



Rainbow Ink

Area of Application

Rainbow Ink is a solvent-based metallic ink for creating iridescent rainbow-like color effects on clear transparent PC, PMMA, rigid PVC and pre-treated PET films, when printed on the reverse side of the materials (second surface print). Even by first surface decoration, interesting effects can be achieved.

Color Shade

Rainbow Ink 10/50 (fine pigments)

Printing Preparation

Stir well before each use!

Caution!!

Even minimal residues of silicone oils (components of defoamers and screen inks) will cause fish-eyes and pinholes. Take care to use absolutely clean equipment for preparation of the printing mixtures along with well degreased fabrics for the printing process.

Auxiliaries

Thinner M 209
Stabilizer Mirror Ink

Important

Stabilizer Mirror Ink:

Before printing: Addition of 10 % is needed in order to give basic protection of the metal layer from corrosion. For long term protection it is necessary to overprint the rainbow ink overlapping with a suitable protective ink layer, otherwise the metal layer is attacked by acid or alkaline materials, water, steam and oxidizing substances. Please refer to chapter "Overprinting".



The mixture of Rainbow Ink and Stabilizer Mirror Ink is press-ready. If necessary, a small amount of Thinner M 209 can be added.

Addition of Stabilizer:

The stabilizer has to be mixed homogenously into the rainbow ink using a propeller mixer. Depending on the size of the vessel, about 5 minutes at a speed of 300 rpm are recommended. Stirring should incorporate as little air as possible.

Residues of the mixture must not be filled back into the original can.

Mesh

Due to the pigment particle size of up to 35 µm, meshes from 77 – 120 threads/cm (195 – 305 threads/inch) are suitable.

Rainbow Ink

Squeegee

Squeegees with an average hardness of 65° – 75° Shore A are recommended.

Drying

At 50 – 60 °C (122 – 140 °F) in a jet dryer and then 30 min at 80 °C (175 °F). (Pre-tests are required!)

The rainbow effect level depends on drying conditions as well as on the substrate and its surface quality.

Cleaning

Thinner M 209

Overprinting

For protection against mechanical and chemical damages (like scratches or corrosion) it is recommended to overprint the Rainbow Ink layer.

Overprinting without forming and backmolding:

To protect the printed layer from mechanical damage and to further improve its climatic resistance, the following ink systems can be used for backprinting (depending on the respective substrate):

Substrate	Ink system	Mesh	
		threads/cm	threads/inch
PC, PVC, Polystyrene, PMMA, PET	NoriCure® MPF	120-34 Y	305-34 Y
PC, PVC, Polystyrene, PMMA	Aqua-Jet® KF	120-34 Y	305-34 Y
Glass, PET	NoriGlass TPI	120-34 Y	305-34 Y

Overprinting with subsequent forming or injection molding:

Various ink and lacquer systems are suitable (see section "Preliminary Test Results of Forming and Injection Molding Trials", pages 3 to 5).

Note:

The rainbow effect will be damaged if unsuitable solvent-based inks and thinners are used for overprinting. Pre-tests are necessary!

Even overprinted and thus sealed ink layers are not completely protected against atmospheric influences. Therefore, the user bears responsibility for durability tests (e.g. climate test).

For long term exterior application specific environmental tests are highly recommended.

Shelf Life

The shelf life stated on the label assures the ink's quality and refers to unopened original cans stored in a dry place at temperatures between 5 °C (40 °F) and 25 °C (75 °F).

Optimal shelf life of opened cans can only be achieved if the can is tightly closed immediately after each use.

Important

If Rainbow Ink has been cooled or warmed during transportation or storage, please allow the product to adjust to room temperature to avoid condensation of humidity, which could contaminate the ink. This advice also applies to the auxiliaries to be added to Rainbow Ink.

Printing results, to a large extent, depend on the substrate as well as the printing and application conditions. We recommend checking your printing materials under your conditions of use before performing any production runs. Materials that are supposed to be identical may vary from manufacturer to manufacturer and even from batch to batch. Some substrates may have been treated with or contain sliding agents, antistatics or other additives which may impair the adhesion of the inks.

In general please refer to our technical leaflet "General Information on Screen Printing Inks", which may be downloaded from our website www.proell.de, click Downloads ⇒ Solvent-Based Screen Printing Inks.

Before starting a production run, it is necessary to test samples of each newly designed part systematically with regard to the specifications for the intended use (e.g. climatic chamber, resistance, etc.).

Preliminary Test Results of Forming and Injection Molding Trials

Please refer to tables on pages 4 and 5

Mesh

100-40 Y (100 threads/cm, 255 threads/inch)

Printing Parameters

NoriPET® 093:

printed with 0.5 % Hardener 001

NORIPHAN® N2K 093:

printed with 2 % Hardener 001

Thinning of the tested ink systems and lacquers:

as described in the respective Technical Information Sheets

Forming Parameters

Niebling High Pressure Forming Machine (HPF)

High pressure time: 5 seconds, depressions are not shaped completely perpendicular

Mold / Tool

Cellular phone housing

Injection Molding

ABS: 250/260 °C (480/500 °F)

PC: 280/290 °C (535/555 °F)

Results

The rainbow effect appears only on smooth and transparent films by second surface printing.

First surface prints on paper and smooth substrate are not wipe resistant.

Optimizing the parameters produces good forming results.

To obtain satisfactory resistance in the climatic chamber it is necessary to use water-vapor-tight substrates and a sufficiently thick back-molded layer.

Climatic Chamber – Test Conditions

One cycle consists of

8 hours at 85 °C (185 °F)

then

16 hours at 25 °C (75 °F).

The relative humidity remains constant at 95 %.

This cycle is repeated 5 times.

Preliminary Test Results of Forming and Injection Molding Trials

No.	Substrate	Print	Layers of Rainbow Ink	Backing Lacquer	Layers of Backing Lacquer	Drying	High Pressure Forming	Molding: Peel Values in N/cm	Climatic Chamber (Pröll Standard Testing Program 2)	Ø Wash-out Point
F1	Coated Paper Profisilk 150 g/m ²	first surface print	1 x	n. a.	-	Jet dryer only	n. a.	-		
F2	Self adhesive PVC film	first surface print	1 x	n. a.	-	Jet dryer only	Very poor effect on first surface; no high pressure forming.	-		
F3	Rigid PVC White matt	first surface print	1 x	n. a.	-	Jet dryer only		-		
F4	Rigid PVC White glossy	first surface print	1 x	n. a.	-	Jet dryer only		-		
F5	Polystyrene White	first surface print	1 x	n. a.	-	Jet dryer only		-		
F6	PMMA 99524	second surface print	1 x	Noricryl® 093	1 x	1 h 90 °C	250 °C/23 s/63 bar/70 °C MT 250 °C 23 s/63 bar/70 °C MT	ABS: 0.56	PMMA prevents humidity migration, thus climatic chamber test results ok.	7 mm
F7	PMMA 99524	second surface print	1 x	Noricryl® 093	2 x	1 h 90 °C	250 °C/23 s/54 bar/70 °C MT 250 °C/23 s/54 bar/70 °C MT	ABS: 0.56		7 mm
F8	PMMA 99524	second surface print	1 x	NORIPHAN® HTR N 093	1 x	1 h 90 °C	250 °C/23 s/54 bar/70 °C MT 250 °C/23 s/54 bar/70 °C MT	PC: 0.28		14 mm
F9	PMMA 99524	second surface print	1 x	NORIPHAN® HTR N 093	2 x	1 h 90 °C	250 °C/23 s/54 bar/70 °C MT 250 °C/23 s/52 bar/70 °C MT	PC: 0.25		15 mm
F10	PMMA 99524	second surface print	1 x	Thermo-Jet® 093	1 x	1 h 90 °C	250 °C/23 s/52 bar/70 °C MT 250 °C/23 s/63 bar/70 °C MT			
F11	PMMA 99524	second surface print	1 x	Thermo-Jet® 093	2 x	1 h 90 °C	250 °C/23 s/50 bar/70 °C MT forming ok (both prints)			
F12	Rigid PVC Transparent	second surface print	1 x	Thermo-Jet® 093	1 x	1 h 60 °C	200 °C/23 s/30 bar/60 °C MT forming ok (both prints)			
F13	Rigid PVC Transparent	second surface print	1 x	Thermo-Jet® 093	2 x	1 h 60 °C	100 °C/23 s/30 bar/60 °C MT 150 °C/23 s/30 bar/60 °C MT Temperature too low, film is not formed sufficiently.			

MT = mold temperature

Preliminary Test Results of Forming and Injection Molding Trials

No.	Substrate	Print	Layers of Rainbow Ink	Backing Lacquer	Layers of Backing Lacquer	Drying	High Pressure Forming	Molding: Peel Values in N/cm	Climatic Chamber (Pröll Standard Testing Program 2)	Ø Wash-out Point
F14	Rigid PVC Transparent	second surface print	1 x	Sorte P 093	1 x	1 h 60 °C	200 °C/20 s/34 bar/60 °C MT 200 °C/18 s/34 bar/60 °C MT			
F15	Rigid PVC Transparent	second surface print	1 x	Sorte P 093	2 x	1h 60 °C	200 °C/23 s/34 bar/60 °C MT 200 °C/23 s/40 bar/60 °C MT			
F16	PET EGB 180L	second surface print	1 x	NoriPET® 093	1 x	1 h 60 °C	PET film cannot be formed using the cellular phone housing mold.			
F17	PET EGB 180L	second surface print	1 x	NoriPET® 093	2 x	1 h 60 °C				
F18	Makrofol® DE 1-1	second surface print	1 x	NORIPHAN® HTR N 093	1 x	1 h 90 °C	300 °C/23 s/63 bar/90 °C MT 300 °C/23 s/63 bar/90 °C MT	PC: 0.07	PC does not prevent humidity migration. Rainbow Ink is tarnished, stained, oxidized.	10 mm
F19	Makrofol® DE 1-1	second surface print	1 x	NORIPHAN® HTR N 093	2 x	1 h 90 °C	300 °C/23 s/63 bar/90 °C MT 300 °C/23 s/63 bar/90 °C MT	PC: 0.19		9 mm
F20	Makrofol® DE 1-1	second surface print	1 x	NORIPHAN® N2K 093	1 x	1 h 90 °C	300 °C/23 s/63 bar/90 °C MT 300 °C/23 s/63 bar/90 °C MT	PC: 0.05		13 mm
F21	Makrofol® DE 1-1	second surface print	1 x	NORIPHAN® N2K 093	2 x	1 h 90 °C	300 °C/23 s/63 bar/90 °C MT 300 °C/23 s/63 bar/90 °C MT	PC: 0.07		17 mm
F22	Bayfol® CR 1-4 print on the matt side	second surface print	1 x	NORIPHAN® HTR N 093	1 x	1 h 75 °C	No rainbow effect on the matt side, thus no forming.			
F23		second surface print	1 x	NORIPHAN® HTR N 093	2 x	1 h 75 °C				
F24		second surface print	1 x	NORIPHAN® N2K 093	1 x	1 h 75 °C				
F25		second surface print	1 x	NORIPHAN® N2K 093	2 x	1 h 75 °C				

MT = mold temperature

Rainbow Ink in the IMD Process

The following points have to be taken into consideration, if Rainbow Ink is used in the IMD Process:

Preparation

See page 1

Overprinting / Back Printing of Rainbow Ink

Total coverage of the Rainbow Ink with a protection layer is recommended for the following reasons:

- Improved formability of the Rainbow Ink layer.
- Increased adhesion to the backmolded resin.

Forming and Injection Molding

Rainbow Ink films can be formed only **to a certain extent**.

Under optimized conditions, the overprinted rainbow ink layer can be backmolded with resin.

Low melting point resins with melting points below 290 °C (550 °F) and good heat transfer through the film into the mold are advantageous.

Due to the basic composition of Rainbow Ink, the peel test results of a film/ink/resin sequence (printed with Rainbow Ink) are poor in every case.

Note:

To avoid corrosion and flaking, the overprint should overlap the edges of the Rainbow Ink layer not less than 0.5 mm.

The suitability of Rainbow Ink for a particular project has to be checked individually by extensive pre-tests.

The information contained in the technical information/instruction sheets or other product information sheets is based on product testing conducted by Pröll. Because printing and environmental factors critically affect each individual ink application, the above mentioned information and instructions represent only general recommendations concerning product characteristics and directions for use and should not be construed as representing express warranties regarding the product. The information and instructions in no way release the purchaser from his obligation to verify and test the inks and their application for the specific request, regarding: product characteristics, weather resistance, mixing proportions, gloss, thinning, special mixtures, printability, drying speed, cleaning, effects on or of other materials to be contacted and safety precautions. All details contained in the instruction sheet "General Information on Screen Printing Inks" are to be considered. The further manufacture and use of products containing our inks by the purchaser takes place beyond our control, and the responsibility for further application and use of our product resides solely with the purchaser. Pröll disclaims any warranties, express or implied.

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