl.Orange	150	70	105	50	45	22

Daytime color specification limits

Table 2 – Chromaticity coordinates (ASTM D495)

COLOR	1		2		3		4		Luminance Factor (Y%)
	x	y	x	y	x	y	x	y	
White	0.303	0.300	0.368	0.366	0.340	0.393	0.274	0.329	> 27
Yellow	0.498	0.412	0.557	0.442	0.479	0.520	0.438	0.472	15 ≤ Y ≤ 45
Orange	0.558	0.352	0.636	0.364	0.570	0.429	0.506	0.404	10 ≤ Y ≤ 30
Red	0.648	0.351	0.735	0.265	0.629	0.281	0.565	0.346	2.5 ≤ Y ≤ 15
Green	0.026	0.399	0.166	0.364	0.286	0.446	0.207	0.771	3 ≤ Y ≤ 12
Blue	0.140	0.035	0.244	0.210	0.190	0.255	0.065	0.216	1 ≤ Y ≤ 10
Brown	0.430	0.340	0.610	0.390	0.550	0.450	0.430	0.390	1 ≤ Y ≤ 9
Fl. Yellow	0.387	0.610	0.369	0.546	0.428	0.496	0.460	0.540	≥ 60
Fl. Orange	0.583	0.416	0.535	0.400	0.595	0.351	0.645	0.355	≥ 20

Nighttime color specification limits

COLOR	1		2		3		4	
	x	y	x	y	x	y	x	y
White	0.475	0.452	0.360	0.415	0.392	0.370	0.515	0.409
Yellow	0.513	0.487	0.500	0.470	0.545	0.425	0.572	0.425
Orange	0.595	0.405	0.565	0.405	0.613	0.355	0.643	0.355
Red	0.650	0.348	0.620	0.348	0.712	0.255	0.735	0.265
Green	0.007	0.570	0.200	0.500	0.322	0.590	0.193	0.782
Blue	0.033	0.370	0.180	0.370	0.230	0.240	0.091	0.133
Brown	0.595	0.405	0.540	0.405	0.570	0.365	0.643	0.355
Fl. Yellow	0.480	0.520	0.473	0.490	0.523	0.440	0.550	0.449
Fl. Orange	0.625	0.375	0.589	0.376	0.636	0.330	0.669	0.331



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Application Instruction

Processing Instructions

This application instruction is intended to explain proper methods to apply REFLOMAX GLODIAN™ HIP-4000/4100 series to traffic sign. Even though it is impossible to explain all aspects to be taken into account, this application instruction incorporates many useful tips for handling REFLOMAX GLODIAN™ HIP-4000/4100 series.

The sign producers who will use REFLOMAX GLODIAN™ HIP-4000/4100 series should observe this application instruction

to produce their signs in right way for traffic sign in accordance with: ASTM D 4956 Type 4, KS T 3507 Type 4, AS/NZS 1906.1:2017 Class400, EN12899-1 Class RA2, GB/T 18833 Class 4, GOST 32945 Class 2, JIS Z 9117 Type 2-A-a & 2-A-b.

Also, specific knowledge and skills of sign production are prerequisites for the processing of REFLOMAX GLODIAN™ HIP-4000/4100 series.

Storage & Transportation

- 1) REFLOMAX GLODIAN™ HIP-4000/4100 series are supplied in cartons specially made considering the roll sizes.
The roll should be stored in the original carton with standard spacers provided with the product. These spacers minimize formation of pressure marks and surface damage which may be created from impact from outside.
- 2) Please make sure that partly processed rolls should also be stored in the same condition.
REFLOMAX GLODIAN™ HIP-4000/4100 series should be stored in a cool, dry indoor place, away from direct sunlight. Recommended temperatures for storage are from 18°C~24°C (65°F~75°F) and from 46% to 60% in R.H.
- 3) It is advisable to stay rolls in horizontal condition. If the rolls are stored vertically, it may have a negative influence on the film's characteristics.

Size & Package

- **Roll Size** 123cm x 45.7m (48.4in x 50yds)
- **Gross** 29 kgs (63.9lb)
- **Weight** 31 kgs (68.3lb)
- **Package** 40 rolls per pallet
(320 rolls per 20' container)

Printing

- 1) REFLOMAX GLODIAN™ HIP-4000/4100 series can be screen-printed with using the ink for screen print for traffic sign or digitally printed with UV digital ink.
- 2) There could be quality deviation according to the printing method, e.g. ink print machine, printing process, condition and technical skill of user etc. It is recommended to pretest before printing.
- 3) It is recommended to use REFLOMAX GLODIAN™ EC-1001 on the surface of printed film for the improvement of ink durability.

Preparations for Screen printing

- ① It is recommended to use the solvent based and two liquid base (ink+hardener screen printing ink with quick drying color system for traffic sign.
- ② Printing should be done in compliance with guideline from ink supplier.
- ③ The worktable must be flat and mechanically stable. Vacuum conveying is required for printing film sheets.
- ④ As the hardness or elasticity of squeegees has a decisive influence on the printing result, squeegee rubbers with Shore hardness of 65~75A are recommended.
- ⑤ The squeegees and screen must be washed with appropriate solvent before printing.
- ⑥ Also, surface of film should be cleaned by anti-dust or anti-static fabric to ensure to avoid any substance on surface before printing.

Screen printing

- ① Optimum conditions for the printing process require an air temperature ranging from 20°C(68°F) to 24°C(75°F) and relative air humidity from 20% to 50%. If the ambient conditions are poor, the use of thinner or retarding agents may be required to adjust the ink for processing. Please note it might cause not to meet required specification values for color and retroreflection that the thinner or retarding agents are used too much.
- ② The distance between screen and film surface should be set suitably pursuant to the testing result. If the distance is too short, it could result in poor print quality.
- ③ It is recommended to maintain a medium squeegee speed of approx. 0.75m/s and the squeegee should be applied at an angle of 30° towards the print surface. Squeegee speed could cause poor print quality when it's too quick or too slow.
- ④ Since an excessive squeegee pressure can result in smearing or blurred contours and edges, the proper testing and user's skill are required.



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Drying after screen printing

- ① The sheeting must be flat when drying.
- ② The drying time of the prints depends upon the type of sheet or ink used, ambient temperature and specific local conditions, etc.
- ③ **Forced drying** is recommended by means of drying in a convection oven to facilitate quick and economical processing of the sheets after printing. In case of using this method, the film should be used after 48 hours from drying, maximum after a week.
- ④ Please note that the maximum number of sheets stacked should not exceed 40 sheets. Otherwise, it may cause result in poor quality on printed surface by high pressure.
- ⑤ Prints on pre-laminated traffic sign substrates should be stored vertically and each sign substrate should maintain proper distance to avoid any bad effect on quality of printed surface.

Adhesive bonding and lamination

- 1) In order to obtain the optimum condition of adhesion with REFLOMAX GLODIAN™ HIP-4000/4100 series, it is important to make the substrate clean.
- 2) The substrate must be free of dust, oil, fats, silicon or other contamination. If the substrate needs to be cleaned using solvent like IPA, then you must wait until the solvent is completely evaporated.
- 3) The surface of substrate should be smooth. In case of adhesion on substrate that is tough like welded joint part, there could be possibility to make difference in adhesion strength by working condition and ambience.
- 4) REFLOMAX GLODIAN™ HIP-4000/4100 series are optimized for application onto flat substrates of aluminum alloys or galvanized steel.
- 5) It is not recommended to conduct lamination at the temperatures less than 15°C(59°F) because it can cause problem in adhesion strength.
The best bonding temperature is 21°C(69°F) and the films should be stored in the space where they will be processed with optimum condition for at least 48 hours before lamination.
- 6) REFLOMAX GLODIAN™ HIP-4000/4100 series are coated with pressure sensitive adhesive layer conforming to Class 1 of Section 4.3 Backing Classes of the ASTM D4956-16b standard. Therefore, additional and/or pre-heat, solvent agent are not required to apply sheeting on the board. It is enough to use just manual pressure. Please make sure NOT to apply especially any excessive heat while applying reflective sheeting on the board. Otherwise, doing so may cause serious damages to the basic quality of sheeting.

UV digital printing

- ① The printing process requires temperature between 20°C(68°F) and 26°C(78°F) and relative air humidity between 40% and 60%. It is optimum condition to make the room free from dust.
- ② Please wear cotton gloves to prevent contamination of the surface during printing process.
- ③ It is necessary to set up optimum condition after enough testing prior to printing. And the professional skill is required to obtain a fine quality of printing since there could be quality deviation by printing equipment.

- 7) In using a film-laminating machine, the coated rubber of upper roller should have Shore hardness 65~75A, and the roll gap should be adjusted over the entire width to avoid any deviation.
- 8) The bonding process should be conducted with a moderate pressure set up after pre-testing.
- 9) If you need to apply two pieces of sheeting overlapped, upper sheet should be placed on lower sheet to avoid rainwater ingress.
- 10) Please be careful of direction of sheets when bonding process and ensure that it is carried out in one-way direction. There could be deviation in reflective performance if adhered cross at the direction of sheets.
- 11) It is advisable that the sheets used for bonding process are tooled under the same light conditions.
- 12) It is recommended to use the films only from the same roll for one substrate in order to coordinate the colors. If more than one roll is required, use the film only from the same production lot.
- 13) It is recommended that applied substrate should be installed after storing for 72 hours at the temperature 20°C(68°F) ~ 26°C(78°F) and relative air humidity 40%~60% to ensure the enough adhesion strength on substrate.
- 14) When using films, it is necessary to take all processed and working conditions into account as they may have effect on the adhesive strength of product and bonding processing.
Also, please perform enough test in advance considering if it's fit for the application or not and can guarantee the performance of product.
When you want to apply the products to workpiece following the suggestions above, it is advisable that you need to have a prior consultation with REFLOMAX.



Cutting, Plotting & Overlaying

- 1) REFLOMAX GLODIAN™ HIP-4000/4100 series can be cut with commercial cutting plotter, die-cut plotter, etc.
- 2) Refrain from cutting several sheets at a time when using the die-cut plotter.
- 3) It is recommended to set up proper pressure and cut moderate number of sheets when it's cut by stack cutter.
- 4) It is strongly recommended that every cutting process be done with setting up reasonable process condition after enough testing done in advance.
- 5) There may be restrictions on our warranty program for this product when any Electro-Cut film other than Reflomax' EC-1000 was overlayed.

Cleaning of the applied products

Surfaces should only be cleaned with pure water, water/isopropanol(80/20%) or diluted soap solution.

Avoid using any solvents or abrasive cleaning agents like metal or sand for the purpose of cleaning the reflective films. Otherwise, this can cause serious damage to the surfaces.



Important

Durability

The durability of REFLOMAX GLODIAN™ HIP-4000/4100 series and finished signs will be dependent upon substrate selection and preparation, compliance with recommended application procedures, geographic area, exposure conditions, and maintenance.

Maximum durability of REFLOMAX GLODIAN™ HIP-4000/4100 series can be guaranteed in applications with vertical exposure on stationary objects when processed and applied to properly prepared aluminum, pursuant to Reflomax's recommendations. Periodic sign inspection and regular sign replacement are strongly recommended for sign owners to ensure their own effective service life and warranty for the durability, if provided.

Substrate

The user must determine the suitability of any nonmetallic sign backing for its intended use. Applications to unprimed, excessively rough or non-weather resistant surfaces can deteriorate the performance of such applications.

Exposure

Exposure to severe or unusual conditions can deteriorate the performance of such applications. Signs in mountainous areas where are covered by snow for a long time may also shorten the durability. Atmospheric conditions in certain geographic areas may result in reduced durability.

Splice

There could be one splice per roll and in case of roll with splice, additional meter will be provided.

Warranty

No warranty is given for the purposes other than those listed in the Specifications Sheet or which are not processed in compliance with Reflomax's processing and handling instructions. The durability of the signs will depend upon various factors, including but not limited to substrate selection and preparation, compliance with recommended application guidelines, geographic area, exposure conditions and maintenance of the product and finished sign. Imperfect sign caused by the substrate or improper surface preparations are not under the responsibility of Reflomax.

For further information, please see full warranty instrument available at www.reflomax.com.

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