DuPont™ ImageMaster™ PHD

Highlight Duplicating Phototool Film

**Description**
PHD-7 is a direct-positive silver halide contacting film designed to make same tone (positive-to-positive or negative-to-negative) reproductions in contact frames utilizing high-intensity UV lamps. It is an ultraviolet-sensitive product that can be handled under bright white (UV-filtered) or yellow room lights.

**Applications**
PHD-7 is suited for making same-size reproductions in contact frames that utilize a high-UV output lamp, such as metal halide, pulsed xenon or mercury vapor. The reproduction will retain the same image tone (black vs. clear) as the original. Through-the-back exposures can be used to retain the original image orientation.

PHD-7 can also be used to make reproductions of diazo originals onto a silver halide film.

**Exposure**
Exposure settings vary widely from one exposure device to another. Exposure settings must be determined experimentally for each exposing device. Through-the-back exposures require approximately 30% more exposure than normal.
Sensitometric Characteristics

PHD-7 developed in PRAD/R for 25 sec at 35°C

Processing

PHD-7 can be processed through most developers with acceptable results. The following developers and processing conditions are recommended for optimum performance:

<table>
<thead>
<tr>
<th>Developer</th>
<th>Development Time (sec)</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-IM</td>
<td>30-45</td>
<td>90-95°F (33-35°C)</td>
</tr>
<tr>
<td>CUFD</td>
<td>30-45</td>
<td>90-95°F (33-35°C)</td>
</tr>
</tbody>
</table>

Fixer temperature should be 0–5°F (0–3°C) less than the developer. Fixing time will be determined by the design of the processor, though usually it is the same as the development time.

Features/Benefits

- Room light handling to allow contacting operations to be conducted without a darkroom to improve efficiency and productivity.
- Excellent line edge acuity for high-quality phototools that produce optimal image transfer to the resist.
- Improved clarity and lower UV density in non-image areas to minimize resist exposure time.
- Outstanding exposure latitude to improve darkroom efficiency and reduce waste.
- Very high image density to reduce pinholes and ensure optimal image transfer to the resist.
- A dimensionally stable structure that utilizes 7-mil polyester base to reduce registration errors and provides sufficient matte to minimize vacuum drawdown time without interfering with resist imaging.
- Permanent antistatic protection to resist the attraction of dirt and dust to polyester-based films and reduce the defects caused by these contaminants.
- Superior developer stability for lower replenishment rates and consistent, easy, carefree processing.
- Easy front-to-back identification to reduce handling errors.

Spectral Sensitivity

Sensitometry should be tested under individual use conditions to determine actual safe handling time.

Safelights Recommendations

PHD-7 can be handled under UV-free white or yellow artificial room light as provided by any of the following sources:

- EncapSulite C20 safelights.
- Illumination Technology Ultra White (UW) or Super White (SW) safelights.
- Gold fluorescent lamps such as those used for dry film resist.
- Low-intensity, unfiltered tungsten lights.

Safelights should be tested under individual use conditions to determine actual safe handling time.
Replenishment Rates
(50% black area)

<table>
<thead>
<tr>
<th></th>
<th>Film Use</th>
<th>Oxidation</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-IM Developer</td>
<td>250 mL/m²</td>
<td>2000 mL/day</td>
</tr>
<tr>
<td></td>
<td>(23 cc/ft²)</td>
<td>(80 mL/hour)</td>
</tr>
<tr>
<td>F-IM Fixer</td>
<td>500 mL/m²</td>
<td>500 mL/day</td>
</tr>
<tr>
<td></td>
<td>(46 cc/ft²)</td>
<td>(20 mL/hour)</td>
</tr>
</tbody>
</table>

**Dimensional Stability**

The final size of a piece of processed film is dependent on the characteristics of the film, the photolab environment, the environment in the resist print area, the conditioning of the film to these areas, and the drying conditions used in the film processor. Preconditioning to the photolab environment before use is recommended for all photographic films.

**Coefficients of Expansion**

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Humidity (%/°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unprocessed</td>
<td>0.0010 0.0012</td>
</tr>
<tr>
<td>Processed</td>
<td>0.0010 0.0011</td>
</tr>
</tbody>
</table>

**Effects of Processing**

The coefficients of expansion are used to predict film size changes due to environmental conditions. They cannot be used to predict size changes due to processing conditions. The after-processing size change of preconditioned film that has dried under optimum conditions can be too small to measure. However, if the film is not conditioned and dried properly, the after-processing size change can be quite large. Run tests to optimize the drying conditions.

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Silver halide and diazo photographic films are considered “articles” under the U.S. OSHA Hazard Communication Regulation [29 CFR 1910.1200], and the Canadian Workplace Hazardous Materials Information System (WHMIS) regulations. They are exempt from the reporting requirements of those regulations and the EPA Toxic Substances Control Act (TSCA) [40 CFR 704.5]. Therefore, no Material Safety Data Sheet (MSDS) is required for this product.

This information corresponds to DuPont’s current knowledge on the subject. It is offered solely to provide possible suggestions for your own experiments and is not intended to substitute for any testing you may need to conduct to determine the suitability of DuPont’s products for your particular purposes. This information may be subject to revision as new knowledge and experience becomes available. Since DuPont cannot anticipate all variations in actual end-use conditions, it makes no warranties and assumes no liability in connection with any use of this information. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any patent right.

Caution: Do not use in medical applications involving permanent implantation in the human body. For other medical applications, see “DuPont Medical Caution Statement”, H-51459.