KODAK PROFESSIONAL DURAFLO RT Developer Replenisher

DURAFLO RT Developer Replenisher is designed to provide moderately fine grain, good process stability, and better resistance to aerial oxidation. This developer features a hardener to prevent emulsion damage in the first developer tank of a roller-transport processor.

Notice: Observe precautionary information on product labels and on Material Safety Data Sheets.

Process Specifications

This data is for a processor that allows a range of development times using temperature control as follows:

Developer	80 ± 1/2°F (26.5 ± 0.3°C)
Fixer	80°F (27°C) nominal
Wash	70 to 75°F (21 to 24°C)
Dryer	105 to 140°F (40.5 to 60°C)

Higher dryer temperatures, 135 to 140°F (57 to 60°C), may be necessary for drying sheet films only. If only roll films are being processed, a lower temperature will generally be adequate. A low dryer setting, 95 to 110°F (35 to 43°C), will aid in preventing drying spots produced by rapid drying.

Process Alternatives

Mixing instructions and replenishment rates are given for both standard and alternate dilutions of DURAFLO RT Developer.

The standard processing recommendations provided produce the maximum improvement in developer characteristics, such as:

- Moderately fine grain
- Good process stability
- Resistance to aerial oxidation.

The alternate processing recommendations will provide advantages to some users who may have systems with high evaporation rates or low utilization.

The alternate recommendations use a replenisher and working-strength developer that is 70 percent of the standard concentration. The replenishment rate is set at a correspondingly higher rate so the net cost per square foot of processed film is the same as with the standard recommendations.

Advantages of the Alternate Recommendations:

1. The higher replenishment rate (143 percent of standard) provides a greater flushing action and keeps the developer tank cleaner. Development by-products and dissolved silver compounds, which can transfer onto rollers and tank walls, are kept at a lower concentration in the developer tank.
2. Unlike most developers, this developer provides a more active developing solution at 70 percent of its standard concentration. This allows a slightly faster machine speed for some films.
3. With some types of film a lower D-min is obtained by using the more dilute developer.

MIXING INSTRUCTIONS

Part A: 5-gal (18.9 L) flexible container

Part B: 5-gal (18.9 L) flexible container

Caution

Follow these instructions carefully. Part A MUST be diluted before part B is mixed in; this will avoid precipitation of some of the developer components.

Percent Concentrate and Percent Water of Mixed Solution

	Water	Part A	Part B	Starter
Standard Recommendation				
Developer Replenisher	50	25	25	0
Developer (Start-up)*	53.1	22.9	22.9	1.1
Alternate Recommendation				
Developer Replenisher	65	17.5	17.5	0
Developer (Start-up)*	67.23	16.0	16.0	0.77

* Working Strength Solution

Mixing Developer Replenisher

To make 20 gallons (75.7 litres) of standard dilution or 28.6 gallons (108.3 litres) of alternate dilution DURAFLO RT Developer Replenisher:

1. Start with 8 gallons (30.3 litres) of water.
2. Add 5 gallons (one flexible container) (18.9 litres) of Part A.
3. Mix for 1 minute.
4. Add 5 gallons (one flexible container) (18.9 litres) of Part B.
5. Add water to bring total volume to 20 gallons (75.7 litres) standard OR 28.6 gallons (108.3 litres) alternate dilution
6. Mix for 2 minutes.

Mixing Standard Developer (Start-up)

Working-Strength Developer (Start-up) from Developer Replenisher

Specific Volumes (Standard Dilution) From Developer Replenisher

To Make This Volume of Developer Working Solution	Start With This Volume of Developer Replenisher	Add This Volume of Developer Starter	And Add This Volume of Water
1 gallon (3.8 litres)	117.33 fl oz (3.47 litres)	1.41 fl oz (41.7 mL)	9.26 fl oz (274 mL)

Working-Strength Developer (Start-up) from Concentrate

For each gallon of developer:

1. Start with 1/2 gallon (1.9 L) of water.
2. Add 29.3 fl oz (866 mL) of Part A.
3. Mix for 1 minute.
4. Add 29.3 fl oz (866 mL) of Part B.
5. Mix for 1 minute.
6. Add 1.41 fl oz (41.7 mL) of starter.
7. Add 4 fl oz (118.3 mL) of water to bring total volume to 1 gallon (3.8 L).

Mixing Alternate Developer (Start-up)

Working-Strength Developer (Start-up) from Developer Replenisher

Specific Volumes (Standard Dilution) From Developer Replenisher

To Make This Volume of Developer Working Solution	Start With This Volume of Developer Replenisher	Add This Volume of Developer Starter	And Add This Volume of Water
1 gallon (3.8 litres)	117.33 fl oz (3.47 litres)	1.0 fl oz (29.6 mL)	9.68 fl oz (286 mL)

Working-Strength Developer (Start-up) from Concentrate

1. Start with 1/2 gallon (1.9 L) of water.
2. Add 20.5 fl oz (606 mL) of Part A.
3. Mix for 1 minute.
4. Add 20.5 fl oz (606 mL) of Part B.
5. Mix for 1 minute.
6. Add 1.0 fl oz (29.6 mL) of starter.
7. Add 22 fl oz (650 mL) of water to bring total volume to 1 gallon (3.8 L).

PROCESSING

The following table lists starting-point development times for several black-and-white films in standard and alternate dilutions of DURAFLO RT Developer at 80°F (26°C). Differences in machine type, design, agitation rate, film path, etc., will affect the actual development time required; therefore, specific machine speeds are not indicated. Measure the development time from the time the leading edge of the film enters the developer to the time that edge enters the fixer.

These starting-point recommendations are intended to produce a contrast index of 0.56, using a diffusion enlarger on grade 2 paper.

Processing in a KODAK VERSAMAT Processor

Processing Steps and Conditions for KODAK VERSAMAT Film Processors

Step	No. of Racks	Path Length		Temperature
		Model 11	Models 5 and 411	
Develop	2	8.5 ft (2.6 m)	4 ft (1.2 m)	80 ± 0.5°F (26.5 ± 0.3°C)
Fix	3	12 ft (3.8 m)	6 ft (1.9 m)	80°F (26.5) nominal
Wash	2	8 ft (2.4 m)	4 ft (1.2 m)	70 to 75°F (21 to 24°C)
Dry		8 ft (2.4 m)	4 ft (1.2 m)	105 to 140°F (40.5 to 60°C)

KODAK PROFESSIONAL PLUS-X 125 Film

Processor	Machine Speed
KODAK VERSAMAT Film Processor, Models 5 and 411	4.0 ft (1.2 m) per minute
KODAK VERSAMAT Film Processor, Model 11	8.5 ft (2.6 m) per minute

KODAK PROFESSIONAL TRI-X 400 and 320 Films

Processor	Machine Speed		
	TRI-X 400 Film	TRI-X 320 Film Rolls	TRI-X 320 Film Sheets
KODAK VERSAMAT Film Processor, Models 5 and 411	3.2 ft per minute	2.3 ft per minute	3.5 ft per minute
KODAK VERSAMAT Film Processor, Model 11	6.9 ft per minute	4.8 ft per minute	7.3 ft per minute

KODAK PROFESSIONAL T-MAX 100 and 400 Films

Processor	Machine Speed	
	T-MAX 100 Film	T-MAX 400 Film
KODAK VERSAMAT Film Processor, Models 5 and 411	2.5 ft (0.8 m) per minute	2.6 ft (0.8 m) per minute
KODAK VERSAMAT Film Processor, Model 11	5.3 ft (1.6 m) per minute	5.5 ft (1.7 m) per minute

KODAK PROFESSIONAL T-MAX P3200 Film

EI	Machine Speed
KODAK VERSAMAT Film Processor, Models 5 and 411	
800	2.2 ft (0.7 m) per minute
1600	2.0 ft (0.6 m) per minute
3200	1.7 ft (0.5 m) per minute
6400	1.5 ft (0.5 m) per minute
KODAK VERSAMAT Film Processor, Model 11	
800	4.5 ft (1.4 m) per minute
1600	4.0 ft (1.2 m) per minute
3200	3.5 ft (1.1 m) per minute
6400	3.0 ft (0.9 m) per minute

You may need to use higher dryer temperatures (135 to 140°F [57 to 60°C]) to dry several sheet films processed in succession. If you are processing only roll films, a lower temperature will be adequate.

Processing Conditions for Other Roller-Transport Processors

Adjust the machine speed so that the development time for normally exposed film is approximately:

KODAK PROFESSIONAL Film	Development Time
PLUS-X 125 Film / 125PX	60 seconds
TRI-X 400 Film / 400TX	74 seconds
TRI-X 320 Film / 320TX (rolls)	106 seconds
TRI-X 320 Film / 320TX (sheets)	70 seconds
T-MAX 100 Film / 100TMX	97 seconds
T-MAX 400 Film / 400TMY	85 seconds
T-MAX P3200 Film / P3200TMZ EI800 EI1600 EI3200 EI6400	 109 seconds 120 seconds 141 seconds 160 seconds

The development time is measured from the time the film enters the developer to the time it enters the fixer. Differences in machine design that affect agitation and crossover times from one tank to the next may require development-time adjustments.

REPLENISHMENT RATES

Standard Dilution: Because most film loads will consist of a variety of film types, use an average replenishment rate of 0.20 mL/in^2 (29 mL/ft^2 or 312 mL/m^2) of film processed.
Alternate Dilution: Use a replenishment rate of 42 mL/ft^2 (452 mL/m^2). These replenishment rates consume equal amounts of developer replenisher concentrate per square inch or square centimeter of film. Therefore, the operating cost of the alternate recommendation is the same as that of the standard recommendation.

These rates are based on processed film with an average net density of 0.80.

KODAK PROFESSIONAL DURAFLO RT Developer Replenisher

Note: These replenishment rates are suggested for normal utilization. Systems with low utilization may require increased replenishment rates.

To calculate the replenishment rate for each solution, use this formula:

$$\text{Replenishment Rate} = \frac{\text{Amount of replenisher used (mL)}}{\text{Amount of film processed (ft}^2\text{ or m}^2\text{)}}$$

To determine the amount of replenisher used, measure the volume of replenisher at start-up and shut-down, and take the difference. From that value, subtract the volume used for pump calibrations and waste. This is the actual volume of replenisher used to process film. Use the table below to determine the total volume of film processed in square feet or square metres. Divide the volume of replenisher used by the total volume of film processed.

Equivalent Areas for Film Formats

Film Size/ Format	Area / ft^2	Area / m^2
4 x 5 sheets	0.139	0.0129
5 x 7 sheets	0.243	0.0226
8 x 10 sheets	0.556	0.0516
11 x 14 sheets	1.070	0.099
135-24	0.420	0.0391
135-36	0.592	0.0551
120	0.543	0.0504
220	1.094	0.102

PROCESS CONTROL

Use KODAK Black-and-White Process Control Strips. For more information, refer to Kodak publication Z-133E, *Monitoring and Troubleshooting KODAK Black-and White Film Processes*.

SOLUTION LIFE

Condition	Solution Storage Life
Storage tank with floating cover	4 weeks
Storage tank without floating cover	Not recommended
Processor tank: 50 - 80°F (10 - 27°C) room temperature, processor OFF	3 weeks
Processor tank: 50 - 80°F (10 - 27°C) room temperature, processor ON	4 days
Processor tank: normal film load, processing 6 - 8 hours/ day, normal replenishment	Indefinitely

Note: Drain, clean, and refill all tanks every 4 weeks.

MORE INFORMATION

Kodak has many publications to assist you with information on Kodak products, equipment, and materials.

Additional information is available on the Kodak website.

The following publications are available from Kodak Customer Service and from dealers who sell Kodak products, or you can contact Kodak in your country for more information.

E-30	*Storage and Care of KODAK Photographic Materials—Before and After Processing*
F-4016	*KODAK PROFESSIONAL T-MAX Films*
F-4017	*KODAK PROFESSIONAL TRI-X 320 and 400 Films*
F-4018	*KODAK PROFESSIONAL PLUS-X Film*

For the latest version of technical support publications for KODAK PROFESSIONAL Products, visit Kodak on-line at:
http://www.kodak.com/go/professional

If you have questions about KODAK PROFESSIONAL Products, call Kodak.
In the U.S.A.:
1-800-242-2424, Ext. 19, Monday–Friday
9 a.m.–7 p.m. (Eastern time)
In Canada:
1-800-465-6325, Monday–Friday
8 a.m.–5 p.m. (Eastern time)

Note: The Kodak materials described in this publication are available from dealers who supply Kodak products. You can use other materials, but you may not obtain similar results.

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