



# TECHNICAL BULLETIN

## Pad Printing

### 21 Step Grey Scale Exposure Calibration for DURAPRO

**PROCESS OVERVIEW:**



The **DURAPRO** polymer clichés from **DECO TECH** are precision made using UV sensitive photo-polymer emulsion laminated to a thin steel backing plate. This special photo-polymer emulsion makes the **DURAPRO** clichés easy to process in most standard UV exposure units (a unit equipped with vacuum frame is best). Since all UV exposure units do vary in light intensity, it is necessary to determine the optimum exposure time to create the proper etch depth (usually around 25 microns) of a **DURAPRO** cliché. By using the **PROSERIES** 21 Step Grey Scale, you can properly calibrate the exposure times required for both the first and second exposures of the cliché using the tint screen.

**NOTE:** You should periodically recalibrate your cliché exposing process using the 21 Step Grey Scale, due to decrease in UV bulbs strength over time.

**Required Materials:**

- DURAPRO** Polymer test clichés (Available from DECO TECH at no charge)
- PROSERIES** Screen tint film (recommend 280 line 85%)
- PROSERIES** 21 step grey scale
- PROSERIES** Washout Solution
- PROSERIES** Washout Tank
- PROSERIES** Washout Brush
- PROSERIES** Washout Gloves
- PROSERIES** Anti-static accessories (optional)

**STEP 1 - EXPOSURE:** The 21 step grey scale is a precision made film positive with a series of 21 "steps." These so-called "steps" range from 100% light transmission (transparent) to 0% light transmission (opaque). Every step in the scale is a halftone dot image in which the dots cover a fixed percentage of area and block out a fixed percentage of light. Each step increase corresponds to an additional 5% of light transmission decrease. For example, step 1 equals 100% light transmission and step 21 equals 100% light blockage.

<p><b>1</b> Remove a single <b>DURAPRO</b> test cliché from the black protective bag under "UV safe" light source to prevent pre-exposure of the emulsion by any ambient light sources.</p>	<p><b>3</b> Ensure that all dust and dirt is removed from the 21 step grey scale, as well as the exposure units' blanket &amp; acetate or glass cover. (Figure 2)</p>
<p><b>TECH TIP:</b> Clear or yellow UV sleeves are available from DECO TECH for making your 4 ft. or 8 ft. fluorescent tubes UV safe. Call customer service for details and pricing.</p>	 <p style="text-align: right;">Figure 2</p>
<p><b>2</b> Remove and discard the translucent protective film cover from the test cliché. (Figure 1)</p>  <p style="text-align: right;">Figure 1</p>	<p><b>TECH TIP:</b> To remove dust, it is best to use an anti-static film cleaner or use an anti-static brush.</p>

**4** Lift the vacuum frame and place the test cliché into the center of the UV exposure unit with the clichés emulsion side facing the light source. (Figure 3)



**NOTE:** Depending upon your exposure unit this may be face-up or face-down. On the DECO TECH **X-POSÉ** units this is face-up.

**5** The 21 step grey scale is now placed onto the test cliché with the emulsion side (matte side) facing down and in direct contact with the clichés emulsion side. (Figure 4)



**6** Close the exposure units vacuum frame (cover) over the test cliché and 21 step grey scale.

**7** Turn on the vacuum (Figure 5) and allow the 21 step grey scale to be pulled down into contact with the test cliché and remove any trapped air bubbles. (Figure 6)



**8** Close the exposure unit and set the exposure time to an initial setting of 3 minutes (or 180 seconds). Begin the exposure process.

**9** Once the first exposure is complete, open the exposure unit and bleed off the vacuum to release the test cliché and 21 step grey scale. (Figure 7)



**10** Lift the vacuum frame (acetate) off of the test cliché and remove the 21 step grey scale and test cliché from the exposure unit.

**STEP 2 - WASHOUT AND ETCHING PROCESS:** In this step the unexposed emulsion in the cliché is removed by the **PROSERIES** alcohol based washout solution. This allows the solution to remove all unexposed soft emulsion in the artwork image and creates the actual etching in the cliché. The washout tray should be prepared by filling it with the **PROSERIES** washout solution to a depth of  $\frac{1}{4}$  to  $\frac{1}{2}$  inch. The solution should be at or above room temperature ( $72^{\circ}$  F) for optimum performance results.

**11** Place the exposed **DURAPRO** test cliché into the washout tank filled with our alcohol based washout solution with the emulsion side of the cliché facing up. Let sit in solution for at least 1  $\frac{1}{2}$  minutes. (Figure 8)



**TECH TIP:** The washout solution should be at room temperature or higher. A warmer solution will speed up the processing time. Use caution when warming the alcohol based solution. Do not use an open flame heat source and heat up alcohol solution to a maximum of  $90^{\circ}$ - $100^{\circ}$  F.

**12** Using the **PROSERIES** washout brush, apply light hand pressure and brush the test cliché in a circular motion, brushing for at least 3 minutes (or sufficient amount of time to remove all of the unhardened emulsion.) (Figure 9)



**13** Remove the test cliché from the tank and rinse off the excess fluid by running the cliché under a stream of warm tap water at room temperature for approximately 30 seconds. (Figure 10) This will stop the alcohol from further softening the cliché.



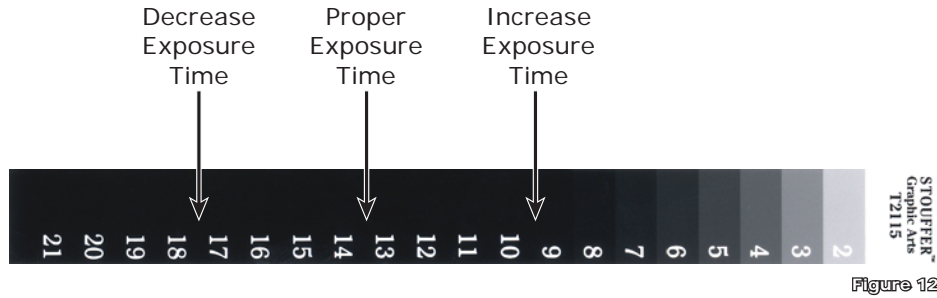
**14** If available, use a compressed air nozzle to blow off the excess water from the etched cliché **NOTE:** This step is optional see tech tip below for alternative. (Figure 11)



**TECH TIP:** Alternate your brush strokes & direction every 10 to 15 seconds and brush the entire cliché surface. Staying in one area will create an uneven depth of the etch.

**TECH TIP:** If compressed air is not available, then pat dry with a paper towel.

**STEP 3 - EXPOSURE TIME DETERMINATION:** To ensure proper cliché life and quality results using the DURAPRO clichés, you will need to get a step value between 13 and 14 on the 21 step grey scale (Figure 12)



<p><b>15</b> Look at the test cliché to see the step pattern that has been etched. If the exposure time you selected (example was 180 seconds) is correct, the step will show a value between 13 and 14 on the scale. If the correct value is not found, use the attached calibration chart to properly calibrate the exposure by increasing or decreasing exposure time.</p>	<p><b>16</b> Repeat the entire process again as many times necessary to obtain the proper calibrated range between 13 and 14 for <b>DURAPRO</b> clichés.</p> <p><b>NOTE:</b> Other brand clichés may require different step settings. The value mentioned in this technical bulletin is for DECO TECH <b>DURAPRO</b> clichés.</p>
<p><b>TECH TIP:</b> If your image is etched to a step <b>GREATER</b> than the 13th step, the exposure time will need to be <b>DECREASED</b>. If your image is etched to a step <b>LOWER</b> than the 13th step, the exposure time will need to be <b>INCREASED</b>.</p>	<p><b>15</b> Once you have determined the correct exposure time, you will use this setting for your exposure of the screen tint film for all your <b>DURAPRO</b> clichés.</p>
<p><b>16</b> If you did not achieve the desired result of a step value between 13 and 14 on the scale, you must adjust your exposure time by estimating the necessary change using the chart below. (Figure 13)</p>	<p><b>TECH TIP:</b> When producing clichés with fine line details, the first exposure may be reduced to minimize the amount of light "undercutting" that may occur. If a reduction of the first exposure time is required, the time value can be reduced up to a maximum of half the original value.</p>

**EXPOSURE ADJUSTMENT CHART:** Use the chart below when making necessary adjustments to exposure time.

Required steps:	Multiply time by:
+6	7.60
+5	5.40
+4	3.90
+3	2.75
+2	2.00
+1	1.40
-1	0.71
-2	0.51
-3	0.36
-4	0.26
-5	0.19
-6	0.13

Figure 13

**Example scenario:** If your last test produced a 9 on the 21 step grey scale at 60 seconds and you need to achieve 13, your new value would be calculated using the chart (Figure 13) as follows: The difference between your initial test value (9) and your desired value (13) is an additional 4 steps (+4). Reference the chart to find the necessary multiplier; +4 shows a multiplier of 3.90. Multiply your initial test exposure time (60) by the given multiplier (3.90) to find your new exposure time. **60 (seconds) x 3.90 = 234 seconds**

**NOTE:** The new value must be retested and further tests beyond that may also be required to fully calibrate the correct exposure time. It may take a total of 5-6 test-size clichés in order to fully calibrate. Do not use full sized production quality clichés for this procedure; a small test cliché (approx. 2" x 5") will be sufficient. Sample size test clichés are available from DECO TECH at no charge (shipping charge will apply if shipped separately.) Call our customer service department **(800) 300-DECO** to request a package of test cliché samples.