Mara® *Pur* PU

Marabu

Solvent-based screen printing ink for pre-treated polyethylene (PE) and polypropylene (PP), thermosetting plastics, metals, and coated surfaces

High gloss, high opacity, fast drying two-component ink, resistant to chemicals and weathering

Vers. 6
2015
09. Mar

Field of Application

Substrates

Mara® *Pur* PU is excellently suited for applications onto

- pre-treated polyethylene (PE) and polypropylene (PP)
- polyurethane (PU)
- polyamide (PA)
- melamine resins
- phenolic resins
- metals
- coated substrates
- thinly anodized aluminium
- wood

Since all the print substrates mentioned may be different in printability even within an individual type, preliminary trials are essential to determine the suitability for the intended use.

Field of use

Mara® *Pur* PU is a versatile and highly resistant two-component ink which is applicable in all cases where highest demands for chemical and mechanical resistance for indoor and outdoor use have to be met.
PU is also designed for printing onto polyolefines (PE, PP), the substrate's surface has to be pre-treated as usual by flaming or Corona discharge. This increases the surface tension and a sufficient adhesion can be achieved with a minimum surface tension of 42 - 48 mN/m.
In case of multicolour prints, especially for bronze shades, flaming is to be carried out only once and not between every print sequence. The surface treatment can be tested either by appropriate test inks in the usual way or by a water test where a wetted PE or PP surface must hold the unbroken water film for about 20 sec.

Mara® *Pur* PU is suited for printing on new PE and PP with a max. percentage of 20% regrind in the granulated material. If this quota is exceeded, the non-calculable contamination level in the granulated material will rise and due to this, adhesion may suffer. Preliminary trials are necessary.
On non pre-treated PP, ink adhesion can also be achieved by a coat of our colourless Special Primer P 2 without flaming or Corona treatment.
PU can also be processed with a spray gun, but preliminary trials are necessary for this process.
In order to avoid surface irregularities, we recommend to filter the thinned ink (25 µm screen) before processing.

Characteristics

Ink Adjustment

Prior to printing, it is necessary to add Hardener H 1, H 2 or HT 1 to the ink in the proper mixing ratio. Please stir the ink/hardener mixture well, before adjusting it to the right printing viscosity by adding thinner and/or retarder (stir again).
This slows down somewhat the hardening reaction which begins spontaneously, and the pot life is at an acceptable level. The proper mixing ratios are:

Basic Shades:
4 parts by weight ink : 1 pbw Hardener

Varnish 910/911:
3 parts by weight varnish: 1 pbw Hardener

For ink mixtures of basic shades with varnish PU 910, the proper addition of hardener must be calculated in the correct ratio.

Pre-reaction time
It is recommended to allow the ink/ hardener mixture to pre-react for 15 minutes.

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Pot life
The ink-hardener mixture is chemically reactive and must be processed within the following periods (if stored at 20° C):

PU + H 1: 8 hours
PU + H 2: 4 hours
PU + HT 1: approx. 6 months

The Hardener HT 1 is a heat-reactive isocyanate hardener and must be dried after the last printed colour in an oven with forced heat at 150° C for 30 min. Increased processing temperatures of more than 20° C reduce pot life. If the mentioned pot life is exceeded, the ink's adhesion and resis-tance may be reduced even if the ink characte-ristics show no noticeable change. By continuously adding freshly mixed ink plus hardener, the pot life can be extended up to 24 hours (3 shifts).

Recommendation
The ink should be stirred homogeneously before printing and if necessary during production.

Drying

Parallel to physical drying, i.e. evaporation of solvents, the actual hardening of the ink film is caused by the chemical cross-linking reaction between ink and hardener.
The following standard values concerning the progressive cross-linking reaction (hardening) of the ink film are experienced (fabric 100-40):

		H 1	H 2
overprintable	20°C	15 min	10 min
	60°C	4 min	2 min
	120°C	1 min	20 sec
stackable	20°C	4 h	3 h
	60°C	30 min	20 min
	120°C	10 min	6 min
final hardness	20°C	14 days	8 days

The mentioned times are only guidelines as the drying times above vary according to the printed ink film thickness, air humidity, drying conditions and selection of auxiliaries used such as thinner and/or retarder.
If multicolour prints are dried with forced heat between printing sequences (by hot air or infrared), the time for overprinting is reduced to approx. 3-4 min.
Due to the extreme stress for substrate and ink, we do not recommend intermediate drying by flame. When drying with forced heat at more than 160° C, the heat application must not exceed 5 min as otherwise, there will be a yellowing, especially with White 070. Generally, an extended drying time is necessary when overprinting the ink. Processing and hardening temperatures should not be below 15° C during printing and 8 hours after printing, otherwise irreversible damage can occur.
Please also avoid exposure of the ink to high humidity or water (rain) during and after printing for 8 hours at 20° C or 12 hours at 15° C, because adhesion between ink and substrate will be affected.

Overprinting
Please pay attention to the fact that the ink film underneath is not chemically cured when first overprinted. If the ink film is dried at room temperature of 20° C, overprinting must be carried out with Hardener H 1 within 12 hours, resp. with Hardener H 2 within 8 hours at the latest. We recommend to carry out the overprinting as soon as possible in order to guarantee good adhesion of the ink layers.

Fade resistance

Mara® *Pur* PU contains a highly weather resistant binder and fade resistant pigments. The basic shades of Mara® *Pur* PU plus over-coating with PU 911 are thus suitable for long-term outdoor use up to 5 years (vertically, referred to the Central European climate). However, the ink must be processed properly, the printed layer thickness (fabric 77-55 to 90-48) must be appropriate, as well as the adhesion and scratch resistance of the substrate, the pre-treatment and substrate quality. Shades mixed with more than 20% of printing varnish PU 910 and/or other standard shades (especially white) show a lower fade and weather resistance. The outdoor resistance is also reduced if the density of the printed ink film is reduced (due to the use of finer fabric). For outdoor use, we recommend White 070 instead of the highly pigmented Opaque White 170 as well as the non-yellowing Hardeners H 1 or HT 1 instead of H 2.

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H 2 is not suited for an exposure to outdoor UV-rays. All pigments used are resistant to solvents and plasticizers.

Stress resistance

After proper and thorough drying (20° C – 14 days), the ink film exhibits outstanding adhesion as well as rub and scratch resistance. If a high chemical resistance to the most usual fillers (alkaline to acid), alcohol, oils, greases, finger sweat, petrol, battery acid and other solvents is required, we recommend to use Hardener H 1, resp. HT 1. These show higher resistances than the fast Hardener H 2. In general, the chemical resistance of PU is improved by heat-forced drying, e. g. at 150° C for 30 min. If Hardener HT 1 is used, oven drying is essential.

Range

Basic Shades

020	Lemon
021	Medium Yellow
022	Yellow Orange
026	Light Yellow
031	Scarlet Red
032	Carmine Red
033	Magenta
035	Bright Red
036	Vermilion
037	Purple Red
045	Dark Brown
055	Ultramarine Blue
056	Turquoise Blue
057	Brilliant Blue
058	Deep Blue
059	Royal Blue
064	Yellow Green
067	Grass Green
068	Brilliant Green
070	White
073	Black

High Opaque Shades

170	Opaque White

Press-Ready Metallics

191	Silver
193	Rich Gold

Further Products

910	Overprint Varnish
911	Overprint Varnish (with UV-Absorber)

The printing varnish PU 911 contains a UV-absorber. By over-varnishing the complete printed area (mesh 77-55 to 100-40), the colour stability for long-term outdoor use will be improved.

All shades are intermixable. Mixing with other ink types or auxiliaries must be avoided in order to maintain the special characteristics of this ink.

All basic shades are included in our Marabu-ColorFormulator (MCF). They build the basis for the calculation of individual colour matching formulas, as well as for shades of the common colour reference systems HKS®, PANTONE®, and RAL®. All formulas are stored in the Marabu-ColorManager software.

Metallics

Metallic Pastes

S 291	High Gloss Silver	10-20%
S 292	High Gloss Rich Pale Gold	10-20%
S 293	High Gloss Rich Gold	10-20%

Metallic Powders

S 181	Aluminium	17%
S 182	Rich Pale Gold	25%
S 183	Rich Gold	25%
S 184	Pale Gold	25%
S 186	Copper	33%

These metallics are to be added to PU 910 in the recommended amount, whereas the addition may be individually adjusted to the respective application. We recommend preparing a mixture which can be processed within a maximum of 8 h since metallic mixtures usually cannot be stored. Due to their chemical structure, the processing time of mixtures with Pale Gold S 184 and Copper S 186 is even reduced to 4 h.

Owing to the smaller pigment size of Metallic Pastes it is possible to work with finer fabrics like 140-31 to 150-31. Owing to the larger pigment size of Metallic Powders we recommend the use of a coarser fabric like 100-40. Shades made of Metallic Powders are always subject to

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an increased dry abrasion which can only be reduced by overvarnishing.
All metallic shades are displayed in the Marabu "Screen Printing Metallics" colour chart.

Auxiliaries

H 1	Hardener, UV resistant	25-33%
H 2	Hardener, fast	25-33%
HT 1	Hardener, heat reactive	25-33%
AP	Antistatic Paste	10-15%
PUM	Matting Base	5-20%
OP 170	Opaquing Paste	5-15%
PUV	Thinner, fast	5-10%
SV 1	Retarder, medium	5-10%
SV 5	Retarder, fast	5-10%
SV 9	Retarder, slow	5-10%
7037	Spray Thinner, very fast	5-10%
MP	Matting Powder	1-4%
ES	Printing Modifier	0.5-1%
UR 3	Cleaner (flp. 42°C)	
UR 4	Cleaner (flp. 52°C)	
UR 5	Cleaner (flp. 72°C)	
P 2	Primer	

Hardener H 1 and H 2 are sensitive to humidity and always to be stored in a sealed container. Shortly before use, the hardener must be added to the ink and stirred homogeneously. The mixture ink/hardener is not storable and must be processed within pot life. If using HT 1, there is practically no pot life to consider since this hardener is activated by a baking process (30 min/150°C).
Please see chapter ink adjustment for recommendations.

The addition of Antistatic Paste AP reduces the impact of static charge on the ink. It lowers the viscosity of the ink and non-polar components help to avoid "stringy" behaviour when printing onto non-polar substrates.

The degree of gloss of Mara® *Pur* PU can be reduced by adding Matting Powder MP or Matting Paste PUM. For the subsequent addition of hardener please consider the amount of PUM added (add 1 part by weight hardener to 4 parts by weight ink mixture). The addition of up to 4 % of Matting Powder MP will not affect the resistance of the ink noticeably. An excessive addition may reduce outdoor resistance and resistance to chemicals.

By adding Opaquing Paste 170, the opacity of colour shades can significantly be increased without considerably influencing the chemical and dry abrasion resistance. OP 170 is not suitable for white shades, and should not be used for prints that will be exposed to more than 2 years outdoor application.

Thinner and/or retarder is added to the ink/hardener mixture to adjust the printing viscosity. For slow printing sequences and fine motifs, it may be necessary to add retarder to the thinner. For an additional thinning of the ink containing retarder, only pure thinner should be used. For hand printing, pure Retarder SV 1, SV 5 or SV 9 may be added.

For spray coating, fast Spray Thinner 7037 should be used (on parts sensitive to tension cracks, preliminary trials are essential).

Printing Modifier ES contains silicone and can be used to rectify flow problems on critical substrates. If an excessive amount is added, flow problems are increased and adhesion may be reduced, especially when overprinting. The use of ES may reduce the degree of gloss.

The cleaners UR 3 and UR 4 are recommended for manual cleaning of the working equipment. Cleaner UR 5 is recommended for manual or automatic cleaning of the working equipment.

Special Primer P 2 is used for manual pre-cleaning and pre-treatment of PP substrates.

Printing Parameters

All types of commercially available polyester fabrics and solvent-resistant stencils can be used. For a good opacity on coloured substrates, we recommend a fabric between 68-64 and 90-48 and for printing finest details a fabric between 100-40 and 120-34.

Note

Our technical advice whether spoken, written, or through test trials corresponds to our current knowledge to inform about our products

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and their use. This is not meant as an assurance for certain properties of the products nor their suitability for each application.
You are, therefore, obliged to conduct your own tests with our supplied products to confirm their suitability for the desired process or purpose. The selection and testing of the ink for specific applications is exclusively your responsibility. Should, however, any liability claims arise, they shall be limited to the value of the goods delivered by us and utilised by you with respect to any and all damages not caused intentionally or by gross negligence.

Labelling
For Mara® *Pur* PU and its auxiliaries, there are current Material Safety Data Sheets available according to EC regulation 1907/2006, informing in detail about all relevant safety data including labelling according to the present EEC regulations as to health and safety labelling requirements. Such health and safety data may also be derived from the respective label.

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