

# ZONE IMAGING LAB

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## TECHNICAL INFORMATION

# 510 PYRO

LIQUID CONCENTRATE ONE-SHOT USE DEVELOPER FOR LOW VOLUME BLACK AND WHITE FILM PROCESSING IN SPIRAL TANKS, DISHES, TRAYS AND ROTARY PROCESSORS

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### OVERVIEW

510 Pyro, formulated by Jay DeFehr, is an extremely fine grained, high acutance, long shelf-life staining developer giving full film speed with most films and uniquely triple optimised for darkroom silver gelatine printing, alternative UV based printing and scanning with the same development time.

510 Pyro is specifically designed for all slow to medium speed films of ISO 50-200 and the Kodak TMAX and Ilford Delta 400 films though most ISO 400 films will still return good results.

510 Pyro is for maximising sharpness with minimal grain – solving the traditional paradox of a trade-off with sharpness and grain levels – full tonality particularly unrivalled highlight separation given by the inbuilt variable contrast filter obtained from the stain, high micro-contrast and enlargements up to x20 or more.

510 Pyro is supplied as a liquid concentrate diluted for 1:100 one-shot use. However, it can be further diluted for economy though there will be a reduction in image quality and longer development times.

**Note:** an acidic stop bath and hypo clear must not be used with 510 Pyro developed negatives as they destroy the stain. A water stop bath is instead recommended. This developer is not compatible with Bergger Pancro 400.

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### MIXING INSTRUCTIONS

Note that photographic chemicals are not hazardous when used correctly. It is recommended that gloves, eye protection and an apron or overall are worn when handling and mixing all chemicals. Always follow the specific health and safety recommendations on the chemical packaging. Note also that 510 Pyro, as a staining developer, will stain any surface so wipe and thoroughly rinse any spills immediately before the stain sets in. White vinegar or sodium hydroxide bleach helps wash away any stains.

Determine first either the tank size being used or the number of films to be processed. Pour the appropriate volume of water into a mixing vessel (a measuring jug or Paterson cylinder is recommended). Ensure it is at the right temperature.

Measure out the appropriate quantity of concentrate with an oral syringe. Due to the viscosity of 510 Pyro, a regular syringe is not suitable. Add the concentrate and stir thoroughly until you can visually see it has been completely mixed.

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Thoroughly wash all utensils, measuring and mixing vessels after use. Do not reuse them for non-film development related activities. Do not contaminate the developer solution with fixer solution.

### Table of Mixing Instructions

The following table gives a list of all common spiral tank volumes – cross referenced with the amount of water and liquid concentrate required to fill the tank.

TANK SIZE (ML)	DILUTION 1:100 CONCENTRATE/WATER
<b>300</b>	<b>3/300</b>
<b>375</b>	<b>3.75/375</b>
<b>450</b>	<b>4.5/450</b>
<b>500</b>	<b>5/500</b>
<b>600</b>	<b>6/600</b>
<b>1000</b>	<b>10/1000</b>
<b>2000</b>	<b>20/2000</b>

1 litre = 33.81 US fluid ounces

3.8 litre = 1 US gallon

29.6 ml = 1 US fluid ounce.

Note: a minimum of 1ml of 510 Pyro is needed per 80 sq. inches of film. This is one 36 exp. 135, one 120, four 4x5 sheets or one 8x10 sheet.

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## PROCESS SYSTEMS

### Manual processing - spiral tanks

510 Pyro developer can be used to process films in spiral tanks using the recommended dilutions. The recommended developing temperature is 20°C (68°F). It can be used in the temperature range of 18°-24°C (68°-75°F). The recommended development times must be reduced if higher temperatures or extended if lower temperatures are used. Care must be taken with the choice of temperature as very short development times with some films may lead to uneven processing.

Before starting to process, prepare the appropriate volume of all the required solutions according to tank size and number of films to be processed together. The solution volume must be enough to cover all the spirals used. Check the temperature of all the processing solutions and adjust them to be +/- 1°C (2°F) of the temperature being used.

Add the developer to the processing tank. Tap the tank firmly on the work bench to dislodge any air bubbles which may be trapped in the processing spiral after the first minute of initial agitation.

The following agitation method, the *Rudiger Hartung semi-stand*, is recommended for spiral tank processing with 510 Pyro for most films: invert the tank continuously for a minute then ONE agitation at the 10<sup>th</sup>, 20<sup>th</sup> and 30<sup>th</sup> minute mark etc if applicable. At the end of each agitation sequence, tap the tank firmly on the work bench to dislodge any air bubbles which may be trapped in the processing spiral.

The remainder of films will follow standard *Ilford* agitation method or a custom method unique to them. Such films will be marked out in the following section “Development Times”.

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Drain off the developer 5-10 seconds (depending on the size of the tank) before the end of the development time and then immediately fill the tank with the water bath to stop development.

Fix with a neutral or alkaline fixer – an acidic one like Ilford Rapid can be used but is not recommended as it negatively affects the stain slightly.

### Dish (tray) processing – Sheet film format

510 Pyro developer can be used to process sheet film in dishes (trays) at the recommended temperature of 20-21°C (68-70°F). Higher temperatures are not recommended as the development times may become too short and lead to uneven processing.

Before starting to process, prepare the required volume of solutions according to dish (tray) size used and number of films to be processed. The solution volume must be enough to cover the sheet film completely during processing. Check the temperatures of all the process solutions and adjust them to be  $\pm 1^\circ\text{C}$  ( $2^\circ\text{F}$ ) of the temperature being used.

When dish / tray processing continuous agitation is used, which is recommended, immerse the film completely in the developer and gently rock the dish from side to side taking care to avoid any spillage. This method of agitation is used for all subsequent processing steps. Remove the film from the dish /tray 10 seconds before the end of the development time and allow developer to drain from its surface before placing it in the water bath.

### Rotary Tube Processors

Rotary tube processors have very similar processing conditions to spiral tank processing by hand, except they process with small amounts of solution using continuous agitation and can be pre-programmed. 510 Pyro developer can be used to process films in rotary processors using recommended dilutions at 20-21°C (68-70°F).

Follow any guidance given by the processor manufacturer. However, generally we do not recommend using a pre-soak unless stated as it can lead to uneven development.

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## DEVELOPING TIMES

### Spiral Tanks

The following tables of development times shown below give an approximate starting point for 510 Pyro when general purpose black and white camera films are being developed in spiral tanks with *Rudiger Hartung semi-stand* agitation (see above), *Ilford* agitation and *custom* agitation.

The development times are for films rated at an appropriate EI rating, marked in bold, for the developer (please note the ones that are rated less than the box rating). They should produce negatives of normal contrast, typically around a Gbar of 0.62, and simultaneously lower for scanning and higher for alternative UV printing processes. However, they are only a guide and may need to be adjusted to suit individual processing systems, working practices and preferences.

Most films have times for N+/- development if such are required.

***Rudiger Hartung's Semi-Stand Agitation @20°C (68°F) – one minute initial, one agitation at the 10<sup>th</sup>, 20<sup>th</sup>... minute mark***

Use Rudiger's times below or modified with the time conversion chart at the bottom if some are too long for your liking. **DO NOT USE MASSIVE DEV CHART, most times are incorrect.**

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<b>Measured speed</b>	<b>ISO 32</b>						
Contrast adjustment	N-3	N-2	N-1	<b>N</b>	N+1	N+2	N+3
ISO				<b>32</b>			
<b>Iford Pan F+</b>				<b>11:30</b>			
<b>Measured speed</b>	<b>ISO 50</b>						
Contrast adjustment	N-3	N-2	N-1	<b>N</b>	N+1	N+2	N+3
ISO	16	20	32	<b>50</b>	80	125	160
<b>Adox Silvermax</b>	10:15	11:30	13:00	<b>15:20</b>	19:00	23:15	32:15
<b>Measured speed</b>	<b>ISO 64</b>						
Contrast adjustment	N-3	N-2	N-1	<b>N</b>	N+1	N+2	N+3
ISO	20	25	40	<b>64</b>	100	160	200
<b>Kodak Tmax 100</b>	11:15	13:15	16:00	<b>20:00</b>	27:30	42:30	95:00
<b>Measured speed</b>	<b>ISO 80</b>						
Contrast adjustment	N-3	N-2	N-1	<b>N</b>	N+1	N+2	N+3
ISO	25	32	50	<b>80</b>	125	200	250
<b>Fomapan 100, Kosmo Foto Mono, Lomography Earl Grey, Arista EDU Ultra</b>	06:45	08:20	09:15	<b>10:30</b>	13:30	18:30	26:30
<b>Measured speed</b>	<b>ISO 100</b>						
Contrast adjustment	N-3	N-2	N-1	<b>N</b>	N+1	N+2	N+3
ISO	32	40	64	<b>100</b>	160	250	320
<b>Agfa APX 100, Kentmere 100, Adox CHM 100, Rollei RPX 100</b>	09:45	11:00	12:45	<b>15:00</b>	18:00	22:45	30:30
<b>Acros 100</b>	10:00	11:30	13:15	<b>15:30</b>	19:00	24:45	35:15
<b>Iford Delta 100</b>	09:15	10:30	12:00	<b>14:30</b>	18:00	23:45	34:45
<b>Fomapan 200 @100, Arista EDU Ultra 200 @100</b>	06:45	07:45	09:15	<b>11:15</b>	14:45	22:30	---
<b>Measured speed</b>	<b>ISO 125</b>						
Contrast adjustment	N-3	N-2	N-1	<b>N</b>	N+1	N+2	N+3
ISO	40	50	80	<b>125</b>	200	320	400

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<b>Adox CHM 125, Ilford FP4+</b>	12:30	14:30	17:15	<b>20:25</b>	25:10	30:45	38:00
<b>Kodak Double XX, Cinestill BwXX (presoak for a few minutes prior)</b>				<b>16:00</b>			
<b>Measured speed</b>	<b>ISO 400</b>						
Contrast adjustment	N-3	N-2	N-1	<b>N</b>	N+1	N+2	N+3
ISO	125	160	320	<b>400</b>	500	800	1250
<b>Agfa APX 400, Kentmere 400, Adox CHM 400, Rollei RPX 400</b>	12:00	14:15	16:45	<b>20:30</b>	27:30	43:15	---
<b>Kodak Tmax 400</b>	14:45	19:45	24:15	<b>30:45</b>	39:45	52:15	72:15
<b>Ilford Delta 400</b>	13:15	15:00	17:45	<b>22:00</b>	28:00	39:15	62:15
<b>Kodak Tri X</b>	10:00	11:15	13:30	<b>16:25</b>	21:00	29:30	48:20

Time conversion chart for shorter development times with RH's development technique:

<b>Agitation technique: once every...</b>	<b>Factor</b>
10 minutes	x1
5 minutes	x0.71
1 minute	x0.57
30 seconds	x0.5

### *Ilford Agitation @20°C (68°F)*

<b>Film</b>	<b>Measured speed (ISO)</b>	<b>Dilution</b>	<b>Time (minutes)</b>
<b>Adox CHS 100ii</b>	<b>100</b>	<b>1:100</b>	<b>8:00</b>
<b>Ilford Delta 3200</b>	<b>3200</b>	<b>1:100</b>	<b>13:30</b>
<b>Ilford HP5+, Street Candy</b>	<b>400</b>	<b>1:100</b>	<b>9:00</b>
<b>Ilford Ortho Plus</b>	<b>80</b>	<b>1:100</b>	<b>10:30</b>
<b>Kodak TMax P3200</b>	<b>3200</b>	<b>1:100</b>	<b>17:30</b>

For processing at other temperatures, increase the given times by 10% for each 1°C drop in temperature and decrease the given development times by 10% for each 1°C rise in temperature.

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### *Custom @20°C (68°F)*

#### Rollei RPK 25 @25

Use 1:150, 1 minute initial agitation then once every minute for a total 8:45 minutes.

#### Rollei Blackbird Creative @64

Use 1:300, 30 seconds initial agitation then for 10 seconds every 7 minutes after for total 22:45 minutes.

#### CatLABS X 80 @32

Use 1:100, 1 minute initial agitation then for 10 seconds every 3 minutes after for total 14 minutes.

### **Rotary Tube Processors/Tray (continuous agitation)**

The following development times are for films rated at an appropriate EI rating, marked in bold, for the developer (please note the ones that are rated less than the box rating). They should produce negatives of normal contrast, typically around a Gbar of 0.62, and simultaneously lower for scanning and higher for alternative UV printing processes. However, they are only a guide and may need to be adjusted to suit individual processing systems, working practices and preferences.

Note: A few require pre-soaking for 3-5 minutes and/or not at the standard 1:100 dilution and such are marked below.

<b>Film</b>	<b>Measured speed</b>	<b>Temperature (°C)</b>	<b>Dilution</b>	<b>Time (minutes)</b>
<b>Adox CHM 100</b>	<b>100</b>	<b>21</b>	<b>1:100</b>	<b>9:00</b>
<b>Adox CHM 100</b>	<b>200</b>	<b>21</b>	<b>1:100</b>	<b>12:30</b>
<b>Adox CHM 125</b>	<b>125</b>	<b>21</b>	<b>1:100</b>	<b>8:30</b>
<b>Adox CHM 400</b>	<b>400</b>	<b>21</b>	<b>1:100</b>	<b>8:30</b>
<b>Adox CHM 400</b>	<b>1600</b>	<b>21</b>	<b>1:100</b>	<b>19:00</b>
<b>Adox CHS 25</b>	<b>16</b>	<b>21</b>	<b>1:100</b>	<b>5:00</b>
<b>AgfaPhoto APX 100</b>	<b>100</b>	<b>21</b>	<b>1:100</b>	<b>9:00</b>
<b>AgfaPhoto APX 100</b>	<b>200</b>	<b>21</b>	<b>1:100</b>	<b>12:30</b>
<b>AgfaPhoto APX 400</b>	<b>400</b>	<b>21</b>	<b>1:100</b>	<b>8:30</b>
<b>AgfaPhoto APX 400</b>	<b>1600</b>	<b>21</b>	<b>1:100</b>	<b>19:00</b>
<b>Arista EDU Ultra 100 (presoak)</b>	<b>50</b>	<b>21</b>	<b>1:100</b>	<b>7:15</b>
<b>Arista EDU Ultra 200</b>	<b>200</b>	<b>21</b>	<b>1:100</b>	<b>6:00</b>

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<b>CatLABS X 80</b>	<b>32</b>	<b>21</b>	<b>1:100</b>	<b>10:00</b>
<b>Efke 100</b>	<b>100</b>	<b>21</b>	<b>1:100</b>	<b>6:00</b>
<b>Efke 25</b>	<b>16</b>	<b>21</b>	<b>1:100</b>	<b>5:00</b>
<b>Fomapan 100 (presoak)</b>	<b>50</b>	<b>21</b>	<b>1:100</b>	<b>7:15</b>
<b>Fomapan 200</b>	<b>200</b>	<b>21</b>	<b>1:100</b>	<b>6:00</b>
<b>Fuji Neopan Acros (II)</b>	<b>100</b>	<b>21</b>	<b>1:100</b>	<b>6:00</b>
<b>Fuji Neopan 400</b>	<b>400</b>	<b>21</b>	<b>1:100</b>	<b>7:30</b>
<b>Fuji Neopan 400</b>	<b>800</b>	<b>21</b>	<b>1:100</b>	<b>10:00</b>
<b>Fuji Neopan 1600</b>	<b>1600</b>	<b>21</b>	<b>1:100</b>	<b>6:30</b>
<b>Iford Delta 100</b>	<b>100</b>	<b>21</b>	<b>1:100</b>	<b>8:30</b>
<b>Iford Delta 400</b>	<b>400</b>	<b>21</b>	<b>1:100</b>	<b>9:30</b>
<b>Iford Delta 3200</b>	<b>3200</b>	<b>21</b>	<b>1:100</b>	<b>10:30</b>
<b>Iford FP4+</b>	<b>125</b>	<b>21</b>	<b>1:100</b>	<b>8:30</b>
<b>Iford HP5+</b>	<b>400</b>	<b>21</b>	<b>1:100</b>	<b>7:30</b>
<b>Iford Pan F+</b>	<b>50</b>	<b>21</b>	<b>1:100</b>	<b>6:30</b>
<b>Iford Ortho Plus</b>	<b>80</b>	<b>21</b>	<b>1:100</b>	<b>8:00</b>
<b>Iford SFX</b>	<b>200</b>	<b>21</b>	<b>1:100</b>	<b>10:00</b>
<b>Kentmere 100</b>	<b>100</b>	<b>21</b>	<b>1:100</b>	<b>9:00</b>
<b>Kentmere 100</b>	<b>200</b>	<b>21</b>	<b>1:100</b>	<b>12:30</b>
<b>Kentmere 400</b>	<b>400</b>	<b>21</b>	<b>1:100</b>	<b>8:30</b>
<b>Kentmere 400</b>	<b>1600</b>	<b>21</b>	<b>1:100</b>	<b>19:00</b>
<b>Kodak Prof. Plus X</b>	<b>125</b>	<b>21</b>	<b>1:100</b>	<b>5:00</b>
<b>Kodak Prof. HIE High Speed Infrared</b>	<b>200</b>	<b>21</b>	<b>1:100</b>	<b>7:30</b>
<b>Kodak TMax 100</b>	<b>100</b>	<b>21</b>	<b>1:100</b>	<b>8:50</b>
<b>Kodak TMax 400</b>	<b>400</b>	<b>21</b>	<b>1:100</b>	<b>7:00</b>
<b>Kodak TMax P3200</b>	<b>3200</b>	<b>21</b>	<b>1:100</b>	<b>13:30</b>

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<b>Kodak Tri X Pan 400 (old)</b>	<b>400</b>	<b>21</b>	<b>1:100</b>	<b>7:30</b>
<b>Kodak Tri X</b>	<b>400</b>	<b>21</b>	<b>1:100</b>	<b>6:15</b>
<b>Kodak Tri X (presoak)</b>	<b>800</b>	<b>21</b>	<b>1:100</b>	<b>10:00</b>
<b>Kodak Tri X (presoak)</b>	<b>1600</b>	<b>21</b>	<b>1:100</b>	<b>16:15</b>
<b>Kosmo Foto Mono (presoak)</b>	<b>50</b>	<b>21</b>	<b>1:100</b>	<b>7:15</b>
<b>Lomography Earl Grey (presoak)</b>	<b>50</b>	<b>21</b>	<b>1:100</b>	<b>7:15</b>
<b>Lomography Lady Grey</b>	<b>400</b>	<b>21</b>	<b>1:150</b>	<b>15:00</b>
<b>Polypan F</b>	<b>50</b>	<b>21</b>	<b>1:100</b>	<b>6:30</b>
<b>Rollei Retro 100</b>	<b>100</b>	<b>21</b>	<b>1:100</b>	<b>8:10</b>
<b>Rollei Retro 400</b>	<b>320</b>	<b>21</b>	<b>1:100</b>	<b>10:00</b>
<b>Rollei RPX 100</b>	<b>100</b>	<b>21</b>	<b>1:100</b>	<b>9:00</b>
<b>Rollei RPX 100</b>	<b>200</b>	<b>21</b>	<b>1:100</b>	<b>12:30</b>
<b>Rollei RPX 400</b>	<b>400</b>	<b>21</b>	<b>1:100</b>	<b>8:30</b>
<b>Rollei RPX 400</b>	<b>1600</b>	<b>21</b>	<b>1:100</b>	<b>19:00</b>
<b>Street Candy ATM 400</b>	<b>400</b>	<b>21</b>	<b>1:100</b>	<b>7:30</b>
<b>Ultrafine Xtreme 100</b>	<b>200</b>	<b>21</b>	<b>1:100</b>	<b>15:00</b>

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### REUSING DEVELOPER AND WORKING SOLUTION LIFE

510 Pyro working strength solutions should not be reused. Use once and discard. The working strength solution should not be kept for more than 2 hours. Make up fresh developer each time it is needed and discard it after the processing session.

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### STOP, FIX, WASH AND RINSE

For best results it is recommended that all process solutions are kept at the same temperature or at least within 5°C (9°F) of the developer temperature.

### Water Stop Bath

After development, acidic stop bath must not be used as it destroys the stain; water is recommended to be used in place. Agitate continuously in water for a minute. If you wish to minimise the pyro stain



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colouring the fixer, you may give a second short rinse but the stain will not affect the fixer ability to function.

### Fixer

Acidic fixers can be used but are not recommended as it slightly negatively affects stain. Neutral fixers and alkaline fixers are instead recommended – alkaline being specifically designed for pyro staining developers for more stain formation. Neutral fixers include Fotospeed FX30, Rollei RXN, Bellini Eco Fix and Bergger BerFix. Alkaline fixers include Photographers' Formulary TF4 and Moersch ATS.

At time of writing, retailers of such fixers include but not limited to: Silverprint, Firstcall, Still Photographic, Fotoimpex, Fotospeed, Bristol Cameras, Speed Graphic and Maco.

Please follow the fixing instructions by the manufacturers of each respective fixer.

### Wash

Wash the films in running water for 5–10 minutes at a temperature within 5°C (9°F) of the process temperature. Or see note below for greater economy when using spiral tanks.

Note: For spiral tank use, the following Ilford Optimum Permanence method of washing is recommended. This method of washing is faster, uses less water yet still gives negatives suitable for long term storage. After fixing, fill the spiral tank with water at the same temperature, +/- 5°C (9°F), as the processing solutions and invert it five times (leave to stand for 5 minutes). Drain the water away and refill. Invert the tank ten times (leave to stand for 5 minutes). Once more drain the water away and refill. Finally, invert the tank twenty times (leave to stand for 5 minutes) and drain the water away. The part in brackets is optional but was put forward by Ilford's engineer that came up with this method as more archival, but it was written out for simplicity.

### Rinse

For a final rinse use ILFORD ILFOTOL wetting agent added to water, it helps the film to dry rapidly and evenly. Start by using 5ml per litre of rinse water (1+200), however the amount of ILFOTOL used may need some adjustment depending on the local water quality and drying method. Too little or too much wetting agent can lead to uneven drying. Remove excess rinse solution from the film before drying.

### Drying

To avoid drying marks, use a clean chamois cloth to wipe the film before hanging it to dry. Dry at 30–40°C/86–104°F in a drying cabinet or at room temperature in a clean dust-free area.

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## STORAGE

Moisture is most damaging to 510 Pyro shelf life. Always store chemicals in their original containers and away from unsupervised children and pets. In cool, dry conditions, 4–20°C (44–68°F) 510 Pyro developer concentrate should keep in good condition for:

10 years in full tightly capped bottles.

5-6 years in half full tightly capped bottles.

510 Pyro darkens with age to a deep dark brown, this does not affect the developer.

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### **AVAILABILITY AND CAPACITY**

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510 Pyro is available in 100ml and 500ml bottles currently in the UK and 100ml bottles in the USA only. Distributed by Zone Imaging Lab and Bostick & Sullivan respectively.

Used at 1+100 for one shot processing in a Paterson spiral tank, a 100ml bottle will develop 30x 135/36 films.