



# KODAK HC-110 Developer

## DESCRIPTION

KODAK HC-110 Developer is a highly concentrated liquid developer. It is intended for use with a variety of black-and-white films, some graphic-arts films, and some glass plates.

It can be used for replenished and non-replenished systems. Use KODAK HC-110 Developer Replenisher to replenish.

FEATURES	BENEFITS
• Highly active	• Short development times
• Liquid concentrate	• Easy mixing
• Clean solution	• Cleaner tanks, racks, and reels; less equipment maintenance
• Long solution life	• Fewer chemical dumps; less waste
• Stable solutions	• Easy process control, even with low utilization
• Quality of stock solutions maintained over a long time	• Good shelf life

## PREPARING WORKING SOLUTIONS

You can prepare HC-110 Developer working solutions by diluting stock solution or concentrate. (Both mixing methods provide the same photographic characteristics.)

To prepare *stock solution*, dilute one part concentrate with three parts water. To prepare *working solutions*, dilute stock solution or concentrate according to the following tables. Mix either stock or working solutions at a temperature between 10 and 32°C (50 and 90°F).

Take care when measuring the concentrate, because of its viscosity. Follow these recommendations for handling.

- Pour the concentrate slowly to avoid air bubbles. If air bubbles form, wait for them to dissipate before measuring the concentrate.
- Wait for the concentrate to run down the sides of the measuring container. (The concentrate will adhere to the sides of a graduated cylinder.)
- When measuring small amounts of concentrate, use a graduated cylinder accurate to 0.5 millilitre. (To simplify measuring small amounts, use a positive-displacement method such as a syringe.)
- Rinse the measuring container with water at least five times, and pour each rinse into the mixing container. This ensures that all the concentrate is dissolved in the water.
- Mix the solution for several minutes until the concentrate is fully dissolved.



### Caution

KODAK HC-110 Developer is a highly concentrated liquid that you must dilute before use. The following tables provide dilution instructions on preparing working solutions from **either** stock solution **or** concentrate. *Exercise caution when following the mixing instructions in the tables, being certain not to intermingle their data.* Follow normal safety precautions whenever working with chemicals to avoid possible physical harm.

**PREPARING WORKING SOLUTIONS FROM STOCK SOLUTION\***

To Mix Working Solution		Add This Amount of Stock Solution†	To This Amount of Water†	Ratio of Stock Solution to Water
Dilution	Amount			
A	300 mL	75 mL	225 mL	1:3
	500 mL	125 mL	375 mL	
	1 qt	236 mL (8 fl oz)	708 mL (24 fl oz)	
	1 L	250 mL	750 mL	
	5 L	1.25 L	3.75 L	
	7.6 L (2 gal)	1.9 L (2 qt)	5.7 L (6 qt)	
18.9 L (5 gal)	4.73 L (5 qt)	14.17 L (15 qt)		
B	300 mL	38 mL	262 mL	1:7
	500 mL	63 mL	437 mL	
	1 qt	118 mL (4 fl oz)	826 mL (28 fl oz)	
	1 L	125 mL	875 mL	
	5 L	625 mL	4.38 L	
	7.6 L (2 gal)	950 mL (1 qt)	6.65 L (7 qt)	
18.9 L (5 gal)	2.36 L (2.5 qt)	16.54 L (17.5 qt)		
C	7.6 L (2 gal)	1.54 L (52 fl oz)	6.08 L (6 qt 13 fl oz)	1:4
	18.9 L (5 gal)	3.78 L (4 qt)	15.12 L (16 qt)	
D	7.6 L (2 gal)	770 mL (26 fl oz)	6.84 L (7 qt 6 fl oz)	1:9
	18.9 L (5 gal)	1.89 L (2 qt)	17.01 L (18 qt)	
E	7.6 L (2 gal)	630 mL (21 fl oz)	6.97 L (7 qt 11 fl oz)	1:11
	18.9 L (5 gal)	1.58 L (1 qt 11 fl oz)	17.32 L (18 qt 21 fl oz)	
F	7.6 L (2 gal)	380 mL (13 fl oz)	7.22 L (7 qt 19 fl oz)	1:19
	18.9 L (5 gal)	950 mL (1 qt)	17.95 L (19 qt)	

\* **IMPORTANT NOTE:** Due to the high viscosity of the developer concentrate, it is preferable to dilute it to a *stock solution*. This may be a more convenient way to store the chemical for future preparation into a *working solution*, per the above instructions.

† Due to rounding of decimals, slight variations occur when amounts are given in millilitres and fluid ounces.

**PREPARING WORKING SOLUTIONS FROM CONCENTRATE\***

To Mix Working Solution		Add This Amount of Concentrate	To This Amount of Water†	Ratio of Concentrate to Water
Dilution	Amount			
A	300 mL	19 mL	281 mL	1:15
	500 mL	31 mL	469 mL	
	1 qt	59 mL (2 fl oz)	885 mL (30 fl oz)	
	1 L	63 mL	937 mL	
	5 L	313 L	4687 mL	
	7.6 L (2 gal)	473 mL (16 fl oz)	7.1 L (7.5 qt)	
13.3 L (3.5 gal)	828 L (28 fl oz)	12.5 L (13 qt 4 fl oz)		
B	300 mL	9 mL	291 mL	1:31
	500 mL	16 mL	484 mL	
	1 qt	30 mL (1 fl oz)	914 mL (31 fl oz)	
	1 L	31 mL	969 mL	
	5 L	156 mL	4844 mL	
	15.2 L (4 gal)	473 mL (16 fl oz)	14.7 L (15.5 qt)	
26.6 L (7 gal)	828 mL (28 fl oz)	25.75 L (27 qt 4 fl oz)		
C	9.5 L (2.5 gal)	473 mL (16 fl oz)	9 L (9.5 qt)	1:19
	16.6 L (17.5 gal)	828 mL (28 fl oz)	15.75 L (16 qt 20 fl oz)	
D	18.9 L (5 gal)	473 mL (16 fl oz)	18.4 L (19.5 qt)	1:39
	33.3 L (8 gal 3 qt)	828 mL (28 fl oz)	32.5 L (34 qt 4 fl oz)	
E	22.7 L (6 gal)	473 mL (16 fl oz)	22.2 L (23.5 qt)	1:47
	39.8 L (10.5 gal)	828 mL (28 fl oz)	39 L (41 qt 4 fl oz)	
F	37.9 L (10 gal)	473 mL (16 fl oz)	37.4 L (39.5 qt)	1:79
	66.3 L (17.5 gal)	828 mL (28 fl oz)	65.5 L (69 qt 4 fl oz)	

\* **IMPORTANT NOTE:** The above instructions refer to the dilution of the package contents from the manufacturer (the *developer concentrate*), directly to a working solution, *without* use of an intermediate stock solution.

† Due to rounding of decimals, slight variations occur when amounts are given in millilitres and fluid ounces.

## DEVELOPMENT TIMES

If film is properly exposed, the times in the following tables should produce negatives with contrast suitable for printing with a diffusion enlarger (or by contact) on a normal-contrast black-and-white paper. If printing negatives with a condenser enlarger, decrease the development time by approximately 30 percent to produce lower contrast.

For critical applications, run tests to determine the best development time. If your negatives are consistently too dense or high in contrast, decrease the development time; if they're too thin or low in contrast, increase the development time.

The following tables offer starting-point recommendations. Adjust as needed.

DEVELOPMENT TIMES FOR <i>KODAK</i> SHEET FILMS										
KODAK Film	Development Time (Minutes)									
	Tray* Continuous Agitation					Large Tank† Manual Agitation at 1-Minute Intervals				
	18°C (65°F)	20°C (68°F)	21°C (70°F)	22°C (72°F)	24°F (75°F)	18°C (65°F)	20°C (68°F)	21°C (70°F)	22°C (72°F)	24°F (75°F)
<b>DILUTION A</b>										
EKTAPAN / EKP‡	3¼	3	2¾	2½	2¼	4	3¾	3¼	3	2¾
<b>DILUTION B</b>										
Commercial‡	2¾	2¼	2¼	2	1¾	—	—	—	—	—
EKTAPAN / EKP‡	5	4½	4¼	4	3½	7	6	5½	5	4¼
PLUS-X Pan Professional / PXT‡	6	5	4¾	4½	4	8	7	6½	6	5½
Technical Pan / TP	For information on developing KODAK Technical Pan Films to varying contrast indexes for specific applications, see KODAK Publication No. P-255, <i>KODAK Technical Pan Films</i> .									
T-MAX 100 Professional / TMX	8½	7½	7	6½	5½	11½	9½	8½	7½	7
T-MAX 400 Professional / TMY	9	7½	7	6½	6	10	8½	7½	7	6½
TRI-X Pan Professional / TXT‡	6	5½	5	4½	4	8	7½	7	6	5

\* Prewet the film in clean water at 20°C (68°F) for 1 to 2 minutes with agitation. Each sheet should be thoroughly wet to prevent sticking (of sheets) and promote even development.

† Tank-development times shorter than 5 minutes may produce unsatisfactory uniformity.

‡ Tray development times also apply to tank development using gaseous-burst agitation. Set the burst duration for 1 second with 10 seconds between bursts; provide sufficient pressure to increase the solution level 16 mm (5/8 inch).

NR = Not recommended

## DEVELOPMENT TIMES FOR *KODAK* ROLL FILMS

KODAK Film	Development Time (Minutes)									
	Small Tank* Manual Agitation at 30-Second Intervals					Large Tank† Manual Agitation at 1-Minute Intervals				
	18°C (65°F)	20°C (68°F)	21°C (70°F)	22°C (72°F)	24°F (75°F)	18°C (65°F)	20°C (68°F)	21°C (70°F)	22°C (72°F)	24°F (75°F)
<b>DILUTION A</b>										
Recording 2475	5½	4½	4	3½	3	NR				
TRI-X Pan / TX	4¼	3¾	3¼	3	2½	4¾	4¼	4	3¾	3¼
TRI-X Pan Professional / TXP	NR					3½	3	3	2¾	2¼
<b>DILUTION B</b>										
PLUS-X Pan / PX PLUS-X Pan Professional / PXP‡	6	5	4½	4	3½	6½	5½	5	4¾	4
Recording 2475	11	9	8	7	6	NR				
Technical Pan / TP	For information on developing KODAK Technical Pan Films to varying contrast indexes for specific applications, see KODAK Publication No. P-255, <i>KODAK Technical Pan Films</i> .									
T-MAX 100 Professional / TMX	8	7	6½	6	5	8½	7½	7	6½	5½
T-MAX 400 Professional / TMY	6½	6	5½	5	4½	8	7	6½	6	5
T-MAX P3200 Professional / TMZ	See the table below.									
TRI-X Pan / TX	8½	7½	6½	6	5	9½	8½	8	7½	6½
TRI-X Pan Professional / TXP	5¾	5½	5¼	4¾	3¾	7	6¼	6	5½	5
VERICHROME Pan / VP	6	5	4½	4	2	8	6½	6	5½	4½

\* Development on a reel in a small roll-film tank.

† Development of several reels in a basket.

‡ Development times also apply to tank development using gaseous-burst agitation. Set the burst duration for 1 second with 10 seconds between bursts; provide sufficient pressure to increase the solution level 16 mm (5/8 inch).

NR = Not recommended

**Note:** Tank-development times shorter than 5 minutes may produce unsatisfactory uniformity.

## DEVELOPMENT TIMES FOR *KODAK* T-MAX P3200 PROFESSIONAL ROLL FILMS

Dilution B	Development Time (Minutes)											
	Small Tank*						Rotary Tube†					
Exposed at EI	20°C (68°F)	21°C (70°F)	22°C (72°F)	24°F (75°F)	27°F (80°F)	29°F (85°F)	20°C (68°F)	21°C (70°F)	22°C (72°F)	24°F (75°F)	27°F (80°F)	29°F (85°F)
400 / 27°	7½	6½	5½	5	4½	3½	7	6¼	5¾	5	4¼	3¼
800 / 30°	8	7	6	5½	4¾	4	8	7	6	5¼	4½	3½
1600 / 33°	9	7½	6½	6	5	4½	8¾	7½	6½	5¾	4¾	3¾
3200 / 36°	11½	10	8½	7½	6½	5¾	11½	10	8½	7½	6½	5
6400 / 39°	14	12	10½	9½	8	6¾	13	11½	10	9	8	6

\* Development on a reel, in a small roll-film tank, with manual agitation at 30-second intervals.

† Development in a rotary-tube processor with continuous agitation.

**Note:** Tank-development times shorter than 5 minutes may produce unsatisfactory uniformity.

<b>DEVELOPMENT TIMES FOR KODAK FILMS IN ROTARY TUBES</b>					
<b>KODAK Film</b>	<b>Development Time (Minutes)* Dilution B</b>				
	<b>18°C (65°F)</b>	<b>20°C (68°F)</b>	<b>21°C (70°F)</b>	<b>22°C (72°F)</b>	<b>24°F (75°F)</b>
<b>ROLL FILM</b>					
T-MAX 100 Professional / TMX	—	6½	6	5½	4½
T-MAX 400 Professional / TMY	—	6	5½	5	5
TRI-X Pan / TX	7	6	5½	4½	4
TRI-X Pan Professional / TXP	—	8½	8	6½	5
PLUS-X / PX	8	7	6	5	4
<b>SHEET FILM</b>					
T-MAX 100 Professional / TMX	—	6½	6	5½	4½
T-MAX 400 Professional / TMY	—	6	5½	5	5

\* Development in a rotary-tube processor with continuous agitation.

<b>DEVELOPMENT TIMES FOR KODAK CONTINUOUS-TONE GRAPHIC-ARTS FILMS</b>						
<b>KODAK Film</b>	<b>Application</b>	<b>Dilution</b>	<b>Development Time (Minutes) at 20°C (68°F)*</b>			
Commercial	Copying photographs	B	2¼			
		D	4½			
	Gravure	C	3			
Professional Copy	Copying photographs	E	4			
Separation Negative 4131, Type 1	Color-separation negatives made from masked transparencies	C	<b>Printer</b>			
			<b>Cyan</b>	<b>Magenta</b>	<b>Yellow</b>	<b>Black</b>
			4	3½	4	3
Pan Masking 4570	Camera-back masking	E	<b>Printer Masks</b>			
			<b>Cyan</b>	<b>Magenta</b>	<b>Yellow</b>	<b>Black</b>
				4	4	4
	Transparency masking	D	3¼	3¼	3¼	3¼

\* Development in a tray with continuous agitation.

## REPLENISHMENT

### General

Replenish tank solutions of HC-110 Developer with a solution made from KODAK HC-110 Developer Replenisher. To prepare a replenisher stock solution, pour the contents (16 ounces [473 mL]) of the replenisher concentrate into a mixing container that holds at least 3.8 litres (1 gallon). Add enough water to bring the total volume to 3.8 litres (1 gallon). Stir the solution until it is uniform. You can store the replenisher stock solution at 18 to 24°C (65 to 75°F) for up to 6 months in a full, tightly closed bottle, or up to 2 months in a half-full, tightly closed bottle.

When ready to replenish the tank solution, prepare replenisher working solution by diluting the replenisher stock solution with water according to the table below.

PREPARING REPLENISHER SOLUTIONS		
For This Dilution of Developer Working Solution	Add This Amount of Replenisher Stock Solution	To This Amount of Water
A	1 part	none
B	2 parts	1 part
C	1 part	none
D	1 part	1 part
E	8 parts	11 parts
F	—	—

**Note:** Dilution F is very dilute; we do not recommend replenishing this solution.

### Replenishment Rate

Add 22 mL ( $\frac{3}{4}$  fluid ounce) of replenisher solution for each 20.3 x 25.4 cm (8 x 10-inch) sheet, 135-36 roll, or 120 roll (or equivalent) processed. Stir or recirculate the solution thoroughly after each addition. With an average drain time of 10 seconds between the developer and the stop bath, this amount of replenisher will usually match the carry-out of developer. However, if more solution is carried out than replaced, add fresh developer *working solution* (of the appropriate dilution) to make up the difference.

**Note:** If negatives become too thin or low in contrast, increase the replenishment rate; if they become too dense or high in contrast, decrease the replenishment rate.

When you aren't processing film, cover the tanks with floating lids to minimize oxidation.

## Process Control

When replenishing tank solutions, monitor the developer activity with KODAK Black-and-White Process Control Strips. Depending on the utilization, you can use a tank solution for up to one month if the control strips indicate proper developer activity.

If you don't use control strips, discard the tank solution when you have —

- Replenished the solution for two weeks;
- Added an amount of replenisher that equals the original volume of the working solution; or
- Processed fifty 20.3 x 25.4 cm sheets per litre (two hundred 8 x 10-inch sheets [or equivalent] per gallon) of developer.

## CAPACITY

Discard the developer after processing the number of sheets (or equivalent) listed below.

CAPACITY OF DEVELOPER WORKING SOLUTIONS				
Dilution	Tray		Tank without Replenishment	
	8 x 10-in. Sheets per Gallon	20.3 x 25.4 cm Sheets per Litre	8 x 10-in. Sheets per Gallon	20.3 x 25.4 cm Sheets per Litre
A	20	5	40	10
B	10	2.5	20	5
C	15	4	30	8
D	8	2	15	4
E	5	1.5	10	3
F	2	1	NR	NR

NR = Not recommended

## STORAGE LIFE

The table below provides guidelines for storing unused solutions at 18 to 24°C (65 to 75°F). The *storage temperature is important* as higher temperatures cause solutions to oxidize rapidly.

<b>STORAGE LIFE (MONTHS) OF UNUSED SOLUTIONS*</b>			
<b>Solution</b>	<b>Full, Tightly Closed Bottle</b>	<b>Half-Filled, Tightly Closed Bottle</b>	<b>Tank with Floating Lid</b>
<b>Developer</b>			
Stock Solution	6	2	2
Working Solution—Dilution A	6	2	2
Dilution B	3	1	1
Dilution C	6	2	2
Dilution D	3	1	1
Dilution E	2	1	1
Dilution F	NR	NR	NR
<b>Replenisher</b>			
Stock Solution	6	2	2

\* Stored at 18 to 24°C (65 to 75°F).

NR = Not recommended

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## MORE INFORMATION

Kodak has many publications to assist you with information on Kodak products, equipment, and materials. The following publications are available from Kodak through the order form in KODAK Publication No. L-1, *KODAK Index to Photographic Information*. To obtain a copy of L-1, send your request with \$1 to Eastman Kodak Company, Department 412-L, Rochester, New York 14650-0532.

- E103CF *Chemicals for KODAK PROFESSIONAL Black-and-White Films*
- F-7 *KODAK VERICHROME Pan Film*
- F-8 *KODAK PLUS-X Pan and KODAK PLUS-X Pan Professional Films*
- F-9 *KODAK TRI-X Pan and KODAK TRI-X Pan Professional Films*
- F-10 *KODAK EKTAPAN Film*
- F-16 *KODAK Commercial Film*
- F-32 *KODAK T-MAX Professional Films*
- P-255 *KODAK Technical Pan Films*

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