

Specific-Gravity and pH Measurements of KODAK Processing Chemicals



You can use specific-gravity and pH measurements to monitor some characteristics of your process and processing chemicals. These are useful measurements, but it is important to keep in mind a few limitations.

pH measurements are very useful for monitoring developers, bleaches, bleach-fixes, and fixers. However, you must make sure your measurements are *accurate* if you want to use them for this purpose. Use a carefully calibrated and maintained pH meter. Follow the manufacturer's instructions on how to use your instrument. To measure the pH of a solution, use the method described in CIS-121, *Measuring the pH of Photographic Processing Solutions*.

Specific gravity is useful in detecting mixing errors of 5 percent or more, and for checking the concentration of processing solutions such as fresh tank solutions and replenishers. However, it is less useful for monitoring some seasoned tank solutions. The carry-in and carry-out of solutions to and from a seasoned tank solution vary with the type of processor used, the process cycle, the photographic material being processed, and other process conditions.

To make specific-gravity measurements, use a hydrometer that meets the standard ASTM E100-95(2001); make sure that it is marked in increments of 0.001 for an accuracy of ± 0.0005 .

To measure specific gravity:

1. Fill a clean, dry 250 mL graduated cylinder to within 1 inch (2.5 cm) of the top with the solution you are measuring.
2. Adjust the solution to the proper temperature (see the specifications given in the tables on pages 2 through 4). *Proper solution temperature is very important.*
3. Place the cylinder in a sink or tray to catch overflow.
4. Choose the correct hydrometer to match the approximate specific gravity of the solution.
5. Be sure that the hydrometer is clean and dry. Carefully lower the hydrometer into the solution in the cylinder. Let it bob up and down slightly. When it stops, read the number at the top of the meniscus.
6. After making the measurement, discard the sample. To avoid contaminating solutions, **do not** return the sample to the tank.
7. Rinse the hydrometer and graduated cylinder thoroughly with water.

Note: Never take specific-gravity readings of solutions in the tanks. If you use the wrong hydrometer, it can sink to the bottom of the tank and break. If it bobs on the surface of the tank solution, the stem may hit the edge of the tank and break. Label hydrometer boxes to avoid confusion. **Do not** use tape labels on the hydrometers.

The tables that follow list pH and specific-gravity measurements for the Kodak chemicals most commonly used in professional and photofinishing laboratories.

Process C-41

KODAK FLEXICOLOR Chemical	Typical pH Values at 25°C (77°F)			Specific Gravity at 25°C (77°F)		
	Fresh Tank	Seasoned Tank	Replenisher	Fresh Tank	Seasoned Tank	Replenisher
Developer Replenisher	9.98 to 10.08	9.98 to 10.08	10.07 to 10.17	1.034 to 1.040	1.036 to 1.044	1.034 to 1.040
Developer Replenisher LORR	9.98 to 10.08	9.98 to 10.08	10.12 to 10.22	1.034 to 1.040	1.036 to 1.044	1.036 to 1.042
Developer Replenisher LORR (5 and 10 litres) and SM Tank Developer	9.98 to 10.08	9.98 to 10.08	10.12 to 10.22	1.034 to 1.040	1.036 to 1.044	1.034 to 1.040
Bleach III Replenisher	4.5 to 5.0	4.5 to 5.0	4.25 to 4.75	1.030 to 1.040	1.030 to 1.060*	1.030 to 1.040
Bleach III HV Regenerator	4.5 to 5.0	4.5 to 5.0	4.25 to 4.75	—	1.040 to 1.070*	—
Bleach III NR Replenisher	4.5 to 5.0	4.5 to 5.0	4.15 to 4.35	1.035 to 1.045	1.040 to 1.070	1.045 to 1.055
RA Bleach Replenisher NR	4.35 to 4.85	4.35 to 4.85	3.75 to 4.25	1.130 to 1.160	1.130 to 1.160	1.155 to 1.165
SM Tank Bleach	4.5 to 5.0	4.5 to 5.0	NA	1.145 to 1.195	1.145 to 1.195	NA
Fixer and Replenisher	6.0 to 7.0	6.0 to 7.0	6.0 to 7.0	1.055 to 1.100	1.055 to 1.100	1.080 to 1.090
RA Fixer and Replenisher	7.25 to 7.75	6.0 to 7.0	7.25 to 7.75	1.075 to 1.095	1.085 to 1.115	1.080 to 1.090
SM Tank Fixer	5.5 to 6.5	5.5 to 6.5	NA	1.095 to 1.135	1.100 to 1.150	NA
ELECTROSILVER Fixer and Replenisher LORR Tank 1	6.0 to 7.0	—	7.7 to 8.3	1.075 to 1.115	—	1.130 to 1.140
Tank 2	—	6.0 to 7.0	—	—	1.085 to 1.125	—
	—	6.5 to 7.5	—	—	1.095 to 1.135	—
Final Rinse and Replenisher	4.0 to 7.0	4.0 to 7.0	4.0 to 7.0	0.990 to 1.010	0.990 to 1.010	0.990 to 1.010
Stabilizer III and Replenisher	4.0 to 7.0	4.0 to 7.0	4.0 to 7.0	0.990 to 1.010	0.990 to 1.010	0.990 to 1.010

* The specific gravity of regenerated bleach replenisher should fall within this range.

Process E-6

KODAK Chemical	Typical pH Values at 25°C (77°F)			Specific Gravity at 25°C (77°F)		
	Fresh Tank	Seasoned Tank	Replenisher	Fresh Tank	Seasoned Tank	Replenisher
PROFESSIONAL First Developer Replenisher	9.81 ± 0.03	9.83 ± 0.03	9.82 ± 0.03	1.055 ± 0.003	1.060 ± 0.003	1.057 ± 0.003
PROFESSIONAL Reversal Bath and Replenisher	5.30 ± 0.07	5.50 ± 0.15	5.30 ± 0.07	1.004 ± 0.002	1.005 ± 0.002	1.006 ± 0.002
PROFESSIONAL Color Developer Replenisher	11.89 ± 0.05	11.90 ± 0.05	12.12 ± 0.05	1.034 ± 0.003	1.038 ± 0.003	1.039 ± 0.003
PROFESSIONAL Color Developer Replenisher LORR	11.88 ± 0.05	11.85 ± 0.05	12.29 ± 0.05	1.034 ± 0.003	1.038 ± 0.003	1.043 ± 0.003
PROFESSIONAL Pre-Bleach and Replenisher	6.30 ± 0.05	6.90 ± 0.50	6.30 ± 0.05	1.019 ± 0.003	1.021 ± 0.003	1.019 ± 0.003
PROFESSIONAL Bleach Replenisher	5.85 ± 0.20	5.85 ± 0.20	5.45 ± 0.05	1.130 ± 0.010	1.190 ± 0.070	1.260 ± 0.010
PROFESSIONAL Fixer and Replenisher	6.66 ± 0.10	6.56 ± 0.20	6.66 ± 0.10	1.041 ± 0.003	1.065 ± 0.025	1.041 ± 0.003
PROFESSIONAL Final Rinse and Replenisher	6.50 ± 1.00	6.50 ± 1.00	6.50 ± 1.00	1.000 ± 0.003	1.000 ± 0.003	1.000 ± 0.003

Process RA-4

KODAK EKTACOLOR Chemical	Typical pH Values at 25°C (77°F)			Specific Gravity at 25°C (77°F)		
	Fresh Tank	Seasoned Tank	Replenisher	Fresh Tank	Seasoned Tank	Replenisher
RA Developer Replenisher	10.12 ± 0.1	10.12 ± 0.1	10.70 ± 0.05	1.017 to 1.023	NA	1.023 to 1.033
RA Developer Replenisher 12	10.10 ± 0.1	10.10 ± 0.1	10.80 ± 0.05	1.019 to 1.025	NA	1.024 to 1.034
RA Developer Replenisher RT	10.12 ± 0.1	10.12 ± 0.1	10.60 ± 0.1	1.017 to 1.023	NA	1.018 to 1.028
RA Developer Replenisher RT (with Additive)	—	10.12 ± 0.1	10.40 ± 0.1	NA	NA	1.016 to 1.026
PRIME SP Developer Replenisher	9.90 ± 0.1	10.12 ± 0.1	10.75 ± 0.05	1.018 to 1.024	NA	1.025 to 1.031
PRIME SP Developer Replenisher LORR	9.90 ± 0.1	10.00 ± 0.1	11.05 ± 0.1	1.018 to 1.034	NA	1.027 to 1.033
RA-2SM Tank Developer	10.30 ± 0.1	10.30 ± 0.1	NA	1.022 to 1.028	NA	NA
RA Bleach-Fix and Replenisher NR	6.0 ± 0.1*	6.0 to 6.5	5.0 ± 0.25	1.060 to 1.070	NA	1.120 to 1.140
RA Bleach-Fix and Replenisher	5.5 ± 0.1	6.0 to 6.5	5.4 ± 0.1	1.065 to 1.085	NA	1.065 to 1.085
RA Bleach-Fix Regenerator II	7.0 ± 0.1	4.0 TO 7.9	7.0 ± 0.1	—	—	—
PRIME Bleach-Fix and Replenisher	5.4 ± 0.25	6.0 to 6.5	5.4 ± 0.25	1.035 to 1.045	NA	1.070 to 1.090
PRIME Bleach-Fix Replenisher LORR	5.0 ± 0.25	6.4 to 6.9	5.1 ± 0.25	1.055 to 1.060	NA	1.090 to 1.110
RA-2SM Tank Bleach-Fix	5.4 ± 0.25	6.5 ± 0.25	NA	1.073 to 1.082	1.135 to 1.145	NA
Stop Bath/Acid Rinse	3.0 to 3.5	4.7 ± 0.25	—	—	—	—
RA Bleach	4.75 ± 0.1	5.0 ± 0.25	4.75 ± 0.1	1.034 to 1.040	NA	1.053 to 1.059
RA Fixer	7.5	6.0 to 7.0	7.5	1.046 to 1.052	1.047 to 1.053	1.088 to 1.098
Stabilizer and Replenisher	NA	NA	NA	0.993 to 1.003	NA	0.993 to 1.003
Stabilizer and Replenisher LORR	NA	NA	NA	0.993 to 1.003	NA	0.993 to 1.003

* To avoid problems due to low pH, use half the normal amount of Part C when you mix a fresh bleach-fix tank solution. Be sure that you use the full amount of Part C when you mix replenisher solution.

Process R-3

KODAK EKTACHROME Chemical	Typical pH Values at 25°C (77°F)			Specific Gravity at 25°C (77°F)		
	Fresh Tank	Seasoned Tank	Replenisher	Fresh Tank	Seasoned Tank	Replenisher
R-3 First Developer II Replenisher	9.68 ± 0.05	9.68 ± 0.05	9.68 ± 0.05	1.061 ± 0.003	1.065 ± 0.005	1.061 ± 0.003
R-3 Color Developer II Replenisher	10.50 ± 0.05	10.50 ± 0.05	11.0 ± 0.05	1.032 ± 0.003	1.036 ± 0.005	1.040 ± 0.003
R-3 Bleach-Fix II and Replenisher						
Tank 1	6.51 ± 0.10	7.11 ± 0.10	6.51 ± 0.10	1.092 ± 0.003	1.087 ± 0.005	1.092 ± 0.003
Tank 2	6.50 ± 0.10	6.81 ± 0.10	6.51 ± 0.10	1.092 ± 0.003	1.094 ± 0.005	1.092 ± 0.003

Specific-Gravity and pH Measurements of KODAK Processing Chemicals

Black-and-White Processes

KODAK Chemical	Solution Concentration	pH at 25°C (77°F)	Specific Gravity (Fresh Tank) at 25°C (77°F)
Developer D-76	Stock (full strength)	8.5 ± 0.05	1.078 ± 0.003
	Working strength (1:1)	—	1.039 ± 0.003
Replenisher D-76R	Stock (full strength)	—	1.091 ± 0.003
DEKTOL Developer	Stock (full strength)	—	1.103 ± 0.003
POLYMAX RT Developer and Replenisher	Working strength	10.8 ± 0.20	1.045 ± 0.003
POLYMAX T Developer	Working strength (1:9)	10.7 ± 0.10	1.036 ± 0.003
DURAFLO RT Developer	Working strength	9.35 ± 0.05	1.115 ± 0.003
DURAFLO RT Developer Replenisher	Working strength	9.55 ± 0.05	1.123 ± 0.003
HC-110 Developer	Working strength, Dilution A (1:15)	8.9 ± 0.10	1.015 ± 0.003
	Working strength, Dilution B (1:31)	—	1.008 ± 0.003
HC-110 Developer Replenisher	Working strength, Dilution A	9.1 ± 0.10	1.023 ± 0.003
T-MAX Developer	Working strength (1:4)	8.37 ± 0.05	1.045 ± 0.003
T-MAX RS Developer and Replenisher	Working strength	8.5 ± 0.05	1.041 ± 0.003
XTOL Developer	Working (full) strength	8.2 ± 0.05	1.085 ± 0.003
POLYMAX RT Fixer	Working strength	5.25 ± 0.25	1.078 ± 0.003
POLYMAX T Fixer	Working strength for film (1:3)	4.9 ± 0.15	1.069 ± 0.003
Rapid Fixer (Parts A + B)	Working strength for film (1:3)	4.4 ± 0.05	1.087 ± 0.003
	Working strength for paper (1:7)	4.4 ± 0.05	1.043 ± 0.003
ROYALPRINT Fixer and Replenisher	Working strength and replenisher (1:3)	6.0 ± 0.05	1.084 ± 0.003

Current Information Summaries provide informal information of limited or specific application. Responsibility for judging the timeliness and applicability of the information to a specific photographic use rests with the user.

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