

Marapur PU



Screen Printing Ink for pre-treated polyethylene (PE) and polypropylene (PP), thermosetting plastics, metals, and top-coated surfaces

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

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Field of Application

Substrates

The Marabu PU is a two-component screen printing ink which is excellently suited for applications onto pre-treated polyethylene (PE) and polypropylene (PP), polyurethane (PU), polyamide (PA), melamine resins, phenolic resins, metals, coated substrates, powder coatings, thinly anodized aluminium, as well as wood.

As the mentioned substrates may be different in their printability depending on the manufacturer, even within an individual type, preliminary trials are essential to determine suitability for the intended use.

Field of use

Marapur 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.

Marapur PU is only suitable for printing on new PE and PP with a max. percentage of 20 %

reground in the granulated material. If this quota is exceeded, the non-calculable contamination level in the granulated material will raise and due to this, adhesion may suffer. Therefore, preliminary trials are necessary (for further details, please see supplementary Aweta Info 1/97.)

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. We recommend to filter the thinned ink (25 µm screen) before processing as, otherwise, there could be bubbles in the ink film.

Characteristics

Mixing ratio

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 ink and hardener well, then thin it to the right printing viscosity by adding thinner and/or retarder in order to stir it once more.

This slows down somewhat the hardening reaction which begins spontaneously, and so the pot life is extended to an acceptable period of time. The proper mixing ratios are:

All basic shades

4 parts of ink : 1 part of hardener
or

800 g Marapur PU : **200 g** Hardener H1, H2, HT1

Printing varnish PU 910 or PU 911

3 parts of varnish : 1 part of hardener
or

600 g varnish : **200 g** Hardener H1, H2, HT1

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For ink mixtures of basic shades with varnish PU 910, the proper addition of hardener must be calculated in the correct ratio. Before printing, the finished ink mixture should rest for 10 min to allow the air bubbles to rise and burst.

Pot life (processing period)

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:	about 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 resistance may be reduced even if the ink characteristics show no noticeable change.

By continuously adding freshly mixed ink plus hardener, the pot life can be extended up to 24 hours in the 3-shift operation with less ink consumption.

Drying/Hardening

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):

Extent of drying	temp.	H1	H2
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
pot life	20 °C	8 h	4 h

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 infra red), 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 when the ink film is formed.

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 strongly 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

Marapur PU contains a highly weather resistant binder and fade resistant pigments. The basic shades of Marapur PU plus over-coating with PU 911 are thus suitable for long-term outdoor use up to 5 years (vertically, referred to the moderate Central European climate).

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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 the 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. 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 the Hardeners 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.

Yield

One litre of Marapur PU yields about 65 m² of printed surface, with a dilution level of 10 % using a 120-34 (T) mesh.

Range

The basic shades of System 21 are included in our colour matching systems Marabu-Color Formulator (MCF) and Marabu-ColorManager (MCM 2.2). All shades are intermixable.

The Marapur PU ink should not be mixed with other types of ink to maintain the special characteristics of this outstanding ink range.

The pigments used in the below mentioned standard shades based on their chemical structure, correspond to the EEC regulations EN 71/part 3, safety of toys - migration of specific elements. All colours are suitable for printing onto toys.

Basic shades

Refer to shade card Marapur PU or System 21

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

By using these 21 basic shades in accordance with the mixing ratios provided by the Marabu-Color-Manager (MCM2) software, it is possible to produce shades of the ink systems HKS®, RAL®, and PANTONE®.

Further basic shades

PU 170	Opaque White
PU 191	Silver, press-ready
PU 193	Rich Gold, press-ready

Additives

PU 910	Bronze binder and printing varnish (600 g)
PU 911	Printing varnish + UV absorber (600 g)

The printing varnish PU 911 additionally contains a UV-absorber. By over-varnishing the total surface (mesh 77-55 to 100-40) of the colour shades, the colour stability for long-term outdoor use will further be improved.

Bronzes (to be mixed with PU 910)

All bronze shades are shown in a separate bronze colour chart.

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S 181	Aluminium (6:1)
S 182	Rich Pale Gold (4:1)
S 183	Rich Gold (4:1)
S 184	Pale Gold (4:1)
S 186	Copper (3:1)
S 190	Aluminium, rub-resistant (8:1)

Bronze mixtures are unstable and must be processed within 8 hours. Due to their chemical structure, Pale Gold S 184 and Copper S 186 further reduce the processing time to 6 hours.

All figures in brackets are guidelines which can be varied according to opacity and ink price. The ratio figures in brackets refer to the mixture bronze binder PU 910 to bronze powder or bronze concentrate, the first figure is standing for the parts by weight of bronze binder PU 910. Due to the larger grain size of bronze pigments, we recommend a fabric of 120-34 (T) or 120-31 (S) or even coarser.

Shades of bronze powder are always subject to dry abrasion which can only be reduced by an appropriate overvarnishing with PU 910.

High-gloss bronze concentrates

The following 3 high-gloss bronze concentrates are available as pastes, to be used by mixing them with bronze binder PU 910 (see separate Technical Data Sheet 'High-Gloss Bronze Concentrates').

S 291	High-gloss Silver (5:1-10:1)
S 292	High-gloss Rich Pale Gold (5-10:1)
S 293	High-gloss Rich Gold (5:1 – 10:1)

Due to the smaller pigment size compared to the bronze powders, it is possible to work with finer fabrics (140-31 (S) to 150-34 (T)). This increases the ink's productivity at an acceptable price. Bronze shades of high-gloss bronze concentrates exhibit high weather resistance and only a small dry abrasion.

Auxiliaries

Hardener:	H 1 (UV-stable) H 2 (fast hardener), HT 1 (heat-reactive)
Mixing ratio:	4 p. ink : 1 p. hardener 3 p. varnish : 1 p. hardener
Thinner:	PUV (fast)
Spray Thinner:	7037 (very fast)
Retarder:	SV 1 (semi-fast) SV5 (fast) SV 9 (very slow)
Matting Paste:	PUM (5-20 %)
Matting Powder:	MP (1-4 %)
Antistatic Paste:	AP (10-15 %)
Opaquing Paste:	OP 170 (5-15 %)
Primer:	P 2, for polypropylene
Cleaner:	UR 3
Printing Modifier:	ES (0,5-1 %)

Briefly before using, the hardener should be stirred into the undiluted ink. An addition of 5-10 % thinner and/or retarder will usually be sufficient to adjust printing viscosity.

To produce a retarding effect for slow printing sequences, the retarder is proportionally added to the thinner (approx. 50 %). For an ink mixture containing retarder, only pure thinner without retarder should be used for additional thinning during print run. For hand printing, pure Retarder SV 1, SV 5 or SV 9 may be added.

By adding Matting Paste PUM, the gloss effect of Marapur PU can be reduced. If hardener is subsequently added, it is to take into consideration the amount of PUM, i.e. one part by weight of hardener is to add to 4 parts by weight of ink mixture (plus PUM).

The addition of up to 20 % of PUM or 1-4 % (White up to 2 %) of MP powder will not affect the resistance of the ink noticeably. An excessive addition may reduce outdoor resistance and resistance to chemicals.

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By adding the Opaquing Paste 170, the opacity of colour shades (not white!) can significantly be increased at nearly same resistances. Maximum quantity to be added is 15 %.

Printing Modifier ES contains silicone. It can be used to rectify flow problems of the printed ink film by adding 0,5-1 % by weight to the ink. If an excessive amount is added, flow problems are increased and adhesion may be reduced, especially when overprinting.

Cleaning

For cleaning screens and tools, we recommend to use the Cleaner UR 3. For all 2-component inks, it is further recommended to carry out the cleaning immediately after printing, especially when hardener has been used.

Fabrics and stencils

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 (T) and 90-48 (T) and for printing finest details a fabric between 100-40 (T) and 120-34 (T).

Recommendation

Every printing ink is to be stirred well and homogeneously before printing. Especially in case of storing the ink for a longer time, the additives will separate rendering the ink inhomogeneous.

Furthermore, the hardeners H 1, H 2, and HT 1 are sensitive to humidity. Please always store these hardeners in a sealed container. The shelf life of the hardeners is max. one year.

Labelling

For our ink type Marapur PU and its additives and auxiliaries, there are current Material Safety Data Sheets according to EC-regulation 91/155 informing in detail about all relevant safety data including the labelling according to the present EEC regulations as to health and safety labelling requirements. Such health and safety data may also be obtained from the respective label.

The ink has a flash point between 21 °C and 55 °C. Since the ink is not considered as a flammable liquid due to its pastous nature, any specific regulations for the handling of flammable liquids do not apply to the ink.

Note

Our technical advice whether spoken, written, or through test trials, corresponds to our current knowledge to inform about our products 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 application is exclusively your responsibility.

Should, however, any liability claims arise, such claims 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.