

PRIPLAK

 ARJOWIGGINS



PRINTING



1. Screenprint
2. Offset printing
3. Ink Jet Printing
4. Other print techniques
5. Inks
6. Key points

“

Printing on Priplak with UV offset, UV Ink Jet or Screen Can give excellent, high definition results.

”

PRINTING

1 SCREENPRINTING

Artwork is exposed onto a screen, which allows ink through in only the image area. Screenprinting is very versatile and can be used on a wide variety of substrates, including paper and board, but also plastics, metal, Wood, glass and ceramics.

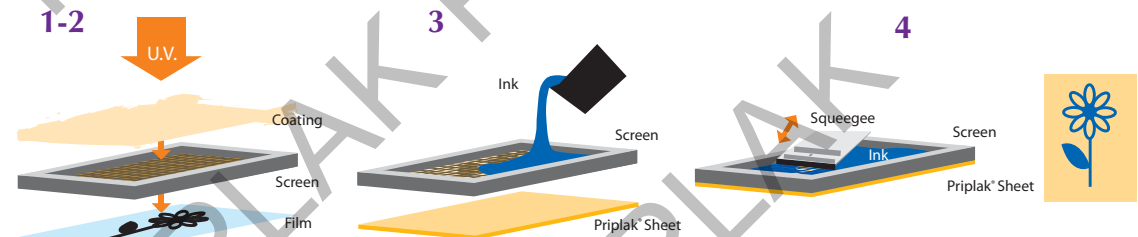
Benefits...

Why use screen with Priplak ?

- Screen deposits a heavy ink film onto substrates - great for large solid colours and for adding a shiny varnish.
- Can be used for small or large size prints without changing the screen.
- Cost effective for relatively Small runs.

The principle

1. The screen is made from a synthetic mesh, held in a frame.
2. The image is exposed onto the screen and developed using UV ;
3. Ink is poured onto the screen mesh.
4. A squeegee spreads the ink over the screen, and the ink can pass through the mesh, only in the image area. The thickness of ink is determined by the mesh used.



Advice

The frame, made from Wood or metal, is largely responsible for the quality of screenprinting. It must not deform or lose tension in the mesh. Consistent tension in the frame is necessary for giving an even ink coverage and ensuring the image isn't distorted.

Screen inks for Priplak®

There are a wide range of inks available for screenprinting onto Priplak®. Their main difference is the way they are cured : oxidation, hot air or UV, and This choice may, to a large extent, depend upon the final application :

- table set
- lamps
- POS, signs...

Whichever drying method is chosen, the inks must be suitable for Priplak®- polypropylene, which has a closed structure and is not made up of fibers like paper and board.

PRINTING

••• Fully oxidizing inks

Mono component inks

Aspect matt or gloss.

Low resistance to fat or grease (eg. from fingers).

Generally not advisable for products that are handled.

To avoid problems with the substrate stretching and registration, a longer drying time without intense heating is preferred.

Advantages :

- Quick use - no mixing required.
- May be suitable for material where the corona treatment is reduced.
- Relatively cheap.

Limitations :

- Only moderate resistance.
- Material must have been corona treated - even if the dyne level is now low (32-38 dynes).
- Only average performance for covering dark substrates.
- Care needed with multi colour printing, especially with the drying.

••• Bi composite inks

Generally epoxy ink.

A catalyst is mixed with the base resin, which produces an exothermic reaction which begins to harden the resin.

The ink manufacturers will advise on the ratio and quantity - because the mix will only be useable for a limited period of time.

Advantages :

- High gloss and very durable.
- Good water resistance
- Highly resistant to chemicals - such as detergents, alcohol, oil and solvents.

Also a good resistant to grease and fats - which makes them ideal for use with table mats Etc.

Limitations :

- Require a higher surface energy than mono composite inks. Discuss with ink supplier 38-42 dynes). Takes up to 48 hours for the ink to be completely cured.
- Once mixed, the ink's useful life is limited.
- Has to be correctly mixed before use.

••• UV inks

Priplak guarantee inks for UV drying for three months from manufacture. In UV inks a catalyst is included in the ink which reacts to the UV lamps and begins to cure the ink.

UV inks allow a thinner film of ink to be deposited - which is ideal for 4 colour process printing.

It is also important to ensure that the power output of the UV lamps is adapted for different speeds. As the lamps age, their output reduces - This will have a greater impact on products like Priplak, than on paper and board where there is also some absorption.

Newer UV systems have much cooler lamps, which reduce the effect of heat expansion of thermoplastic substrates.

Advantages :

- Good speed of printing,
- Immediate drying,
- Less bulky equipment,
- Good resistance to water and chemicals
- Good colour reproduction and the ability to add a high gloss varnish,
- Easy ink handling.

••• Info plus

Screenprinting allows many original and Creative options, such as using glitter, flock, relief printing, and soft touch...

PRINTING

••• Screen Print drying

Method	Description	Advantages	Limitations
Air drying on racks	• Simple system	• Hand operated • Easy	• Requires a lot of space and handling especially for a long run.
I.R. Drying tunnel	• Infra red drying system & conveyor belt	• Short drying time & stacking.	• Bulky equipment
Air drying on racks		• Can also start the exothermic reaction in 2 part inks.	• The hot air Can deform Priplak®
Tunnel & rack drying	• Drying tunnel incorporating a lattice of metal racks which helps evaporate the solvents from the ink.	• Short drying time (20-30 minutes for bi-component inks). • Very efficient • Little expansion of the substrate.	• Large & expensive equipment.
UV lamps	• Inks polymerize under UV lamps.	• Instant drying	• Expensive initial investment.

••• Mastering screenprinting

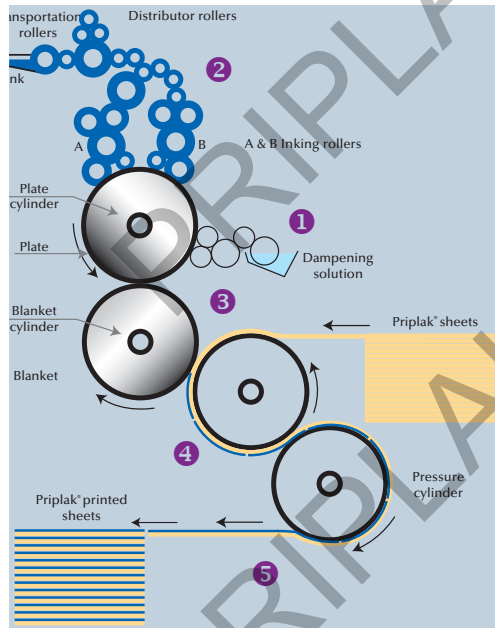
Problems	Causes
• Uneven flatness	Squeegee problem Irregular base
• Lack of resistance to fingerprints	Incorrect ink choice
• Ghost image	• Showthrough of previous work - due to poor cleaning of swollen fibers in the mesh.
• Poor scratch resistance	• Incorrect drying conditions or ink not specified for PP.
• Set off	• Insufficient drying time
• Blocking	• Humidity between the sheets

PRINTING

2

OFFSET

The offset process allows the printing of 1-4 or more colours in large quantities. Offset printing with UV drying is widely used with synthetic substrates.



••• A fast and flexible process

Modern technology allows short set up times for minimum quantities (3-4000 sheets) or less with large format offset. It is also suited for much longer runs.

1. The fount solution is applied via a series of rollers onto the cylinder carrying the plate.
2. Another series of rollers feed the ink, also onto the cylinder with the plate.
3. The hydrophobic parts of the plate attract the ink and the hydrophilic area repels the ink.
4. The inked image is transferred to the blanket.
5. The sheets are fed automatically into the press. Each unit of the press lays down a single colour, and the overall result is apparent only after all the colours have been printed. (4 colour process).
Extra units are possible for adding specific pantone colours and whites and varnishes. Some machines even have flexo coating units for all over whites and special effect varnishes (eg. metallics).

••• Technical info

Offset printing is based on the principal that oils and water don't mix. The printing plates carry a developed image. The non image area attracts water, and the image area is hydrophobic. The ink (image) is transferred onto a blanket which in turn reproduces the image onto the substrate. (Plastic paper or board).

••• Highly accurate with excellent quality

The quality depends on the correct balance between water (hardness/pH) and ink (viscosity, tack surface tension). But also several criteria :

- **The plate and it's photosensitive coating** : smoothness, type and surface tension.
- **The blanket** : it's hardness, surface tension and smoothness.
- **The substrate** : it's wetability, surface smoothness and level of corona treatment.

PRINTING

••• UV offset : ideal for synthetic substrates

On Priplak®, a closed and non porous substrate, none of the ink is absorbed, it simply sits on the surface.

To overcome these limitations press and ink manufacturers have developed UV drying systems. Special inks are required for printing on substrates such as Priplak®.

Offset UV printing is extremely practical. It respects the environment - due to lack of solvents, and drying is immediate, enabling handling and further processing as soon as possible.

••• Offset with fully oxidizing inks

Although this process is not guaranteed for use with Priplak®, there are a number of printers with specially adapted systems, modern ultra fast drying inks and dedicated procedures for stacking and drying who successfully convert Priplak® in this way. (Please note Priplak will not entertain claims relating to ink Key or other technical issues resulting from non UV offset).



••• Dry offset

Please see the chapter on "other Print techniques" page 8.

••• Waterless offset

This technique doesn't use a fountain solution - but instead relies on a siliconised plate to keep the water and ink separate. (Originally patented by Toray).

The ink, plates and blankets are specialised.

The system Can deliver improvements in :

- consistency of colour
- colour density
- very fine screen
- less waste in running up to the correct colour.

At the same time, the ink and rollers need to be chilled within specific limits to ensure good result. (Specific formulations of Priplak® may be necessary for waterless printing - contact our sales department)

PRINTING

3

UV INK JET

Small and medium runs, short lead times and personalisation are all benefits of UV ink jet printing on Priplak®.

UV ink jet is also ideally suited to large format posters and displays.



••• The technique

UV inkjet printers produce small droplets of ink and then spray them onto the substrate in a tightly controlled fashion. There is no contact with the substrate. The closer the print head array is to the material, the better the image definition. Speeds and quality are improving all the time. At FESPA in 2010, 1000 m² per hour with 720 dpi was available on several machines.

Priplak® is ideally suited to UV ink jet printing. It is available in specific grades for POS, including Priplak® Backlit, Priplak® Izilyss Opaque and Priplak® Absolut. It is available in large sizes - up to 2600mm in length, also introducing Priplak® Digital in summer 2012.

This technique is developing extremely rapidly, and the quantities which are economically viable are increasing all the time. The cost of ink has been reducing as more and more companies invest in this technology.

Care is needed when using any thermoplastic, including Priplak® - especially where the material is thin and the UV lamps on full power. (The heat generated can distort the substrate - especially, (but not limited to) 400 micron and below). LED cool lamp technology will reduce this effect.



PRINTING

4

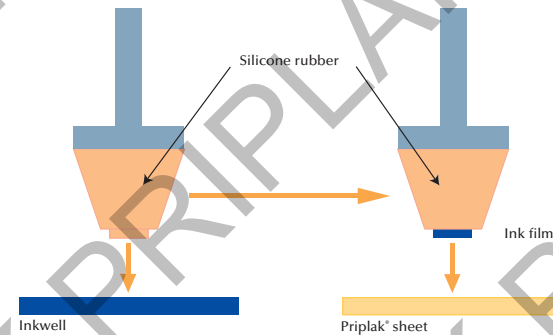
OTHER PRINTING TECHNIQUES



••• Tampography

This technique uses an image on rubber for printing small images and is suitable for large volumes whatever the Shape.

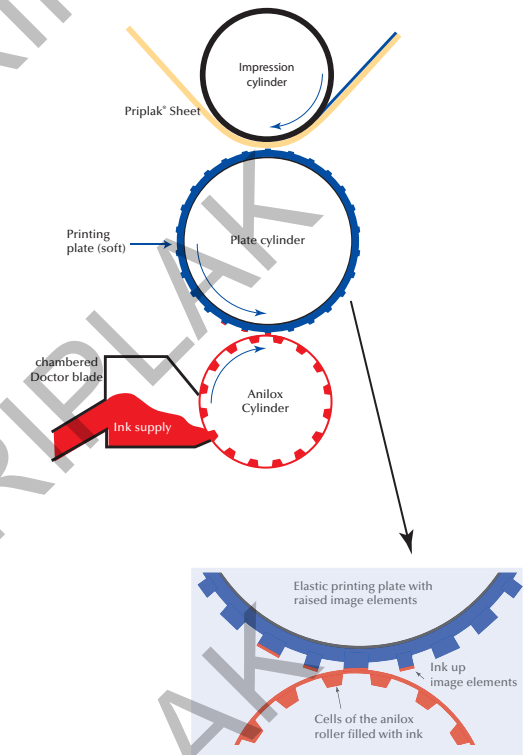
The ink used are the same as for screenprinting but with a special additive. The flexible rubber is inked before moving sideways to print the Priplak® sheet.



••• Flexo & tipographic

Flexo is based on a relief printing principal. Ink is deposited on a raised and flexible pate on a cylinder.

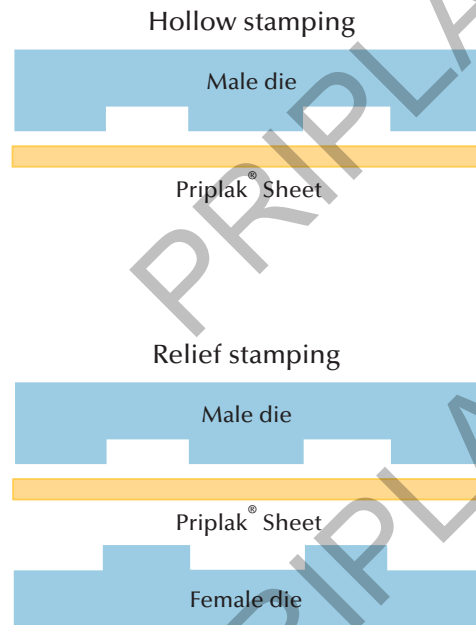
Typographic printing is also called "dry offset". It uses a relief plate - but no water.



PRINTING

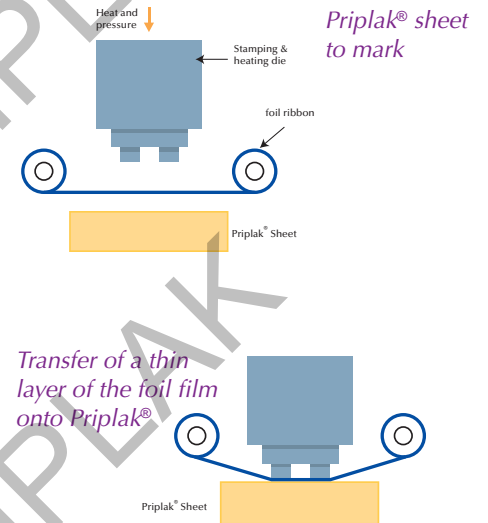
••• Embossing

This technique allows a motif or Crest in relief to be added to Priplak®. We would advise using only with material above 500 microns. The Priplak® maybe pre-printed. Embossing melts the material and enables a range of glossy Effects depending on the type of design and typeface used.



••• Hot foil stamping

Also called foil blocking this process gives a metallic look to the image. There are a range of films especially formulated for polypropylene which are suitable for use with Priplak®. This "top of the range" method of printing is often used in the luxury world of perfumes, cosmetics, confectionary, and high quality garments as well as in Publishing for brochure covers. Gold, silver, white and black are all popular choices, but many other colours and special effect films are also widely available



••• Info plus

With Priplak® Coteline & Priplak® Lines...

Extra pressure will be needed to crush the pre-existing emboss. Tools in magnesium wear out quickly and those in brass or steel alloy are preferable.

Due to large variety of foil stamping film we advice you to contact foil stamping film suppliers for more info an adopted process.

PRINTING

5

INKS

••• **To each application, an ink...**

The final application, as well as the type of printing equipment, will help determine the ink selected.

Liquid inks :

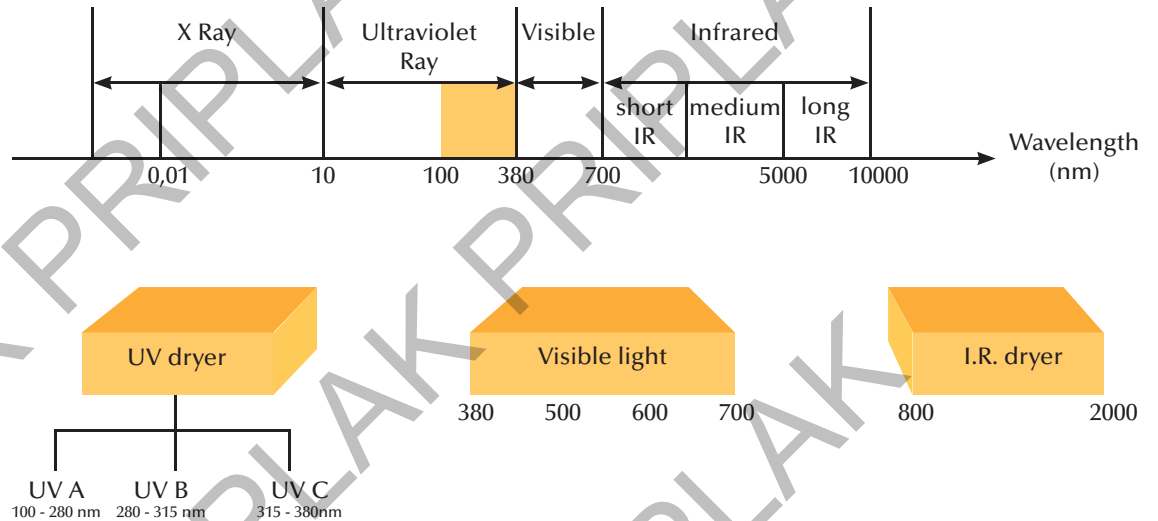
Used amongst other things for screenprinting their viscosity resembles water. After printing on Priplak® drying is started by infra red radiation or by hot air and speeded up by the evaporation of solvents. The proportion of solvent in the mixture is important and may be around 10 % by dry weight.

Oil based inks :

Used in conventional offset printing - these inks are dried by an input of energy, either infra red or hot air. These inks based on mineral oils and resins and need a long time to dry - partly based on chemical drying - improved by driers (organic salts which act as a catalyst to the oxidative process).

UV inks :

UV inks have been around since the 70's and are dried when exposed to UV light. The process relies on reticulation rather than oxidation or evaporation of a solvent. Their composition is changed under UV light and the ink polymerises, leaving only the pigment unaffected. Visible light is characterised by longer wavelengths.



UV inks are considered clean (non solvent) and appear to have good potential for further development.

PRINTING

Their advantages are not only that they dry instantly, increasing productivity, but also the possibility of high gloss varnishes, and the absence of VOC's (volatile organic compounds). On the other hand, the ozone produced by the lamps must be removed and skin contact with the inks should be avoided. Burning material within the drying section is also something to note. The market for UV inks is divided... 100 % UV inks, 100 % UV inks but water soluble and water based UV inks.

What are the differences ?

A 100 % UV		B 100 % UV water soluble		C 50 % UV 50 % water based		Inks	A - 100 % UV	B - 100 % UV Water soluble	C - 50 % UV 50 % water base
Pigments	15 - 20 %	Pigments		Pigments		Advantages	<ul style="list-style-type: none"> • Wide choice of base materials for their formulation • Most problems of ink key caused by reticulation can be overcome • No evaporation • Excellent stability for screenprinting 	<ul style="list-style-type: none"> • Dilution in water • Cleaning in water 	<ul style="list-style-type: none"> • Dilution in water • Cleaning in water • Less odour • Lower irisation
Additives	1 - 8 %	Additives		Additives		Limits	<ul style="list-style-type: none"> • Strong odour • Odour associated with the ink after reticulation • Cleaning with solvents 	<ul style="list-style-type: none"> • Limited choice of raw material • Strong odour • Odour associated with the ink after reticulation • Irisation • Difficult to resolve ink key issues. 	<ul style="list-style-type: none"> • Limited choice of raw material • Less stability on the surface • Difficult to resolve ink key issues.
Photo initiators	5 - 12 %	Photo initiators		Photo initiators					
Monomers	5 - 20 %	Monomers		Water					
Oligomers	40 - 50 %	Oligomers		Oligomers					
RADIATION		RADIATION		RADIATION & EVAPORATION					
↓		↓		↓					
100 % solids		100 % solids (dilution function)		50 % solid 50 % evaporation					

Chilled lamps (by air or water) are becoming increasingly widespread.

PRINTING

Inks content

Oil based inks <i>Offset/Tipographic</i>	UV inks <i>Offset/ Tipo/Helio/Flexo/ Screenprinting</i>	Liquid inks <i>Helio/flexo</i>
Inflexible ink films resins Oxidable resins	Monomers (reactive carrier)	Resins
Vegetables oils Mineral oils (non reactive carrier)	Oligomers	Solvents or water
Pigments	Pigments	Pigments
Additives	Additives	Additives
Siccative/stay open inks	Photo initiators	

••• Other ink types...

Hybrid inks

Hybrid inks are a mixture of UV and conventional inks. The proportion and makeup can vary by manufacturer. Hybrids inks contain :

- Acrylic polymers
- Photo initiators
- Esters of fatty acids
- Siccatives
- Pigments

For the best possible drying IR (or hot air) is also used alongside UV; The UV element allows quicker drying and enables handling of the prints before cross linking.

Vegetable based inks

For food packaging This offers a better solution compared with conventional offset inks containing mineral oils replaced by oils originating from plants such as linseed, which are siccative (fully drying) or soya and sunflower - semi siccative.

The problem with vegetable based inks is their odour - which is bad, despite not being toxic. Their drying time can also be a disadvantage.

••• The best inks for Priplak®

UV cured inks

UV inks are the best adapted for printing onto PP due to it's non porous nature. There are a number of printers who specialize in printing plastics with all their idiosyncrasies.

PRINTING

Typically up to 800 microns. Can be used in conjunction with a primer to improve the ink Key. Usually finished with a UV varnish to protect the printed image from scratches.

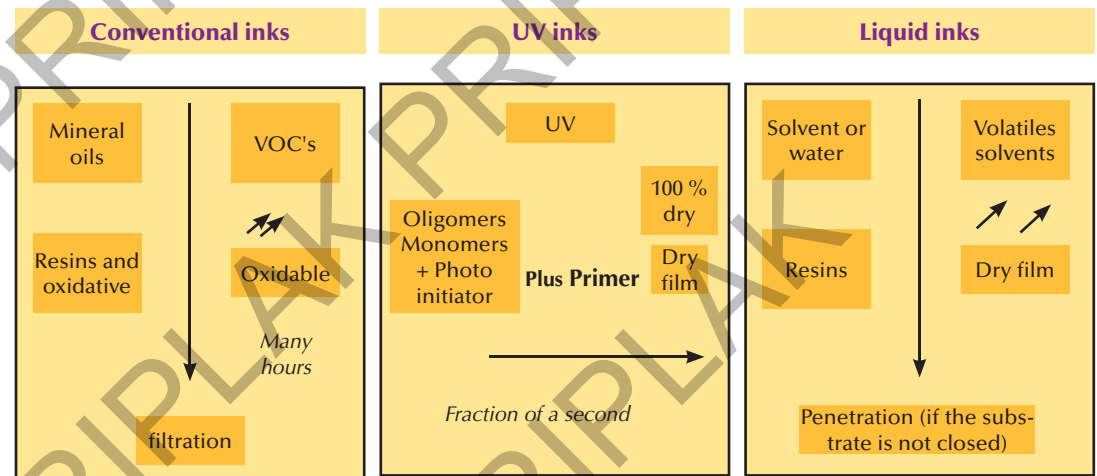
The key points :

- Speed... 2000-6000 sheets per hour
- Quality... Best possible 4 colour process results
- Cost... Most economical for large runs

Inks which dry by oxidation

Due to their constitution, these inks will start to dry in the print room and if the press is stopped for any length time. The result is a skin which can give a blurred impression. Stacks of finished prints must also be kept to a minimum to avoid set-off.

... **Other ink types...**



Drying with conventional inks

3 ways these inks dry :

- Absorption by the substrate
- Evaporation of the solvents
- Oxidation of the resins

Takes some time for the surface to be dry, and several hours of even days before the ink is completely dry. This obviously restricts any attempt at handling the prints during this period.

UV inks and varnish

In UV inks, the carrier is not evaporated or absorbed, but actually participates directly in the polymerization reaction. This means that 100 % of the surface deposit is dry and is why UV are the best inks for PP.

Liquid inks - drying

Drying is mainly by evaporation of the solvents. As Priplak® has a closed surface there is no help in drying from absorption.

PRINTING

6

KEY POINTS

The corona treatment increases the surface energy level, which helps ink key.

The surface energy (dyne) level can be estimated with testing kits. We prefer the liquids - using separate wipe for each test and never putting a wipe that has been in contact with the material surface back in the testing liquid. Most kits have a maximum 6 months shelf life and should be routinely replaced.

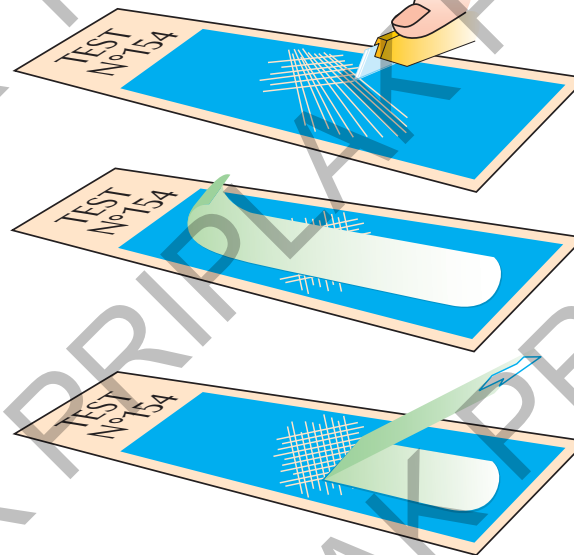
Humidity and time both reduce the effectiveness of the corona treatment - so it is important to keep material well wrapped and print within the advised timeframe.

Priming can help with ink key - especially with outdoor applications such as horticultural labels.

A varnish / sealer is useful to protect the printed image, but it is very important to ensure that is compatible with the ink set.

Polypropylene is a thermoplastic and will expand with heat. When printing both sides of a sheet, we recommend leaving the material to cool for at least a day between passes.

Ink key can be tested with different standards. It is best to wait 24 hours after printing to allow for "post cure". The tests are made with scotch tape with or without scoring.



Primer

- used to improve ink key
- especially important when used outside (plant tags)

Writeable undercoat

- an ink, white or transparent, which allows Priplak® to be written on with ordinary pens, pencils, etc...
- used for archive boxes, menus, labels, calendars.

Varnish

- applied After printing to protect the image from scratching.
- can be matt or gloss or even used in conjunction with special metallic and other effects.

As always it is important that inks, primers and varnishes are compatible when used together, and suitable for polypropylene.

Nb : Contents offered in good faith, no guarantee written or implied. Information may change and Priplak are not responsible for any loss caused by incorrect information contained in this guide or website.