



### Folex Reprojet P, a high resolution Ink Jet Repro film for pre-press applications

**Reprojet P** Reprojet P is a coated, clear transparent film to produce repro film colour separations and then expose in conjunction with screen printing stencils, flexo plates and other UV-curing systems. The film meets the highest demands in colour reproduction, density, dimensional stability and flatness.

The technical properties are state of the art and guarantee optimal and consistent handling. The film can be printed with water based dye and pigment inks. The dedicated nanoporous Ink Jet coating accepts a very high ink load, dries quickly and produces excellent line/edge sharpness with intensive ink coverage (UV-density).

An additional reverse side coating guarantees slip free printer feeding, important with large format rolls. Additionally this coating feature allows a faster vacuum in the exposure frame.

The coated Polyester film with a thickness of 0,160 mm offers high mechanical stability and excellent copy properties.



### Repro film production with Ink Jet printing technology

Film less printing technology today is not yet fully integrated into all printing applications. Although computer to plate (offset) and computer to screen are state of the art they are often linked with relatively high investment costs which can financially impact small and medium sized companies.

With the switch to computer to plate film, traditional exposure units are becoming less and less popular and the choice of models continues to decline. Therefore smaller businesses have to search for new alternatives. The solution to produce Repro films with Ink Jet is an interesting alternative.

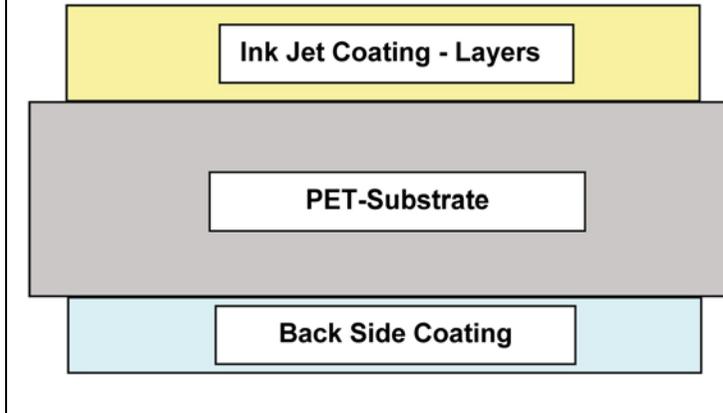
To generate film originals digitally by Ink Jet opens up many interesting new possibilities in the pre-press workflow. Such as in house film production, daylight handling, chemical free processing, layout control and the flexibility to make corrections right up to the last minute are just a few highlights of this capable film system. In combination with a suitable printer, RIP-software and optimised film it is possible to generate high quality line and colour separation films quickly and efficiently. In practice 48 lpc screenprint rasters and offset printing with 60 lpc raster is today already being achieved. The maximum possible printable raster size is mainly dependant on the type of printer used.

### Film print side

Ink Jet Coating (nanoporous)

- fast ink absorption
- fast drying
- high ink coverage
- optical transparency
- resistance to humidity
- mechanical stability
- good contact and gliding properties
- dimensionally stable

### Film construction



### Film reverse side

Anti-Curl Coating

- good gliding properties
- mechanical stability
- optical transparency

**Reprojet P** is a clear transparent, double side coated polyester film. The base film used is of outstanding quality and best suited for reprographic applications. The substrate thickness of 0.125 mm offers high material stability and is easy to handle, especially for bigger cut sheets and formats. The functional coating (printing side) is designed for high ink-absorption and fast drying. The slightly milky nano-porous coating improves the mechanical properties to guarantee optimal film handling. The reverse side coating stabilises the film mechanically if climatic conditions change (anti-curl coating).



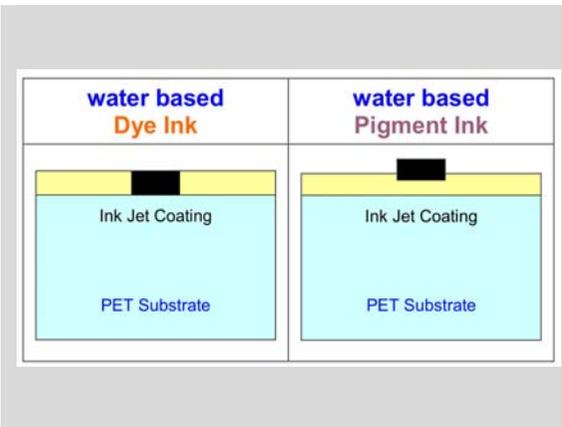
### Printing equipment

To achieve a high ink coverage (UV-density) specific printers (plotters) are required which enable you to print in high resolution and high drop volumes (dot size). A high copy density is achieved only if black is printed with black ink (K) only – therefore not using a processed black.

Unfortunately the necessary driver settings can normally not be chosen in the standard printer driver. Therefore special RIP software is required. Depending on the RIP it is also possible to modify the print layout, produce halftones and create colour separations.

**Small desk top printers** (A4, A3) are controlled often by a printer driver and **are not recommended** as they often do not produce the required print results or ink density.

**Recommended printers:** Epson Stylus Pro Series, H.P. Z-Series, Canon iPF-Series. Other printers in combination with a suitable RIP may produce acceptable print results.



## Ink Jet Inks

**Reprojet P** is designed to accept only water based inks. Dye or pigment inks can be used. The ink type used is normally dictated by the printer. The use of "third party inks" may result in printer defects. Prints with pigmented inks will guarantee longer term light resistance with better water and smudge resistance.

Depending on the ink deposit the images show a more or less a matt black surface.

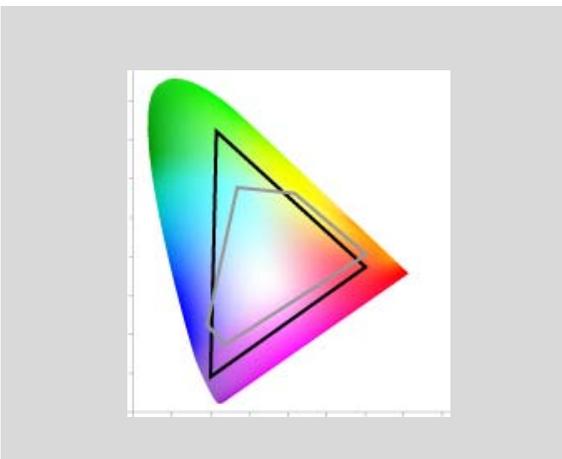
The pigments adhere mainly to the top of the Ink Jet coating. Therefore parts of the image can be vulnerable to scratching if not handled with care. In printers that run with either Matt or Photo-Black inks, we recommend to print with Photo-black ink as this will result in higher density and a better scratch resistance.

Dye based inks penetrate more into the Ink Jet coating therefore the images are relatively resistant to any mechanical influence. The black ink images have a transparent glossy appearance. Prints with dye inks do not have a long shelf life. Strong UV-light may destroy the dyes causing image shifting and fading. High humidity and water drops etc. can also have a negative effect on the image.

Repro films printed with dye inks can show colour shifting. The dye stuff can migrate into the image free (clear) areas. This effect is shown with yellow edges (bleaching) directly next to printed areas. This effect can increase in high humidity environments and where a film is not sufficiently dried.

Nanoporous coatings absorb the water content from the printer ink directly into the coating therefore the surface may be touch dry but the ink within the coating is still wet. With higher humidity environments this can mean a longer period before the ink is completely dry. This effect can move the moisture content in the non-image (transparent) areas. In areas of high ink coverage, different light refractions (humidity and pigments) may occur and may be visible as white "ghost lines". Both the cosmetic above-mentioned yellow shift, like the white "ghost effect" has mostly no negative influence in the further processing of the film (Screen / Polymer exposure).

**Actual recommended inks:** original OEM inks from the previous mentioned printers.



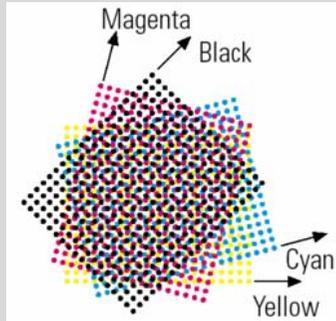
## RIP-Software

For critical raster and colour separations we recommend to use a specific RIP software such as Colorgate-Filmgate, Wasatch SoftRip, Perfectproof, Ergosoft Posterprint or similar in combination with the recommended printers. These special tools ensure that the accurate printing criteria can be met along with offering a choice of various options to achieve the optimal print targets, regarding:

- Ink load
- Ink drying
- Density
- Half tone raster
- Colour separations

Depending on the workflow, colour separations can be done in the layout programme (e.g. Indesign) or directly in the RIP during printing.

To select the print settings (parameters) two guidelines need to be considered:



### Parameter for print relevant guidelines (screen print)

The special RIP's for screen separations offer for each application an optimal choice of parameters. Depending on the software supplier a variety of pre-adjusted printer settings are included in the software. The individual configuration of the respective print settings can be quickly and easily selected for the selected print job. For this the following details have to be considered:

• <b>Raster widths</b>	Lines per inch / centimetres (lpi, lcm)
• <b>Type of raster</b>	PS-, AM-, FM- Raster etc.
• <b>Dot shape</b>	dot (round), ellipse etc.
• <b>Raster angle</b>	possible standard C:82.5°, M: 52.5°, Y:7.5°, K 22.5°
• <b>Special colours</b>	Pantone etc. / Standards

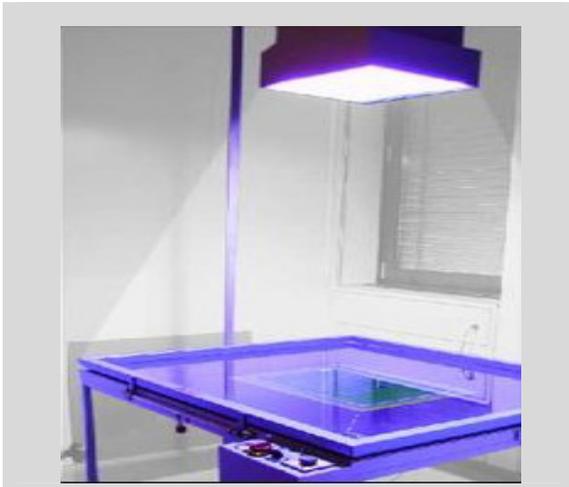


### Parameters for the printer settings (Ink Jet printer)

As well as the application related instructions already mentioned a number of other settings are necessary to manage the printer. If the parameters are correctly selected a film print out with excellent line, dot quality and high UV-density is guaranteed.

The range of settings available is usually dependant on the printer and driver. The following parameters are normally available:

• <b>Print resolution</b>	Dots per Inch (dpi)
• <b>Droplet size</b>	Picoliter (pl = one billionth of a litre ) or droplet size (i.e. small, medium, large)
• <b>Dot variation</b>	Fixed Dot, Variable Dot
• <b>Passes</b>	1 pass, 2 pass, 4 pass etc. (Print head cycles per print pass)
• <b>Print Cycles</b>	Uni-directional, Bi-directional
• <b>Colour Output:</b>	Monochrome (black) / colour print
• <b>Ink Load %</b>	Correct Ink-Limit, Ink-Load (Dependant on RIP specific settings)
• <b>Color Management</b>	Calibration, Profiles, Rendering Intents



### Exposure

To expose light curing printing forms (screen print stencils, offset plates, flexo plates etc.) film originals with high density image areas are required. For many years silver halide films have been the primary choice. The performance of the required blackness (density) is measured by the spectral absorption properties of the film. The spectral sensitivity range of the printing form has to be considered. (Screenprint emulsions i.e. are sensitive in the UV-Range).

Instead of a continuous absorption spectrum the density can also be measured with a **densitometer**. This means a quantitative measurement of the colour density. For transparent films special transmissive densitometers are used.

Depending on the densitometers, specific spectral areas (i.e. CMYK colours) can be measured, for example visible contrast or specific colour areas. For UV-sensitive coatings densitometer measurements in the UV-range  $\lambda$  350-400 nm are recommended. Density measurements done with the incorrectly selected filter area can lead to errors.

### Principle of Film Transparency / Density

Light source (copy lamp): irradiated light	↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
Film material: defined black / transparency	<b>Transmission 10 %</b>	<b>Transmission 1 %</b>	<b>Transmission 0.1 %</b>	<b>Transmission 0.01 %</b>
Radiated (passed) light	↓ ↓ ↓ ↓ ↓	↓ ↓ ↓	↓ ↓	↓
Resulting Density Values D	Density: 1.0	Density: 2.0	Density: 3.0	Density: 4.0

$$D = \lg \frac{1}{T}$$

### Measuring Density

Density values are logarithmic values and are calculated in accordance with the adjacent formula. For transparent substrates, the transmission value (T) is calculated, for non-transparent materials, eg printed papers, the reflective value (R) (instead of T) is important.

The above shown graphic illustrates the dependence of increasing density values with increasing film blackness. **Example:** 90% coverage / 10% transmission = Density 1

*Guidelines for this practice:*

For optimum control of repro films, the density value (Dmax) for the imaged (black) areas is measured as well as the density value in the transparent, non-imaged areas (Dmin).

For a Screen Copy, i.e. a density value of **Dmax:** 3 or greater is recommended!

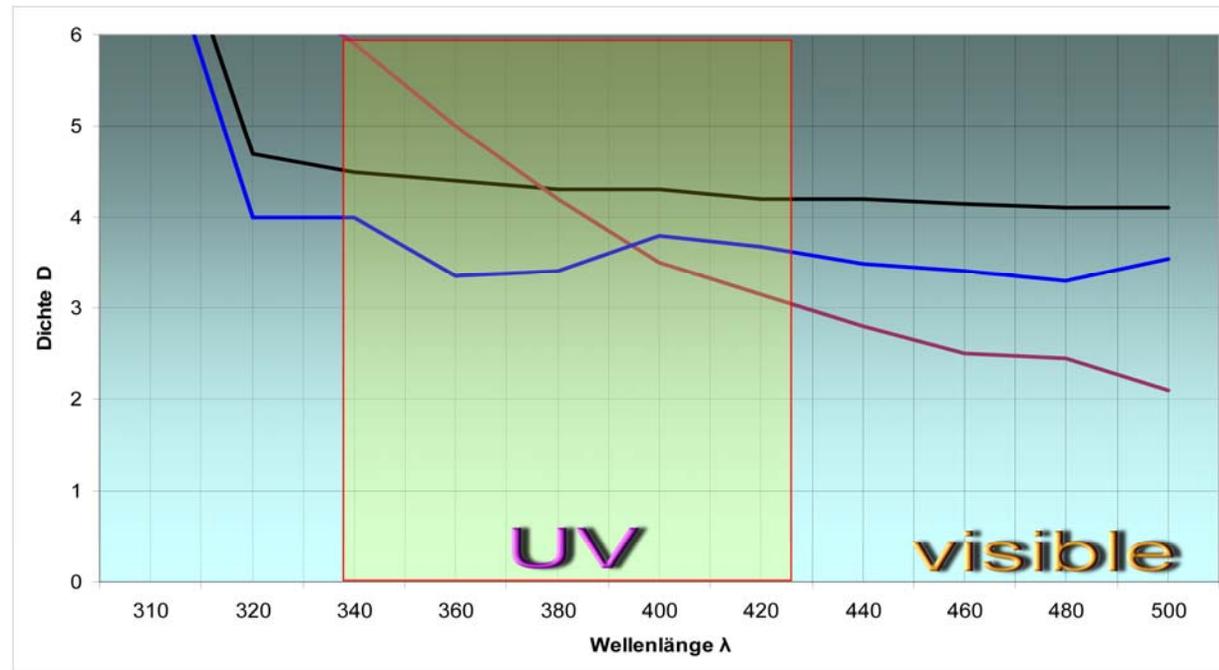
The density value to the image-free, transparent areas is about Dmin: 0.08 to 0.13, depending on film thickness and applied matt top coating.

### Spectral Density (Absorption):

The spectral characteristics of silver halide films are different from Ink Jet printed repro films.

The blackness of a silver halide film shows over a wide spectral range practically a linear absorption. This is because of the “metallic silver mask”. This can be different with films printed by water based black inks. Depending on the pigments or dye stuff a typical absorption curve will be produced. The graphic shows three specific absorption curves of film materials:

- black** Reprographic Silver Film
- blue** Ink Jet Film Black Ink (Dye Ink)
- red** Ink Jet Film Black Ink (Pigment Ink)





Densitometer X-Rite 369 (UV Transmission)

## Densitometer

With the red curve you can clearly see that the density values in the long wave (visible spectral range) are noticeably lower than in the short wave (UV-range). This range (yellow) indicates the spectral sensitivity of copy emulsions

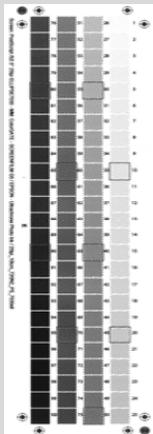
The above explained absorption behaviour indicates, that, if transparent “coloured” films are measured a densitometer which measures a spectrum in the UV-range is necessary.

If a measuring device with visible spectrum is used, the density values are clearly too low!

**Relative comparison:** Dvis 2.4 to Duv 3.8

Unfortunately today there are only a few UV-densitometers available on the market.

One of the most popular devices is the **Diazo/Silver Film Densitometer X-Rite 369**.



COLORGATE: Raster-Target for linearization

## Linearization

With basic settings (not calibrated) Ink Jet printers produce a rather high ink deposit and dot, line width. To acquire an accurate halftone reproduction it is necessary to carry out a so called linearization.

Considering the previously mentioned setting parameters for the Ink Jet print such a linearization should be made for each screen print related raster width. The RIP software available offers a step by step guide which could be as follows:

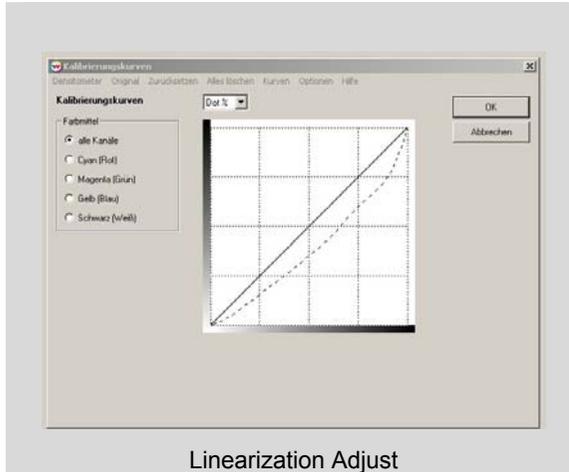
### 1. Choice of the screen print process parameters

- Dot shape
- Dot count
- Raster angles

### 2. Choice of the Ink Jet print parameters

Depending on the printer we suggest to pre-test first with a few prints to find an optimal printer setting which reaches the required minimum blackness (density DUV >3). We recommend the use of a densitometer.

**Note:** an unnecessarily high density results in slower ink drying, higher ink costs, bleeding of ink in dot and line elements (filling in), over saturated and scratch sensitive image areas.



Linearization Adjust

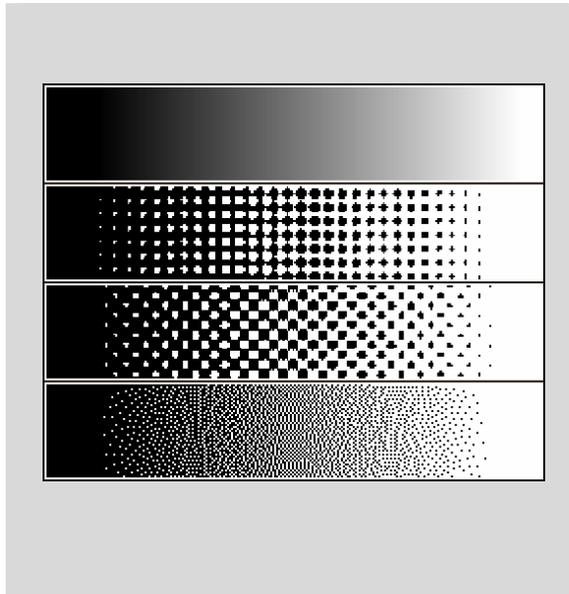
## Balance

How a specific raster target will be printed. These test charts are normally stored in the software. But it is also possible to create targets with other gradations. With the following example the *FOLEX Reprojet linearization target* with 23 measuring fields. has been used to check the tonal value a transmissive densitometer has been used.

### % Tonal Values

Target	0	2	4	6	8	10	15	20	25	30	40	50	60	70	75	80	85	90	92	94	96	98	100
actual	0	6	9	12	15	18	26	32	37	43	55	68	77	86	90	92	95	97	98	98.5	99	99.5	100

The measured tonal values (actual value) on the printed target are then keyed into an input window of the software. After the balance has been executed, the correction is normally shown as a correction curve in a separate window.



## Typical settings (dependant on the RIP small variations can occur)

### Epson Stylus pro 7600 / 9600 Ink: Ultrachrome Photo black

Screen-Print-Parameter			Ink Jet-Print-Parameters				Density Film
Raster Ipi	Raster type	Raster shape	Resolution dpi	Dot-Size	Direction	Ink Reduction %	Duv (X-Rite 369)
50	Post Script	Ellipse 7030	1440x720	Normal Dot MW2	uni-directional	none	3.8

### Epson Stylus pro 7880 / 9880 Ink: Ultrachrome Photo black K3

Screen-Print-Parameter			Ink Jet-Print-Parameters				Density Film
Raster Ipi	Rastertype	Raster shape	Resolution dpi	Dot-Size	Direction	Ink Reduction %	Duv (X-Rite 369)
50	Post Script	Ellipse 7030	1440x1140	Gross	uni-directional	75	3.4



## Handling of film

Ink Jet coatings for water based films exhibit strong hydrophilic behaviour. If the climatic room conditions (humidity, temperature) change, the mechanical stability of the film can be influenced (curl effect, roll tendency).

**Reprojet P** carries a special anti-curl coating on the reverse side, which reduces this curl tendency.

Often the printing of Ink Jet films is made in a warm and dry office environment. In very dry air room conditions (< 40 % relative humidity.) a curl in the direction of the film coating side can occur. In these situations we recommend the temporary use of a humidifier.

*Recommendation:*

- Allow films in unopened packs acclimatise fully over 24 hours in the processing area
- storage and printing of Reprojet P should ideally be made in an controlled air conditioned room at approx. 20 - 25 °C / 40 - 60% relative humidity
- Always monitor room conditions by measuring temperature and humidity
- If necessary correct the room conditions if not optimal (heating, humidifier).
- If air humidity is < 40 % r.h. we recommend the use of a humidifier
- Check the flatness of the film before starting the print job. If the film exhibits curl, run the film a few cm forward in the printer and this will reduce the curl effect near the print heads.



## Dimensional Stability

Dimensional stability for graphic film materials is a constant theme. It is the physical change in dimension (stretching / shrinking) of substrates (eg paper, foil) influenced by moisture and/or heat.

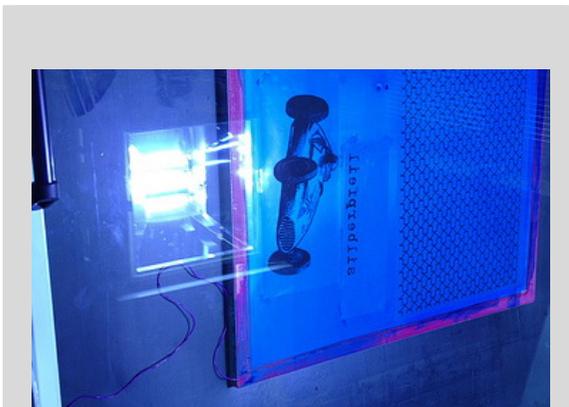
**FOLEX** uses a high quality polyester substrate for its coating of “Reprojet P” and therefore fully meets the high requirements that such reprographic films demand.

*Dimensional differences when printing (Registration):*

Ink Jet printers transport cut sheets and rolls with a motor and meet the necessary requirements for poster and banner prints.

Today such printers are also being used for separation prints in prepress, even the smallest deviations in the range of tenths of a millimetre may result in problems with the accuracy of the film.

Using a special print file on some LF Ink Jet printers, a length calibration test can be run. Here, the transport and slip behaviour of the device can be checked using a precision scale measuring the deviation in the longitudinal, longitudinal and diagonal direction. A correction and calibration of such transport errors may however not always lead to success.

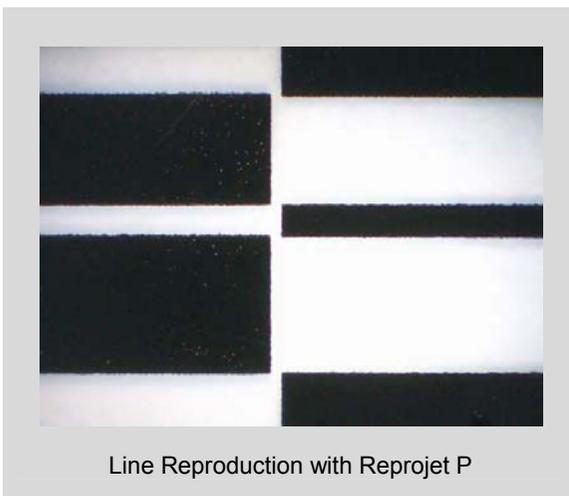


### Mechanical stress

When exposing the screen or flexo stencil some of the emulsion or photopolymer layers may have a tendency to stick to the image areas. The copy is usually done "layer to layer" (film emulsion side to emulsion side). Certain emulsion and polymer layers (eg, flexo) can therefore at this contact point have a tendency to bond to the Ink Jet printed area of the film.

This can often be avoided by powdering the film and emulsion slightly with talcum powder.

Alternatively a thin crystal clear polyester film of approx. 15 - 25 micron can be placed between the film and the emulsion to avoid direct contact. This is only possible, if the line and raster size is a relatively low resolution. (Undercutting of lines and rasters).



Line Reproduction with Reprojet P

### Requirements for the Ink Jet film

- Printable with standard Large Format printers
- Use of waterbased dye and pigment inks
- High ink absorption
- Fast ink drying
- Roll-to-Roll printing (for large format use)
- Good line and dot reproduction
- High density DmaxUV: > 3
- Possible to produce rasters up to about 50 L/cm
- Good processing in the copying frame
- Mechanical resistance
- Very good dimensional stability
- Durability / reusability

### Arguments for the use of Reprojet P

- Production of Repro Films without traditional film setter
- Chemical-free process
- No darkroom
- Good durability of the film material
- No limited shelf life
- Cost effective in-house manufacturing of Repro Films
- Independence in prepress
- Flexible workflow
- Corrections possible shortly before printing
- Archiving of print jobs in digital form
- No archive space required (saves space)
- Use of Ink Jet printer for proofing, posters, etc

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