



NORIPHAN[®] XMR

Halogen Free Ink System for IMD/FIM-Technology
(back molding of screen printed films)

Area of Application

NORIPHAN[®] XMR is a solvent-based two-component screen printing ink for IMD/FIM technology (In-Mold-Decoration/Film Insert Molding) for printing on PC films, PC blend films, PET films and PP films as well as scratch resistant surfaces after pre-tests.

Characteristics

- extremely high wash out resistance
- extremely high cohesion in compound
- optimized adhesion on PC films
- low odor
- formable
- high electrical resistance in capacitive field (suitable for Touch Panel-applications)

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 (59 °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[®] EBG / Autotex^{®2}
PP film after corona pretreatment

Further plastic films after pre-tests.

¹ Makrofol[®] and Bayfol[®] are registered trademarks used by Covestro AG, Germany

² Autoflex[®] and Autotex[®] are registered trademarks used by MacDermid Autotype Ltd., UK

NORIPHAN® XMR

Mixing Ratio

100 % NORIPHAN® XMR
10 % Hardener 004
5 – 10 % Thinner M 201 (medium) or Thinner S 403 (slow)

Pot Life

4 – 6 hours, depending on thinning ratio and ambient temperature (25 °C / 75°F)

Mesh Count

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

Defoamer

Defoamer L61693 to correct levelling issues, primarily with coarser meshes (low mesh counts).
Addition: approx. 0.5 - 1 %

Adhesion Promoter

NORIPHAN® HTR N – one-component (see Technical Information NORIPHAN® HTR N)

Color Shades

HF = halogen free

Halogen Free Basic Colors	108 Citron HF	445 Violet HF
	112 Yellow HF	566 Blue Transparent HF
	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
Halogen Free Special Colors	770 Silver HF	944 White Opaque HF
	780 Silver Coarse HF	953 Deep Black HF
	790 Silver Glossy HF (press-ready)	

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:

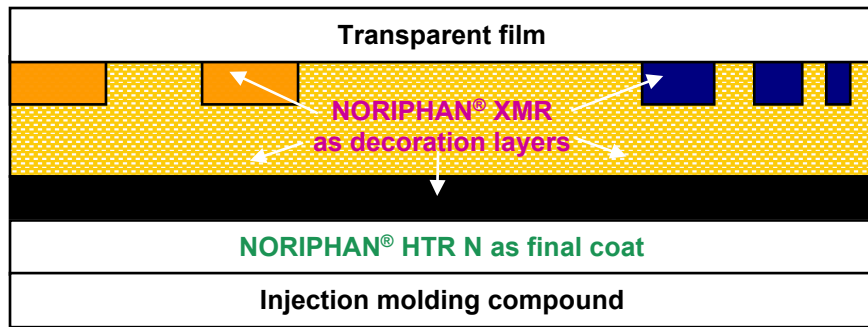
The peel strength (bonding) of the silver and effect inks is lower than that of the basic colors.
Back molding the special effect colors may alter the orientation of the pigment particles.

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.

Printing Sequence

*NORIPHAN® XMR
as decoration ink
(at least 2 fully
covering layers)*



The adhesion of NORIPHAN® XMR on PC film can be improved by a primer layer of NORIPHAN® HTR N 093 in advance. This measure is a must in case of PMMA films.

NORIPHAN® HTR N as final layer has two functions, to guarantee the adhesion to injection molding material as well as to avoid ink sticking on the heated forming tool.

Cleaning of Screens and Utensils

UNI-REIN A III

Drying for solvent evaporation

Following remarks refer to processing of PC films

Tunnel drying after each layer:

1. section: 85 – 90 °C (185 to 195 °F)
2. section: 90 °C (195 °F)
3. section: cooling

Belt speed: 5 m/min. referring to tunnel length of 7 m.

Tunnel drying is applied for solvent evaporation.

After tunnel drying, printed ink films are **not resistant to blocking**, consequently the sheets must be placed in a **rack**.

After each layer up to 10 min. intermediate drying at 80 °C (175 °F) can be applied in case of sticking issues.

Process Frame

Overprinting: Overprinting of NORIPHAN® HTR N onto the last layer NORIPHAN® XMR should be done within one day (8 h) and post-drying should follow without delay.

Special attention should be paid to drying of **the last NORIPHAN® XMR layer as area print**, which should not exceed 5 min. at 80 °C (175 °F) for good interlayer adhesion between NORIPHAN® XMR and NORIPHAN® HTR N. Consequently, the racks should be moved out of the oven right away after this drying period.

Forming: Forming can follow even after several weeks.

For good forming results a higher molecular weight and therefore crosslinking time of minimum 2 days after post drying is beneficial.

Injection Molding: After the application NORIPHAN® HTR N on the very last layer, there are no further limitations known (see Technical Information NORIPHAN® HTR N).

High Temperature Storage for Crosslinking Reaction

Post-drying at high temperatures accelerates chemical crosslinking of the ink.

After applying adhesion promoter, **high temperature storage** 3 h at 80 °C (175°F) in a box oven with fresh air supply is necessary. Optimum conditions are depending on color shades and have to be determined in specific testing. Prolonged heating can lead to brittleness of ink layers.

The degree of crosslinking also promotes the washout resistance in the back molding process.

Delayed post-drying one day later will lead to decreased adhesion and washout resistance.

Wicket-dryer

When using a Wicket-dryer there is a certain risk in over curing of the single layer, which decreases adhesion to the following layer.

Therefore, optimum drying conditions have to be established within a drying study, especially for the crucial intercoat adhesion between last NORIPHAN® XMR layer and NORIPHAN® HTR N as adhesion promoter.

Such drying study is recommended to be started at 60 °C (140 °F) with a stepwise increase by 5 °C (40 °F) to find the optimum temperature for best adhesion and other requirements e.g. high washout resistance. Color shades are influencing the drying results and black dries faster than white, transparent or other pigmented colors

Drying temperature can be increased to 90 °C (195 °F) after application of NORIPHAN® HTR N adhesion layer.

Further evaluation in forming and backmolding tests have to follow to determine if post curing in box oven is still required or beneficial.

Forming

High pressure forming:

In case of depths up to 12 mm, based on a film thickness of 250 µm, the following starting point parameters are recommended:

Top and bottom heat:	320 °C (610 °F)
Duration of heating:	15 – 18 sec.
Hot air temperature:	300 – 320 °C (570 to 610 °F)
Tool temperature:	120 °C (250 °F)
Pressure:	80 – 150 bar
Dwell time:	4 sec.

Molding

To achieve a good adhesion between adhesion promoter NORIPHAN® HTR N and injection molding resin, the resin temperature must be at least 270 °C (520 °F).

In order to avoid internal stress in the final part, the coefficients of film and injection molding resin should be as similar as possible.

In case of NORIPHAN® HTR N as adhesion promoter, the resins PC, PC/ABS and PMMA can be injection molded. With other adhesion promoters such as NoriAmid® APM the resins PA or ABS can also be injection molded successfully.

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® XMR** should be printed. The first layer can be composed of almost fully covering graphic motifs.

NORIPHAN® XMR

Safety Precautions

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

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

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).

Important

Allow the ink as well as all the auxiliaries to be added to adjust to ambient 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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