



QUARTZ
CATIONIC U.V. INK SYSTEM

(Prefix (MQ))

DESCRIPTION

A high gloss ultra violet curing Ink System for Flexo applications that is instantly converted to a solid using an acid catalysed process.

The MQ series should only be used in applications where the package represents a barrier to migration and a suitable assessment has been conducted.

TYPICAL
PROPERTIES*
(FULLY CURED INK)

A high gloss and resistant surface.

100% compliance with Environmental Protection Act-VOC Free.

Excellent solvent resistance.

Excellent wet & dry rub resistance.

Good taint and low odour properties.

Continues to dark cure after initial reaction.

Steam Shrinkage/ Pasteurisation resistance- **(NOT METALLICS OR FLUORESCENTS)****

*Overprinting solvent, free radical and waterbased inks can cause serious failure and so specific tests will be required to identify acceptable working parameters - refer to Technical Department. MQ30566 High strength Black is not suitable for printing onto P.E.T.

**The standard technical data sheet does not cover cationic Metallics & fluorescents.

SUBSTRATES

The system is suitable for printing a wide range of plastic substrates (OPP, Polythenes, papers and foils. However, some additives and binders can inhibit or poison the curing reaction). Mirage Inks Technical Department should be consulted before printing any unproven substrate.

REDUCERS

Normally no reducers are required and no addition should be made to the ink. It is supplied press ready as a complete system. Additions of solvent and other materials may adversely affect cure rate and should be avoided. A medium is available if a reduction in colour strength is required.

QUALITY ASSURANCE

Products with the prefix and product name specified above are Quality Controlled to Mirage Inks Test Specification No53 as described in the test manual. Details of all tests are available on request from our technical department.

The information given above is supplied as a guide only with the properties achieved under laboratory conditions. Mirage Inks Limited strongly recommend that you satisfy yourself as to the suitability of the product with trials. Please consult our laboratory to discuss any different requirement. As particular conditions of use and variations in quality of materials and substrates being used are outside our control, it is therefore not possible to guarantee the performance of our products.

Products supplied under this ink name / prefix, are best used within a six month period from the date of manufacture (as specified on the product label). In-line with Mirage Inks Ltd ISO 9001 procedures, retained batch samples for any product supplied under this ink name / prefix, are retained & stored at room temperature for a period of six months from the date of manufacture.

Should the product be used outside of this six month period, Mirage Inks Ltd. have no reference sample for comparative & test purposes, so cannot investigate or be held responsible for any print related problems. Mirage Inks Ltd will not accept liability for any claim arising as a consequence of a laboratory colour matching being offered to our customer in good faith, and then subsequently Mirage's customer failing to obtain approval from their customer prior to printing / production.



IMPORTANT ASPECTS TO CONSIDER WHEN PRINTING WITH CATIONIC UV INKS

Mirage Inks seek to provide all users of their products with up to date information based on feedback and experience gained in the use of UV products. **This document is intended as a guide to users and should not be considered as a guarantee.**

The following sections contain information on aspects of the print process that can contribute to successful printing.

Substrates	Doctor Blades
Machine Configuration	Pumps
Lamp Details	Pipes
Photo Polymer Plates	Wash Up
Aniloxes	Humidity
Specific Ink Information	

SUBSTRATES

Plastic films need to be treated to a minimum of 38 to 40 dynes/cm (initial levels may need to be higher for those films on which treatment falls off quickly). Certain additives used in the manufacture of polymer films, particularly low-density polythene, can inhibit cure and/or adversely affect lay down and adhesion therefore high levels of slip additives (significantly erucamides) should be avoided.

Care should be taken when printing on foil as certain coatings used in their manufacture can adversely affect lay down resulting in reticulation. Substrate basicity can also inhibit cure (this will occasionally occur with certain paper coatings). Some substrates can produce an odour when passed under/exposed to U.V. energy and, in the case of papers can come from some of the binders used.

MACHINE CONFIGURATION

Due to the nature of the cure with Cationic ink systems the distance, after the curing lamp, to the next roller which would be in contact with the ink is crucial. The distance required will depend on running speeds, lamp power, ink film weight and curing speed of the colour concerned. If the substrate wraps around a water cooled drum to keep the substrate cool whilst it is being cured by the UV lamp then the water must not be too cold as this will slow cure. The addition of Photoinitiator to the inks may upset the end use properties and is not recommended by Mirage Inks Ltd. Cure speeds also vary with colour due to pigment absorption of U.V. energy.

LAMP DETAILS

There are two main types of U.V. lamp commercially available; the medium pressure mercury arc (MPMA) variety and the microwave powered electrodeless type. The MPMA lamps contain an electrode at each end between which an arc of electricity provides the energy to excite the plasma inside the quartz bulb thus emitting certain wavelengths of U.V. light. The microwave-powered lamps utilise microwaves to directly energise the plasma without the use of electrodes.

The lifetime of a microwave-powered lamp is longer than a mercury arc lamp as it has no electrodes and is less sensitive to being switched on and off. The microwave powered lamps are much bulkier, this should be considered if space is restricted. There are various reflector types available i.e. parabolic, elliptical and cold mirror. The most suitable for curing cationic U.V. inks are the elliptical types which provide a focused source of U.V. light at the surface of the ink film. This produces higher peak irradiance (or intensity) which increases further with higher electrical input and decreasing bulb diameter.

Higher power and irradiance does however produce more heat which can be managed by using a dichroic surface on the inside of the reflector which absorbs more of the heat and reduces reflection onto the substrate. The lamps are also cooled with air, water or a combination of the two. The cold mirror type reflector contains a mirror at 45° which reflects the U.V. energy onto the substrate, this again is not suitable for curing a Cationic system due to the indirect focus and reduction in intensity of the U.V. energy by the time it reaches the ink.

Lamp power in the region of 500 watts/in is recommended.

PHOTO POLYMER PLATES

Compatibility with a cationic U.V. ink system can vary significantly with different makes of photopolymer plate. Incompatibility manifests itself in terms of plate swelling. Differences in degrees of plate swelling can occur in different areas on the same plate i.e. very fine screen areas of <2% dots exhibit worse swelling than solid areas. Differences are also noticeable between a Conventionally and digitally manufactured version of the same plate, where the digital version can exhibit worse swelling.

ANILOXES

As a U.V. ink system is 100% solid the dry film weight is equal to the wet film weight applied (cf: a solvent-based ink where the dry film weight is approximately one third of the wet film weight due to evaporation of solvent), This enables the use of finer screen/lower volume aniloxes.

As a general guide a volume of 8cm³m⁻² should be sufficient for printing solids, 4cm³m⁻² for printing tones. A screen angle of 60° is believed to be best suited to printing with U V inks. Ink film weight and smoothness of lay down can have a significant effect on cure speed therefore it is important not to apply more ink than is required to give adequate strength and coverage. Ideally a bladed anilox should be used for applying U.V. inks. Two-roll applications usually apply too heavy a film weight adversely effecting cure speeds and hence running speeds.

Varn Enviroflex Anilox Paste has been found to be effective in cleaning aniloxes and is acidic in nature. (Varn International)

DOCTOR BLADES

It has been discovered that on occasion a phenomenon occurs when the doctor blade is left in contact with the anilox on standing. When the doctor blade is subsequently lifted a line of cured/hard ink is apparent on the surface of the anilox. It is therefore recommended that the doctor blade not be left in contact with the anilox for long rest periods or overnight.

PUMPS

If pumping this ink system it is beneficial to do so at as slow a flow rate as possible and to make sure the level of ink in the container remains reasonably high. It is however not necessary to pump this ink, unless chambered blades are being used, as it can be applied straight from the duct. If pumping into a chambered blade system it is recommended that a peristaltic pump be used to minimise foaming.

PIPES

The following is a table of the results with various types of pipe material in terms of their swelling behaviour when immersed in a U.V. Cationic medium.

<u>Material Type</u>	<u>Original Circumference of pipe (in)</u>	<u>Circumference after 90hrs immersed in medium</u>	<u>% increase</u>
Mioprene			
/Bioprene	0.300	0.300	0.00
Neoprene	0.320	0.343	7.19
Butyl	0.309	0.309	0.00
Tygon	0.310	0.335	8.06

Watson Marlow Limited who can be contacted as follows supplied all the above materials: -

Tel: 44(0) 1326 370370 Fax: 44(0)1326 376009 E-mail:support@watson-marlow.co.uk

WASH UP

Wash -up of these inks can be carried out satisfactorily with a 90/10 I.M.S /N.P.Acetate mixture. However, if a less volatile alternative is preferable then Butyl Glycol can be used provided Health & Safety issues are adhered to regarding its use.

Great care should be taken and a thorough wash-up is needed when changing from printing Free-radical to Cationic inks as certain components used in Free-radical type inks i.e. amines can inhibit the reaction of the Cationic inks. This is also the case when changing from printing Water-based to Cationic inks for similar reasons. In addition alkaline wash-up solutions should be avoided.

An acidic wash should be used when switching from Free Radical to Cationic inks.

The Cationic inks are a 100% solid system supplied press ready. Due to the complex chemistry involved in the curing it is important to avoid contact with the following types of material:-

Free Radical curing UV inks,
amines,
bases,
acids,
solvents and
water.

HUMIDITY

Cure speed is effected by atmospheric humidity. Experience has shown that RH levels over 50%, at temperatures above 25 degrees ,can seriously reduce the rate of cure and, therefore, press speed. A temperature and humidity controlled environment will ensure consistent results and RH levels as low as practicable are recommended. Dry air fed directly onto the web prior to printing, from an air bar, has been seen to have a dramatic effect on cure speed even if the press room is at normal to high humidity levels. See the link <http://www.fynu.ucl.ac.be/themes/he/cms/Manuals/Humidite/Humidity.html> for a graph that shows the rapid increase in water content, at a fixed RH , as the temperature rises.(Blue line- section 3)

SPECIFIC INK INFORMATION

Strength

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A medium can be supplied if a reduction in colour strength required. There is no limit to the amount of medium that can be used.

Colour Matching

Colours are matched in day light/ under daylight tubes unless specified with order.

Fluorescents (Prefix - MQX)

There is a limited range of fluorescent colours available based on the Quartz system, **however** it should be noted that due to the chemical nature of the colourants involved the cure speed of these inks can be significantly slower than the other base range colours, similarly the resistance properties will be reduced (see Technical Data Sheet). As with other colours the cure speed is dependant on film weight, colour strength and lamp power.

Metallics (Gold and Silver Prefix MQ)

There is a limited range of metallic colours available based on the Quartz system, **however** it should be noted that due to the chemical nature of the colourants involved the cure speed of these inks can be significantly slower than the other base range colours, similarly the resistance properties will be reduced (see Technical Data Sheet). As with other colours the cure speed is dependant on film weight, colour strength and lamp power.

Trapping

When overprinting, the preceding color needs to be sufficiently cured to achieve adequate trapping of the next color. However, if the preceding color is cured too well the surface energy of this ink when cured can be reduced to such a level that the next color down will not wet it properly. It is possible to overcome this phenomenon by either slowly increasing the speed at which the press is running or reducing the lamp power, in both cases ensuring that the inks are still curing sufficiently not to cause offsetting.

Coefficient of Friction/Slip

The coefficient of friction of the inks can be reduced by the addition of a wax additive UV10123/2 - general addition level 1-2%. Greater levels of addition can be made but it should be noted that above 4% the gloss levels and compatibility are affected.

Viscosity

Viscosity varies with colour and ranges from approx. 1000-14000cps at 25 degrees C. Viscosity can be reduced by increases in temperature but it is advised not to exceed 35⁰ C as stability may be impaired.

Storage

Avoid exposure to sunlight, ultra-violet light and excessive heat. Preferably store inks in a cool(below 20°C) dry atmosphere.