



NORIPHAN® N2K

Ink System for Second Surface IMD/FIM Technology
(back molding of screen printed films)

Area of Application

NORIPHAN® N2K is a solvent-based two-component screen printing ink for IMD/FIM technology.

NORIPHAN® N2K is optimized for the needs of processing thin films (e.g. 50 µm). Printed films decorated with NORIPHAN® N2K show no curling effect. NORIPHAN® N2K can also be used for metallized films in the masking/chemical etching process in IMD/FIM technology.

Characteristics

Films printed with NORIPHAN® N2K are perfectly suited to the IMD/FIM process (In-Mold-Decoration/Film Insert Molding):

- **formability e.g. high pressure forming or thermoforming**
- **temperature and washout resistance during injection molding**
- **good and durable bonding with injection molding resins, preferably PC, PC/ABS and silicon rubber resin**

Equipment for Printing on Films within IMD/FIM Technology

- **Tunnel dryer, with final active cooling**
 - **3 heating sections with 80 °C (175 °F) minimum and high air exchange rate**
 - **active cooling adjustable to 15 °C (60 °F)**
- **Box oven adjustable up to 90 °C (195 °F)**
- **Racks for single placing of printed sheets**

Different supplier of IMD/FIM parts utilize different equipment for production which requires individual adjustments of process parameters. For this reason production parameters of the same IMD/FIM parts at different supplier can be very different for best results from each origin.

Films

PC film: Makrofol®¹
PC blend film: Bayfol®¹
PET film: Autoflex®² EBG

Finish

Glossy

The gloss level is influenced by the structure of the substrate.

Pigmentation

NORIPHAN® N2K inks are based on high brilliance pigments.
Nearly all color shades can be mixed using basic colors.

¹ Makrofol® and Bayfol® are registered trade marks used by Covestro AG, Germany

² Autoflex® is a registered trade name used by MacDermid Autotype Ltd., UK

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Color Shades

Halogen Free	108 Citron HF	455 Violet HF
Basic Colors	112 Yellow HF	566 Blue Transparent HF
<i>HF = halogen free</i>	225 Orange HF	570 Deep Blue HF
	318 Red Transparent HF	665 Green HF
	321 Bright Red HF	945 White HF
	372 Bright Red Transparent HF	952 Black HF
	412 Pink Transparent HF	093 Colorless HF
Basic Colors	109 Citron	320 Bright Red
	171 Yellow Transparent	472 Violet
	213 Orange (not available in the USA)	669 Green Transparent
	307 Red	812 Brown
Halogen Free	770 Silver HF	944 White Opaque HF
Special Colors	780 Silver Coarse HF	953 Deep Black HF
		954 Black Opaque HF

Silver inks may be used to mix gold and other metallic colors.

Effect Pigment Colors

Further metallic, color-flop, pearl effect, fluorescent and other colors are available on request.

Caution:

The peel strength (bonding) of the silver and effect inks is lower than that of the basic colors. Back molding the special effect colors may alter the orientation of the pigment particles.

Mesh Count

Polyester mesh 77-48 threads/cm to 150-31 threads/cm (195-48 threads/inch to 380-31 threads/inch). A stainless steel mesh may be used for special requirements.

The following mesh counts are recommended for standard silver:

NORIPHAN® N2K 770 – 120-34 threads/cm (305-34 threads/inch) or coarser

NORIPHAN® N2K 780 – 77-48 threads/cm (195-48 threads/inch) or coarser

Stencil

Solvent resistant emulsions must be used. Excellent results during long production runs are achieved by using Pröll Diazo-UV-Polymer Emulsion Norikop 10 HQ.

Auxiliaries

All of the following mentioned auxiliaries are free of halogens (HF).

Hardener

Hardener 001 has to be mixed to the ink thoroughly prior to printing.

Addition 3 – 4 %

Mixtures of NORIPHAN® N2K ink and Hardener 001 have a pot life of 8 – 12 hours in closed cans depending to temperature and humidity.

Thinner

Thinner F 005 (fast)
Thinner M 206 (medium)
Thinner M 214 (slow)

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Retarder Paste

NORIPHAN® N2K 097/002 (medium)

NORIPHAN® N2K 097/007 high viscosity (slow)

Auxiliaries may be mixed with each other thinner: 15 – 20 %.

To print fine details, Thinner M 214 can be used alone or in combination with Retarder Paste NORIPHAN® N2K 097/002 respectively NORIPHAN® N2K 097/007. The following proportions are recommended:

10 – 20 % NORIPHAN® N2K Retarder Paste

5 – 10 % Thinner

Matting Agent

NORIPHAN® N2K Matt Paste 098

Addition: approx. 20 %

Antistatic Additive

Norilin® C to prevent static charging, especially when printing metallic inks.

Addition: 0.5 %

Defoamer

Defoamer 5702 to prevent any possible flaws in color gradient (craters, bubbles). Adding too much Defoamer 5702 causes white spots.

Addition: max. 0.5 %

Cleaning of Screens and Utensils

UNI-REIN A III

Drying

NORIPHAN® N2K is a physically curing ink system which dries through evaporation of the solvent in a tunnel dryer. The chemical curing process of the printed films continues in stack with no additional supply of air.

Note:

To protect PC films from extensive solvent attack, tunnel dryers should be used also for small trial runs. Rack drying is not recommended (cracking!).

Tips on Drying

Drying performance can be improved by:

- drying at higher temperatures
- use of infrared rays
- completely exhaust evaporated solvents lingering in the tunnel dryer – good air exchange.

The following settings are recommended for use with 3 zone dryers:

- First Zone: 80 °C (175 °F).
- Second Zone:
In the second zone, the maximum temperature for processing heat sensitive Bayfol® films is 80 °C (175 °F).
The maximum drying temperature for processing pure PC films (Makrofol®) is 100 °C (210 °F). If additional infrared emitters have been installed in the second compartment, they may be used to increase the efficiency of the drying operation.
- Third Zone: Is for cooling at ambient temperature.

Drying results depend on the combination of thinner and retarder paste along with the thickness of the ink layer.

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Conditioning / Post-curing

Complete evaporation of thinner residues in ink and film is necessary for further processing of printed films in the IMD/FIM process.

Thinner residues can lead to washout during the back molding process, or damage during the climatic test or use of the end product.

Fully benefiting from NORIPHAN® N2K's superior properties (adhesion, suitability for back molding, etc.) requires guaranteeing an absolute minimum of solvent residues.

Post-curing is done after printing the last color; the ideal conditions for each product must be determined individually.

For best results, dry separately on a rack in a well ventilated box oven.

Conditions:

Post-curing at 75 – 90 °C (165 – 195 °F) for 3 – 5 hours.

Maximum temperature 70 – 80 °C (160 – 175 °F) for processing heat sensitive films of PC blends such as Bayfol® CR.

In case of an application of too high temperatures with Bayfol® CR a change into bluish coloring of the film could be observed.

Bonding Strength

The adhesion of a film/ink/plastic bonding system depends on a number of variables (production, process, and structure of product). For this reason, specific tests with respect to individual requirements are essential.

For good adhesion, at least **2 fully covering layers of NORIPHAN® N2K** should be printed. The first layer can be composed of almost fully covering graphic motifs.

Safety Precautions

NORIPHAN® N2K inks are inflammable. Smoking or open flames are strictly prohibited during use of these products.

Processing NORIPHAN® N2K inks requires normal hygiene. Please see recommendations on label and read the material safety data sheets before use.

Shelf Life

Storing NORIPHAN® N2K at temperatures below 15 °C (59 °F) for a longer period of time (more than 7 days) can lead to the formation of bubbles during printing and a rough print surface.

Therefore, storage of the product below 15 °C (59 °F) should be avoided.

Considering these instructions NORIPHAN® N2K in condition of the unopened original cans can be kept without any loss of quality up to the date stated on the label.

Important

Allow the ink as well as all the auxiliaries to be added to adjust to room temperature in the closed container before use.

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 prior to 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 can contain sliding agents, antistatics or other additives which will impair the adhesion of the inks.

It is not always possible to produce a given part using IMD/FIM technology.

The resins used for back molding IMD/FIM ink systems are supplied as commercial technical products. They are different in chemical composition as well as the content of additives. Process parameters will also influence the quality of the finished IMD/FIM parts.

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.).

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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