# DESRFL2000

## REFLECTIVE

### Description

DESRFL2000 retroreflective sheeting was specifically developed for use in reflective Car License Plates (CLP), and can also be used on motor-cycle or truck license plates. DESRFL2000 sheeting is all-weather, bright, durable, flexible and impact resistant sheeting consisting of glass beads embedded with a transparent film. It is pre-coated with a permanent pressure sensitive adhesive protected by easily removable liner that will provide a secure bond for many years. After DESRFL2000 sheeting is applied to the base plates, it is embossed and printed with either a opaque ink or hot stamping foil to produce attractive license plates. Lf applied properly, DESRFL2000 sheeting and inks or hot stamping foil will result in a bright and highly legible license plate during the daytime and nighttime when viewed from the car. The combination of these qualities will contribute to traffic safety.

### Physical data

The minimum retroreflective values of DESRFL2000 sheeting are given in Table-1 below. Measurements shall be conducted in accordance with ISO 7591
(Road vehicles - Retro-reflective registration plates for motor vehicles and trailers - Specification). The reflective value of DESRFL2000 series sheeting,
totally wet by rain, will not be reduced by more than 10% of the values specified in Table-1 below. Rainfall per- formance measurement shall be conducted at 0°20' observation and 5° entrance angle in accordance with ISO 7591.

**Table 1** Minimum values of retroreflectivity

| Color | O.A | Entrance angle | | | Max. |
|---|---|---|---|---|---|
| | | 5° | 30° | 40° | |
| White | 0°12′ | 45 | 18 | 8 | 250 |
| | 0°20′ | 30 | 12 | 6 | |
| | 1°30′ | 3.5 | 2 | 0.7 | |
| Yellow | 0°12′ | 30 | 12 | 5 | 250 |
| | 0°20′ | 20 | 8 | 4 | |
| | 0°30′ | 2.3 | 0.8 | 0.4 | |

**Table 2** Typical value of retroreflectivity

| Color & Item no. | O.A | Entrance angle | | |
|---|---|---|---|---|
| | | 5° | 30° | 40° |
| White | 0°12′ | 82 | 36 | 20 |
| | 0°20′ | 66 | 30 | 20 |
| | 1°30′ | 12 | 9.2 | 6.5 |
| Yellow | 0°12′ | 58 | 28 | 12 |
| | 0°20′ | 43 | 25 | 16 |
| | 0°30′ | 8.9 | 7.1 | 4.9 |

**O.A.:** Observation Angle

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**Table 3** Color limits (Daytime)

| Color | 1 | | 2 | | 3 | | 4 | | Luminance factor |
|---|---|---|---|---|---|---|---|---|---|
| | x | y | x | y | x | y | x | Y | |
| White | 0.355 | 0.355 | 0.305 | 0.305 | 0.285 | 0.325 | 0.335 | 0.375 | ≥ 0.35 |
| Yellow | 0.465 | 0.534 | 0.427 | 0.483 | 0.487 | 0.423 | 0.545 | 0.454 | ≥ 0.27 |

Color coordinates of DESRFL2000 White and DESRFL2000 Yellow conforming to the color limits of Table-3 above. (The tour pairs of chromaticity coordinates
determine the acceptable co/or in terms of the CIE 1931 Standard Colorimetrie System measured with CIE Standard I/luminant D65.)

**Table 4** Physical Properties of the sheeting

| Properties | Test Method | Results |
|---|---|---|
| Average thickness | Micrometer | 160 µ m |
| Average gloss | Gloss meter | 85 at 60° |
| Tensile strength | Instron tester | 22.5 N/25 mm width |
| Average elongation | Instron tester | 120% |

**Table 5** Chemical Tests Performance (After applied to aluminium plate)

| Chemical composition | Test performed | Results |
|---|---|---|
| Water resistance | 24 hours at 23±5°C, RH 10±5% → drying 48 hours | No defects |
| Average gloss | Wipe with heptane after smeared with a mixture of lubricating oil and graphite | No defects |
| Tensile strength | Immerse the sample for 1 min. in 70% n-heptane + 30% toluol. | No defects |
| Average elongation | According to ISO 7591, Item 15: Resistance to saline mist | No corrosion and no defects |

**Table 6** Physical properties of the sheeting (After applied to aluminium plate)

| Type of test | Test method | Results |
|---|---|---|
| Temperature resistance | 7 hours at 65±2°C, RH 10±5% →<br>1 hours at 23±5°C, RH 10±10% →<br>15 hours in -20°C | No peeling, cracking, blistering and discoloration |
| Adhesion | Peel sheeting after 1 hour, -20°C | Sheet can not peel without breaking |
| Impact resistance | Immediately after conditioned 1 hour at -20°C, drop 25mm diameter steel ball from 2m height to the sample rate | No further cracking and no separation cloud not be found around the hit mark |
| Flexibility | Bend the flat sample 90° along with the 50mm mandrel within 2 seconds at 23±5°C | No cracking |

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The test of Table-5 and Table-6 above are based on tests conducted on DESRFL2000 sheeting applied to chemically treated aluminum panels and conditioned for 24 hours at a temperature 23±2°C and 50±5% relative humidity before testing. All the aforementioned figures in the tables are based on our experience and actual measurements based on our own tests. However, these figures may not be guaranteed.

## Effective performance life

Based on numerous tests and past experience, finished license plates of DESRFL2000 sheeting, applied on the treated aluminum plate and processed as recommended, will perform effectively without remarkable color fading, sheet peeling, blistering, or cracking, for 5 to 7 years.

## Cleaning

During its lifetime the CLP may require cleaning at some stage. The CLP will probably have sand/grit within the surface dirt, therefore it is recommended that a low-pressure flow of water is used to help remove this loose dirt and sand/grit from the CLP first. Never use a strong jet of water. Rubbing the sand/grit into the CLP during the cleaning procedure may cause irreparable damage to the CLP material. 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 alcohols and be chemically neutra!. Rinse the whole area thoroughly after washing and allow to dry naturally or use a lint free cloth. Tar or similar deposits can be removed by a light application of turpentine, following with the washing instructions above.

## Storage

Retroreflective sheeting, inks, thinner, etc. should be stored between 15°C to 25°c, ideally with a relative humidity of 30% to 60%, and out of direct sunlight. Retroreflective sheeting and inks should be used within one year after purchased. Do not leave full or open rolls of material resting on hard surfaces; this may cause bruising to the retro0reflective material, which may not be seen until exposed to a light source.



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