

# Practical Information

No. 4.2, version 2011/02

## ORALITE® reflective films of the reflection class RA1, design A for road safety



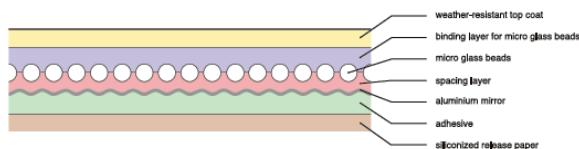
ORAFOL® Europe GmbH

### 1. Processing instructions for ORALITE® reflective films of the reflection class RA1,A

The processing instructions given below apply to the following ORALITE® reflective films of the reflection class RA1, design A (RA1, A):

ORALITE® 5700 Engineer Grade *Premium*  
ORALITE® 5710 Engineer Grade *Premium*  
ORALITE® 5500 Engineer Grade  
ORALITE® 5510 Engineer Grade  
ORALITE® 5300 Commercial Grade  
ORALITE® 5400 Commercial Grade  
ORALITE® 5430 Construction Grade

The basic structure of the films is shown in the diagram given below.



The compiled information is based on our knowledge, experience and application tests. Its purpose is to provide suggestions and support to practitioners. Even though it is not possible to explain all aspects that need to be taken into account, this guideline comprises a large number of useful tips for handling ORALITE®- reflective films of the reflection class RA1, A. Where individual series from the range of ORALITE®- reflective films require specific handling, this fact is pointed out at the relevant place.

Specific knowledge and skills of a traffic-sign maker are prerequisites for the processing of ORALITE® reflective films of the reflection class RA1, A. On account of the large number of conditions that may influence processing, adhesive bonding and use, we recommend that you perform your own tests of ORALITE® reflective films of the reflection class RA1, A for specific applications. A guarantee as to the existence of certain characteristics cannot be deduced from this information.

### 2. Storage and transportation

ORALITE® reflective films of the reflection class RA1, A should be stored in a cool and dry place that is protected from direct sunlight. We recommend temperatures ranging from 20°C to 24°C and relative air humidity of 40% to 60%.



Rolled material should be handled and stored in the original carton. The rolls have standard spacers that prevent contact

between the roll surface and the carton and thus the formation of pressure marks and surface damage. Please make sure that partly processed rolls, too, are never stored or handled without spacer.

When making the rolls available for processing, it is advisable to use a horizontal suspension system (such as a pater-noster system or a rack).

Even if the rolls are stored in a vertical, freestanding position, a negative influence on the film's characteristics is generally not expected. Here again, it is crucial to place the roll on the spacer so as to avoid breakage of the edges. In practice it was shown, however, that this type of storage complicates the handling of the films.

Blank or printed film sheets are supplied in cartons that have been designed especially for the sheet dimensions, 50 sheets per carton. If the sheets are stored outside the carton, please make sure to put individual sheets on a flat and stable support so that they do not adjoin or overlap at the edges. Sheets may be stacked. In order to limit the weight load, not more than 40 to 50 sheets should be stacked.

### 3. Printing

ORALITE® reflective films series 5700, 5710, 5500, 5510 and 5300 featuring an alkyd resin surface are suitable for the silk-screen process with silk-screen inks ORALITE® 5010 and ORALITE® 5018, whereas series ORALITE® 5400 and 5430 featuring a modified PVC topcoat can be printed only with one-component silk-screen ink ORALITE® 5018.

#### 3.1 Silk-screen process

ORALITE® silk-screen inks are solvent-based, quick-hardening ink systems providing a glossy surface with high weather resistance after hardening.

After proper hardening, the ink film is extremely resistant to mechanical stresses such as those caused by cleaning brushes, etc. Chemical resistance to commercial cleansers is also very high. The application of an additional clear topcoat is not necessary for these ink systems.

Both the series ORALITE® 5010 (two-component) and ORALITE® 5018 (one-component) are available in the following six translucent shades:

yellow	(020)
red	(030)
orange	(035)
blue	(050)
green	(060)
brown	(080)

The shade black (070) is a covering substance.

A unit of the two-component system ORALITE® 5010 consists of 630g ink and 150g hardening agent H5010.

**Caution!** The hardening agent H5010 is sensitive to moisture and therefore must be stored in a dry place and in the closed packaging.

The specified mixture ratio is 4.2 parts by weight of ink and 1 part by weight of hardening agent. This ratio is guaranteed if both components of a unit are completely used for preparing the mixture. Both components must be stirred thoroughly.

# Practical Information

No. 4.2, version 2011/02

## ORALITE® reflective films of the reflection class RA1, design A for road safety



ORAFOL® Europe GmbH

After stirring, let the mixture stand for 10 min. so that the trapped air can escape.

When a complete unit is prepared, the pot-life of the ink (applicability of the mixture ready for printing) is about 8 hours at a room temperature of 20°C.

The one-component silk-screen ink ORALITE® 5018 is supplied ready for printing in an 800ml-container. Before application, the ink must be homogenized by stirring. It is advisable to let it stand for 10 min. so that the air can escape. Opened containers must be closed tightly immediately after use. In this way the escape of the solvent is prevented and the ink remains suitable for printing.

### 3.2 Preparation of the screen

We recommend using polyester fabric, mesh count 61 to 64, as screen-printing stencils.

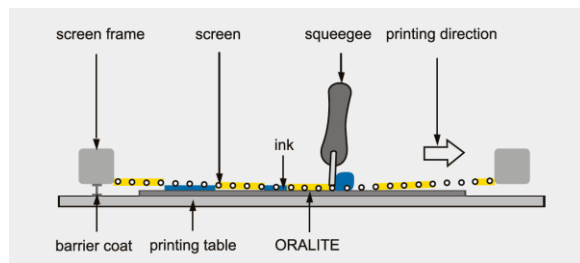
When such screen-printing stencils and ORALITE®-screen-printing inks are used, we guarantee that prints on ORALITE® reflective films series 5700, 5710, 5500 and 5510, 5300, 5400 and 5430, color 010 (white), comply with the required chromaticity and specific retroreflective values called for in international specifications for reflective materials of these classes, provided that the printing process is correctly carried out.

Manual printing tables or automatic printing systems may be used. The screen-printing table must be flat and mechanically stable. Vacuum conveying is required for printing film sheets.

The hardness or elasticity of squeegees has a decisive influence on the printing result. We recommend squeegee rubbers with Shore hardness of 65-75. Checking and surface grinding, if required, of the squeegees is crucial. The squeegees should be 7 to 10cm bigger than the printing format.

### 3.3 Printing

Before starting the printing process, screen, squeegee and flood bar must be cleaned with a suitable licensed solvent, for instance isopropanol. In addition, each film to be printed should be wiped with an anti-dust or anti-static cloth.



For printing, we recommend maintaining a medium squeegee speed of about 0.75m/s and the squeegee should be applied at angle of 30° to the print surface.

The distance between the screen and the film surface should be set to about 10mm. If the distance is too short, the screen does not come off the substrate neatly, which results in cloud formation in the print.

Excessive squeegee pressure can result in smearing or blurred contours.

The ink containers must be closed immediately after use.

Optimum conditions for the printing process are an air temperature ranging from 20°C to 24°C and air humidity of 20% to 50%.

Unfavorable ambient conditions or the need to adjust the opened ink containers may require the use of thinning or retarding agents. To meet the required specification values for shade and reflection, it is crucial to ensure that not more than 3% thinner and not more than 1.5% retarding agent are used in ORALITE® 5010 or 5018.

### 3.4 Drying after printing

The drying time of the prints does not only depend on the type of sheet or ink used but specific local conditions such as the positioning of the prints, ambient temperature, air humidity, etc. also have a major impact.

To facilitate quick and economic processing of the sheets after printing, we recommend forced drying by means of fans or drying in a convection oven. Furthermore, forced drying can prevent crack formation in the films after printing.

The following procedure has proved successful in air-drying by means of fans:

We recommend placing the prints individually on a platform rack truck or a similar shelf system. To ensure adequate air circulation, a distance of 4 to 6cm should be kept between the storage levels. Furthermore, we recommend using at least three or four fans for drying. The fans are best arranged one above the other in a movable manner on a trolley that can be driven up to the sheets from a distance of 1-2 m. Immediately after printing, the fans should run at higher speed for about 30 minutes, after that normal speed should be sufficient.

The use of a heatable drying tray results in a temperature increase and thus substantially reduced drying time.



Drying conditions can be further optimized by using convection ovens. These closed systems permit a low-dust drying phase at constant temperature, low air humidity and do not subject the operator to solvent vapors.

The following drying times may serve as general guidelines:

#### Silk-screen ink ORALITE® 5010

Overprintable		Stackable (pay attention to maximum number)	
Temperature	Time	Temperature	Time
20 °C (air drying, relative air humidity 40-60 %)	30 min	20 °C	5 h
60 °C (convection oven)	6 min	60 °C	45 min

# Practical Information

No. 4.2, version 2011/02

## ORALITE® reflective films of the reflection class RA1, design A for road safety



ORAFOL® Europe GmbH

*Silk-screen ink ORALITE® 5018*

Overprintable		Stackable (pay attention to maximum number)	
Temperature	Time	Temperature	Time
20 °C	20 min	20 °C	3-4 h
(air drying, relative air humidity 40-60 %)			
60 °C	5 min	60 °C	30 min
(convection oven)			

In case the sheets are printed in an overlapping manner, please make sure that the lower ink layer is not fully hardened yet and that overprinting must take place within of 12 hours after the first printing.

At an ambient temperature of 20°C and an average relative air humidity of 40 to 60%, printed traffic signs can be shipped after a drying time of 48 hours. Prints made with the two ink series are fully hardened after a period of about 8 days.

### 3.5 Storing printed films or traffic signs

When the inks are hardened (see Table above), printed sheets can be stored horizontally, preferably in cupboards. Please note that the maximum number of sheets stacked should not exceed 40–50 sheets.

Prints on pre-coated traffic sign substrates should be stored vertically and separated by an intermediate layer of suitable paper or support film. Here again, a low pressure load is crucial.

### 4. Cutting, die cutting, plotting

ORALITE® reflective films of the reflection class RA1, A can be cut by means of a commercial stack cutter. The holding-down clamp should be set to very low pressure and, as an additional measure, the film be protected from compression. We recommend limiting the stacking height to 40-50 sheets (see Storing).

If ORALITE® reflective films are die-cut by means of steel strip tools, we advise against placing several sheets on the platen at the same time.

Commercial cutting plotters with tangential blades, preferably of the flatbed type, should be used as plotter systems. Tangential control ensures high-quality cut edges. The cutting depth can be adjusted to starting a cut or cutting through. Systems with a pneumatically controlled die head, where the cutting pressure can be adjusted precisely in accordance with the specific material used, are highly recommended. We advise against the use of drag-knife systems. The respective cutting or processing speed depends very much on the complexity of the cutting pattern and the applied cutting system.

Besides ORALITE® reflective films of the reflection class RA1, A also non-reflective ORALITE® films can be processed in this manner.

For small series of traffic signs on the basis of ORALITE® reflective films of the reflection class RA1, A and/or with variable lettering, Orafol Europe GmbH offers ORALITE® 5061 Transparent Films in all common traffic-sign colors. The Orafol range of products includes the Lettering Film

5071, which is suited to black lettering, markings and symbols.

The transfer film ORATAPE® MT 95 or the various paper-based variants ORATAPE® MT 72, LT72 and MT52 are suitable for applying cut films.

They can be transferred by means of a laminating machine or hand roller.

### 5. Adhesive bonding and laminating

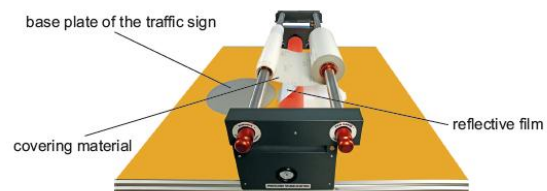
In order to achieve good adhesion of the films, the substratum must be dry and free of dust, oil, fats, silicon or other contamination. If the substratum needs to be treated with a solvent, the next processing step cannot be carried out until the solvent is completely evaporated. When bonding films to metallic substrata, slight grinding of the surfaces is advantageous.

ORALITE® reflective films series 5700, 5710, 5500, 5510, 5400 and 5300 have been optimized for bonding to flat substrata of aluminum alloys or galvanized steel plate, whereas ORALITE® reflective films 5430 are also suitable for bonding to polyolefin substrata such as polyethylene and polypropylene. However, the foreman should test the reliability of bonding in each concrete case.

Bonding should not be carried out at air and material temperatures of less than 15°C. The optimum bonding temperature is about 21°C. The films should be stored for a period of at least 48 hours in the premises designated for their processing.

Adequate hardening of the ink is an indispensable prerequisite for any further processing of printed reflective films as otherwise the escaping solvent may cause blistering and even tearing of the films.

If you intend to use a film-laminating machine, we recommend using a machine with controllable unwinding and winding motors. The upper roller should be coated with Shore hardness 65-75 rubbers. The optimum roll gap should be adjusted over the entire width. We recommend using a ROLLSROLLER flatbed applicator for the bonding.



When several film webs need to be bonded side by side, they should always overlap. Depending on the format, the overlap should be 3-5mm. Please make sure that a right side of the film web is always bonded to a right side and a left side is bonded to a left side, thus ensuring the uniform orientation of the film's honeycomb structure.

When a hand roller is used for lamination, the film must be placed on the sheet in such a way that it protrudes at least 5mm from the surface on all sides. We recommend to proceed as follows to ensure the accurate positioning of the sheet: In a first step, peel off 60 to 80cm of the protective

# Practical Information

No. 4.2, version 2011/02

## ORALITE® reflective films of the reflection class RA1, design A for road safety



ORAFOL® Europe GmbH

paper or film from the ORALITE® reflective film. Align the sheet on the substratum and press down the area where the adhesive is exposed. Then get hold of the folded-over protective paper underneath the sheet and slowly peel it off further, while pressing down the sheet with the rubber hand roller.

Finally, the edges of the traffic sign sheet should be trimmed with a sharp knife applied at a 45° angle.

**Caution!** Before bonding ORALITE® reflective films, please make sure that they are dry.

### 6. Color adjustment

If several film sheets or film webs of ORALITE® reflective films of the reflection class RA1,A are to be bonded with a substratum, they should be color-matched in daylight and when illuminated in retroreflection. It is preferable to use only films from the same roll. If more than one roll is required, only material from the same production lot should be used.

### These instructions apply to the following materials:

#### **Retroreflective films with a reflector system based on embedded micro glass balls**

ORALITE® 5700 Engineer Grade *Premium*  
ORALITE® 5710 Engineer Grade *Premium*  
ORALITE® 5500 Engineer Grade  
ORALITE® 5510 Engineer Grade  
ORALITE® 5300 Commercial Grade  
ORALITE® 5400 Commercial Grade  
ORALITE® 5430 Construction Grade

#### **Color laminates**

ORALITE® 5051 Transparent Film

#### **Lettering materials**

ORALITE® 5071 Lettering Film

#### **Transfer materials**

ORATAPE® MT 95  
ORATAPE® MT 72  
ORATAPE® LT 72  
ORATAPE® MT 52

For further information on the above-described materials, please go to: [www.orafol.de](http://www.orafol.de).