

Screen Exposure

Choosing the right exposure system



How to Guide

Exposure is one of the most important steps in screen making and will directly affect the quality of the print and press life of the stencil. Choosing the right exposure system is equally important, so this How to Guide will provide you with essential advice helping you select the best system that meets your requirements.

Factors to consider when selecting an exposure system:

Quality of the UV light - Diazo, Dual Cure and Photopolymer photostencils are only sensitive to Ultra Violet light with a wavelength from 320 to 430 nanometres. It is very important to select a light source that has a spectral output in this range. Avoid light sources that also produce large amounts of Infrared (IR) as this heat energy will quickly cause the stencils to fuse. If in doubt, check the spectral output with the equipment manufacturer to ensure that it is compatible.

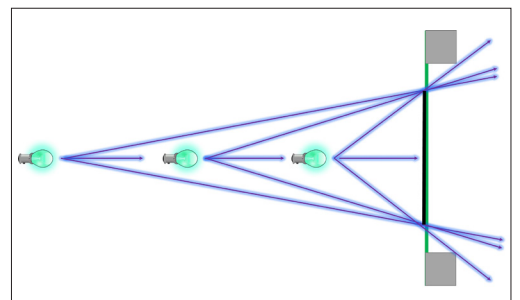
Power of the light - For conventional contact exposure, choose the most powerful lamp you can. The more powerful the lamp, the further it can be positioned away from the stencil.

Top tip: The UV output from all bulbs reduces with use, therefore always replace the bulb regularly in accordance with the manufacturer's recommendations.

Distance from the stencil - The distance from the lamp to the stencil has a big impact on exposure time, as the intensity of the light reduces very quickly the further it has to travel. For example a stencil requiring a 30 second exposure at 1.0 metre distance would increase to 900 seconds if positioned at a 2.0 metre distance. Importantly, the further away you can position the light source from the screen, the less undercutting you get at the image edges.



Angle of the light - Ideally the light should enter the stencil at an angle of 90° to the positive as this will give no undercutting of the image. Be aware though that the closer the lamp is to the image, the more acute the angle will become at the edges of the image. Ultimately, the size of the screen and the quality of the print you require will determine the optimum distance you should use.



The best compromise:

A good combination for conventional contact exposure of Diazo and Dual Cure stencils, such as Capillex 25 and PLUS 8000, of up to 1 square metre in size, is a 5 Kw metal halide with a Gallium Iodide doped 'Diazo' bulb (365, 405 & 418 nanometres output) positioned at a distance of 1.5 metres. For screens bigger than 1 square metre, a more powerful lamp at a greater distance may be required.

If you only use photopolymer stencils, such as PLUS 9000, a specific 'Photopolymer' Iron Iodide doped bulb can be used, as this emits a shorter wavelength than a Gallium Iodide 'Diazo' bulb. A 'Photopolymer' bulb typically has an enhanced output at 360 to 380 nanometres. If you use a variety of Diazo, Dual Cure and Photopolymer stencils, then a 'universal' bulb is the best compromise.

Other factors to consider

Mesh - Dyed (anti-halation) mesh will stop a lot of the light reflection/refraction during exposure providing a better resolution and definition at optimum exposure. However, you may need to increase your exposure time by as much as 100% compared to white mesh.

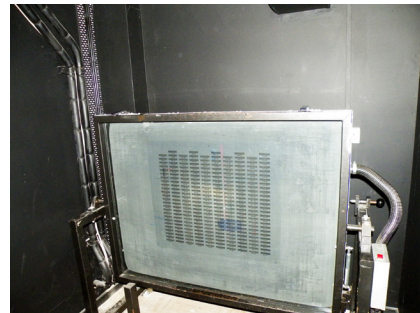
Vacuum frames - It is essential that the exposure frame gives you perfect contact between the film positive and the stencil, so a good vacuum and seal is very important.

Top tip: If you use a free standing exposure system, paint the walls black to reduce unwanted reflections that could cause undercutting.

Film positives - The quality of the positive you use will have a significant effect on the quality of the final print as any pixilation or imperfections on the image will be reproduced by the stencil. We recommend using quality Lith film positives for very high resolution applications and to make sure the emulsion is in perfect contact with the stencil, otherwise you will lose resolution.

Take care when using low cost ink jet or laser printer positives as these often have quite a low UV/Blue density and the stencils will need to be under exposed to prevent burn through.

Top tip: Make sure that you do not overload ink jet film positives to increase their UV density as this may result in them sticking to the stencil during vacuuming.



Computer to Screen

There are two main Computer to Screen (CTS) processes that are used today in screen printing; (i) direct digital exposure of the screen using UV light and (ii) digital imaging of a UV resist directly onto the screen followed by a blanket UV exposure.

Within these groups there are several different types of CTS systems including laser exposure, Digital Mirror Device/LED, ink jet and even laser ablation, each one has its own advantages and disadvantages. The choice of which system you select will depend on the size of the screens, the number of screens required per hour, the print detail and the durability required from those screens.

It is also important to match your choice of photostencil with your CTS system to get the optimum result. In general, most Diazo or Dual Cure photostencils (such as PLUS 6000 or 7000) can be used for small to medium sized CTS applications, however for large screens an ultra-fast projection speed photopolymer emulsion (such as PLUS MIDI or AQUA) will probably be required.

Summary:

There is no universal exposure system that will suit all screen printing applications, as the requirements for producing stencils for a touch screen application are quite different from those for printing giant flags or banners. Carefully consider all of the above factors before making your choice, as exposure is the most important step in determining the quality and durability of the screens being produced.

Contact us today and see for yourself how our range of products can help you.

Call: Europe +44 (0)1235 771111

US: 800 323 0632 (Toll Free)

Asia: +65 (0)689 79670

Email: salesupport@macdermidautotype.com

Local Distributor: macdermid.com/autotype



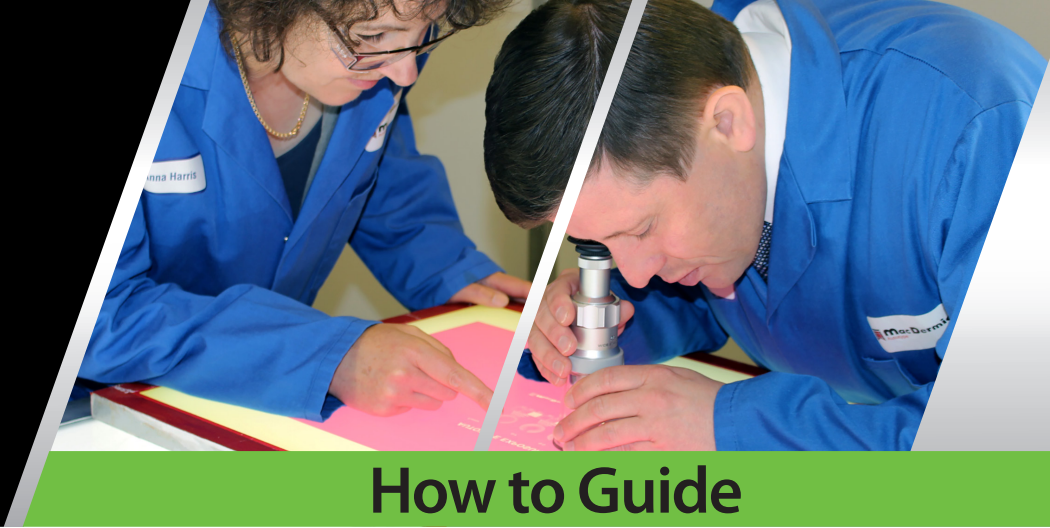
The information and recommendations contained in the Company's literature or elsewhere are based on knowledge at the time of printing and are believed to be accurate. Whilst such details are printed in good faith they are intended to be a guide only and shall not bind the Company. Due to constant development, customers are urged to obtain up-to-date technical information from representatives of the Company and not to rely exclusively on printed material. Customers are reminded of the importance of obtaining and complying with the instructions for the handling and use of chemicals and materials supplied as the Company cannot accept responsibility for any loss or injury caused through non-compliance.

Automask®, Autosol®, Autostrip®, Capillex® and Five Star® are registered trademarks of MacDermid Autotype Ltd
©2016 MacDermid Autotype Ltd
W23-2016



Screen Exposure

Determining optimum exposure



How to Guide

If your stencils break down quickly on the press, or give a poor quality print, it is probably due to incorrect exposure. This How to Guide provides essential advice on how to determine the correct exposure with direct photostencils (Direct emulsions and Capillary films).

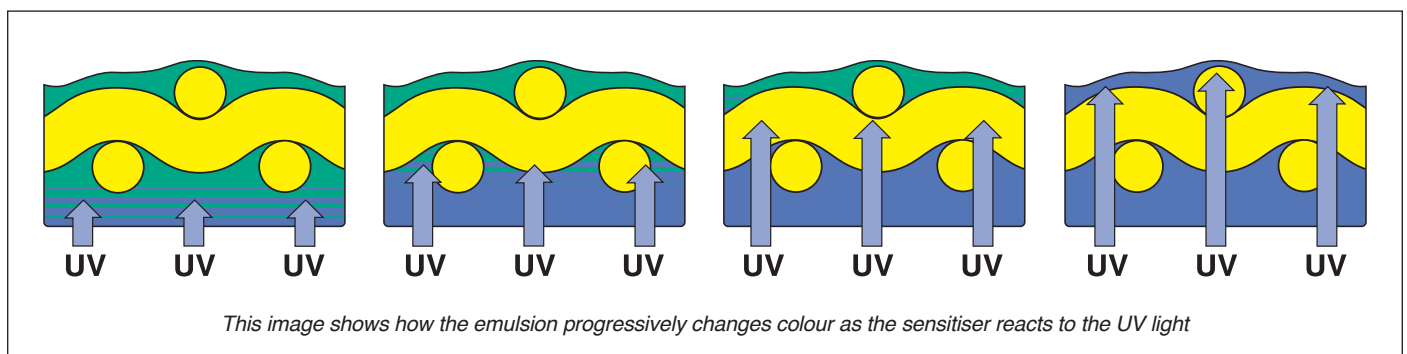
The importance of correct exposure:

All photostencils rely on Ultra Violet (UV) light to harden them. Therefore, it stands to reason that if you do not expose the stencil to enough UV light then it will not harden sufficiently to give you the print life you require. However, if you give it too much exposure to UV light, then you will not reproduce the fine detail. A perfectly exposed stencil is one where you have hardened all the emulsion without losing any of the detail you wish to print.

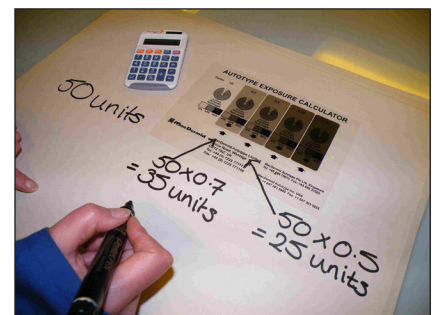
Diazo or Photopolymer sensitised photostencils:

There are two main methods used for determining the exposure time for direct photostencils.

1. Determining optimum exposure with Diazo and Diazo/Dual Cure photostencils - One of the benefits of a Diazo sensitiser is that when it reacts to UV light it changes colour and loses its yellow hue. It is this colour change that is the key to determining optimum exposure. All you need to do is to increase the exposure time until the stencil stops changing colour, as this is the point where all of the sensitiser has been used up.



The Autotype Exposure Calculator - The Autotype Exposure Calculator is an invaluable tool to determine optimum exposure as it will allow you to compare multiple exposures in one go. The four grey filters on this high quality photographic film positive absorb a controlled amount of the UV light to give the equivalent of 0.25, 0.33, 0.5 and 0.7 of the 1.0 full exposure; in just one step. To use the Exposure Calculator you expose the stencil, process the screen as normal and then examine the screen in white light to choose the exposure factor where the colour change stops.



Use the factors on the Exposure Calculator to work out the optimum exposure

Through-cure - A less accurate method of exposure determination is to look at the degree of through-cure of the stencil; simply process the screen and then after washout, rub your finger on the wet stencil on the squeegee side. If the emulsion is soft and easily removed it has not been exposed and the screen is significantly under-exposed.

2. Determining optimum exposure with Photopolymer stencils - Under-exposed Photopolymer stencils are also weak and will quickly break down, so it is important to try and maximise the exposure time without compromising the detail you need to print. It is actually a lot harder to determine the optimum exposure with a Photopolymer stencil than with a Diazo as there is no obvious colour change to help guide you.

Typically the optimum exposure is determined by looking at a combination of resolution and through-cure. Use the Autotype Exposure Calculator for your test exposure and then whilst the stencil is still wet after washout, look for through-cure on the squeegee side. You can either use your finger to gauge softness, or try putting a sheet of unprinted newspaper on the squeegee side and seeing if it sticks to the soft emulsion. The optimum exposure (with respect to print durability) is where all the emulsion has been hardened by the UV light and is not soft on the squeegee side.

Next dry the test screen and check the resolution to make sure it will print the detail that you need. You can refer to the working instructions for the Autotype Exposure Calculator to identify what line width the stencil is resolving at each exposure factor and then check this against your film positive.

Top tip: Always try to make the test exposure 1.5 to 2.0 times higher than the optimum as you want this test stencil to show the effects of both under and over-exposure on the stencil's adhesion and resolution.

21 step Grey Scale (step wedge): It is actually quite difficult to use a 21 step Grey Scale (0.15 density) as a means to determine exposure with either Diazo or Photopolymer stencils. Very small variations in either the washout water temperature or pressure will influence the result giving a false reading. Step wedges can, however, be a useful tool to pick up process drift.

Top tip: In our experience, most stencils are given too little, rather than too much exposure. Increasing the exposure time slightly can often save you time by not having to 'spot out' pinholes caused by minute particles of dust and dirt on the positive.

Summary:

More screens fail due to exposure related problems than any other cause, so it is worth spending a few minutes optimising the exposure time whenever you change your process and it should be the first thing you look at if there is a problem.

Contact us today and see for yourself how our range of products can help you.

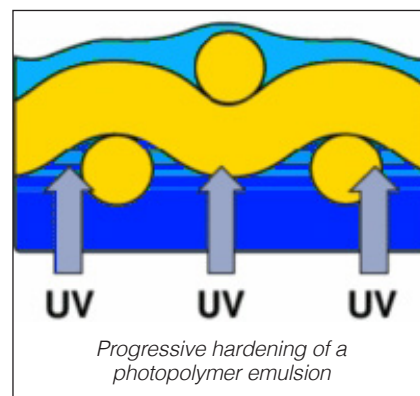
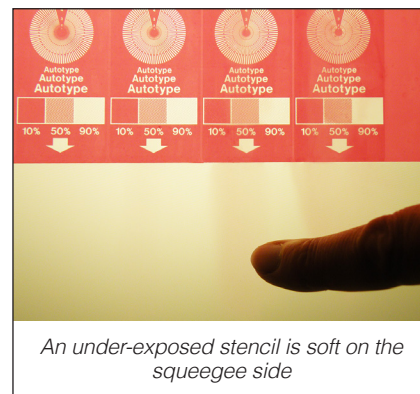
Call: Europe +44 (0)1235 771111

US: 888 910 1008

Asia: +65 (0)643 00701

Email: salesupport@macdermidautotype.com

Local Distributor: macdermid.com/autotype



The information and recommendations contained in the Company's literature or elsewhere are based on knowledge at the time of printing and are believed to be accurate. Whilst such details are printed in good faith they are intended to be a guide only and shall not bind the Company. Due to constant development, customers are urged to obtain up-to-date technical information from representatives of the Company and not to rely exclusively on printed material. Customers are reminded of the importance of obtaining and complying with the instructions for the handling and use of chemicals and materials supplied as the Company cannot accept responsibility for any loss or injury caused through non-compliance.

Automask®, Autosol®, Autostrip®, Capillex® and Five Star® are registered trademarks of MacDermid Autotype Ltd
©2017 MacDermid Autotype Ltd
W06-2017

