

TECHNICAL INFORMATION

400 DELTA PROFESSIONAL

FAST FINE GRAIN, BLACK AND WHITE FILM FOR SUPERB PRINT QUALITY

Photo by Marc Hauser

ILFORD

400 DELTA PROFESSIONAL Fast Fine Grain Black and White Film

1 DESCRIPTION & USE

400 DELTA PROFESSIONAL is a fast, fine grain black and white film, ideal for pictorial and fine art photography. This new, improved version builds on the quality and reputation of ILFORD 400 DELTA. Compared with 400 DELTA, it has finer grain, better tonal rendition and a true 400 speed.

Prints made from 400 DELTA PROFESSIONAL film exposed at EI 400/27 have very fine grain and outstanding sharpness. In fact the results are similar to those expected from a conventional medium speed black and white film.

The superb image quality of 400 DELTA PROFESSIONAL means that it is possible to use this film in situations that would usually require a medium speed film. Its EI 400/27 speed rating, however, allows the use of higher shutter speeds or greater depth of field than with a medium speed film while giving similar quality results. Additionally, the fast speed of 400 DELTA PROFESSIONAL ensures excellent results in low lighting conditions.

400 DELTA PROFESSIONAL is more than an ISO 400/27° film. Its exposure latitude allows good quality results to be obtained over the exposure range EI 200/24 to EI 1600/33.

400 DELTA PROFESSIONAL is compatible with all major processing systems and can be processed in all popular developers.

1.1 35mm FILM

400 DELTA PROFESSIONAL 35mm film is supplied in DX coded cassettes, so the film speed of ISO 400/27° is set automatically on most cameras. These cassettes are very strong and have the end caps firmly fixed to the body. This ensures the caps remain in position during rough handling.

The combination of the tangential style cassette and the low friction characteristics of the films much appreciated by motor drive or autowind users, as the film is easily advanced, thus saving battery wear.

400 DELTA PROFESSIONAL 35mm film has a neutral base tint which enables easy print contrast assessment on the light box.

400 DELTA PROFESSIONAL 35mm film is available in 24 or 36 exposure DX coded cassettes or in bulk film lengths of 100 feet. 400 DELTA PROFESSIONAL 35mm film is coated on 0.125mm ($\frac{5}{1000}$ inch) acetate base.

1.2 ROLL FILM

400 DELTA PROFESSIONAL roll film is coated on 0.110mm clear acetate base which has an antihalation backing that clears during development. 400 DELTA PROFESSIONAL roll film is available in 120 and 220 lengths and is edge numbered 1 to 19 for 120 and 1 to 40 for 220 to ensure all formats can be identified, whatever camera format is being used.

The backing paper has a white outer surface for easy frame identification. The portion of the backing paper visible after exposure is black with white printing for quick identification of exposed films.

1.3 SHEET FILM

400 DELTA PROFESSIONAL sheet film is available in a wide range of standard sizes. It is coated on 0.175mm ($\frac{7}{1000}$ inch) polyester base, offering rigidity and dimensional stability. This makes it ideally suitable for machine processing in automatic processors without the need for leaders. The base has an antihalation backing which clears during processing.

The short side of 400 DELTA PROFESSIONAL sheet film is notched to indicate the emulsion surface and film type. The emulsion faces the user when the film is held in the position shown. The notches indicate that the film is 400 DELTA PROFESSIONAL.



The new notch code, being phased in (September 1995), includes an ILFORD identifier. This identifier is an elliptical notch in the number one and number five positions. Either set of notches indicated above identify ILFORD 400 DELTA PROFESSIONAL sheet film.

Both surfaces of 400 DELTA PROFESSIONAL accept commonly used retouching media and are designed to resist surface roller marks when machine processing.

In addition to general purpose photography, 400 DELTA PROFESSIONAL sheet film is ideal for copying and inter-negative work.

2 EXPOSURE DETAILS

2.1 EXPOSURE RATING

400 DELTA PROFESSIONAL has a speed rating of ISO 400/27° (400ASA, 27DIN, EI 400/27) to daylight and is recommended for pictorial and fine art photography in all types of lighting. The ISO speed rating was measured using ILFORD ID-11 developer at 68°F with intermittent agitation in a spiral tank. Best results are obtained at EI 400/27, but excellent image quality will also be obtained at meter settings from EI 200/24 to EI 1600/33.

It should be noted that the exposure index (EI) recommended for 400 DELTA PROFESSIONAL is based on a practical evaluation of film speed and is not based on foot speed, as is the ISO standard.

2.2 FILTER FACTORS

400 DELTA PROFESSIONAL film can be used with all types of filters (e.g., color, polarizing and neutral density filters) in the usual way.

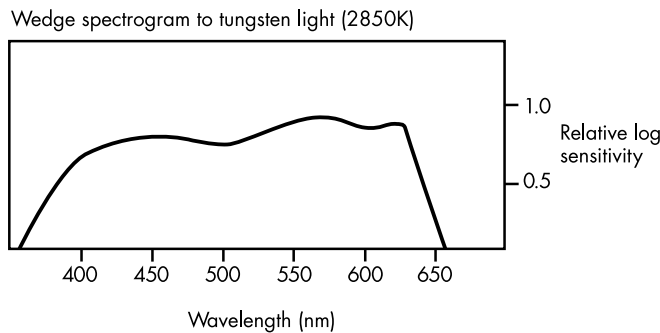
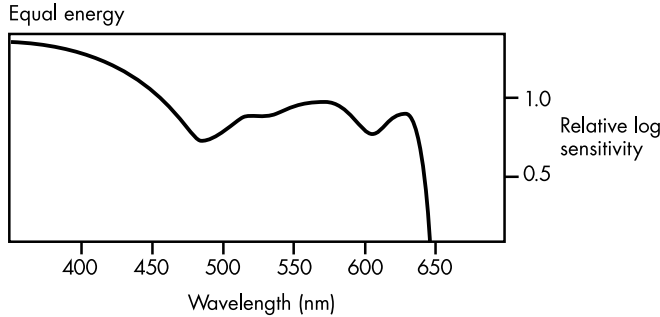
The table gives a practical guide to the increase in exposure needed when using the filters listed. The exposure increase in daylight may vary with the angle of the sun and the time of day. In the late afternoon or the winter months, when the daylight contains more red light, green and blue filters may need slightly more exposure than usual. The exposure increases for tungsten light are based on an average tungsten source which has a color temperature of 3200K.

The factors are intensity scale factors, but in most cases exposures can be increased by using either a larger aperture or a slower shutter speed. For this reason, approximate increases are also given in stops.

Note: Cameras with through-the-lens metering will usually adjust the exposure automatically when using filters.

Kodak Wratten Filter	Daylight Factor	Stop	Tungsten Factor	Stop
Yellow (#8)	1.5	2/3	1.2	1/3
Deep Yellow (#15)	1.5	2/3	1.5	2/3
Yellowish Green (#11)	3.0	1 2/3	3.0	1 2/3
Orange (#21)	2.3	1	2.0	1
Deep Orange (#22)	5.0	2 2/3	2.5	1 1/3
Tricolor Red (#25)	6.0	2 2/3	4.0	2
Tricolor Blue (#47)	6.0	2 2/3	6.0	2 2/3
Tricolor Green (#58)	9.5	3 1/3	19.0	4 1/3
Neutral Density (.30)	2.0	1	2.0	1

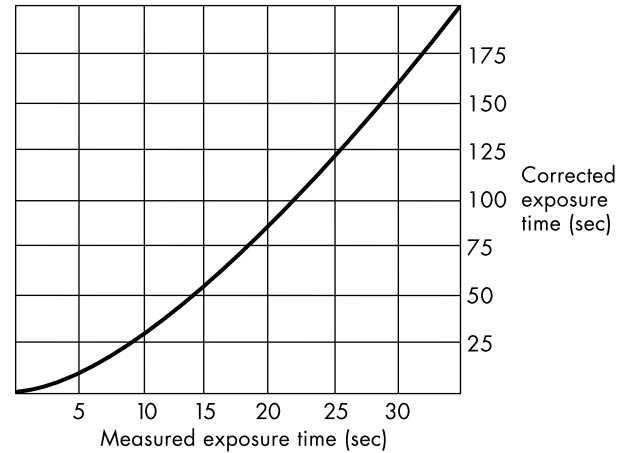
2.3 SPECTRAL SENSITIVITY



2.4 RECIPROCITY CHARACTERISTICS

Most films, including 400 DELTA PROFESSIONAL, are designed to be used over a wide range of exposures. This range covers most normal photography, including exposure by electronic flash. Thus, for exposures between 1/2 and 1/10,000 second, no corrections are needed for reciprocity law failure.

For exposures longer than 1/2 second, 400 DELTA PROFESSIONAL, along with other films, needs to be given more exposure than indicated by a meter. Use the graph to calculate the increased exposure time which should be given once the measured time is known.



3 PROCESSING OPTIONS

400 DELTA PROFESSIONAL is a versatile film and may be exposed and developed to suit a wide range of requirements. This section outlines how this can best be done.

3.1 DEVELOPERS

The versatility of 400 DELTA PROFESSIONAL can be exploited by selecting the best ILFORD developer for the job. The table is a guide to choosing the ILFORD developer for 400 DELTA PROFESSIONAL that is most suited to individual requirements.

MANUAL PROCESSING (e.g., Spiral Tank, Deep Tank)		
Requirement	Liquid	Powder
Best Overall		
Image Quality	ILFOTEC HC (1+31)	ID-11 (Stock)
Finest Grain	ILFOTEC HC (1+31)	PERCEPTOL (Stock)
Maximum Sharpness	ILFOSOL-S	ID-11 (1+3)
Maximum Film Speed	ILFOTEC HC (1+15)	MICROPHEN (Stock)
One-Shot Convenience	ILFOSOL-S	ID-11 (1+3)
	ILFOTEC HC-D	MICROPHEN (1+3)
Economy	ILFOSOL-S	ID-11 (1+3)
	ILFOTEC HC-D	MICROPHEN (1+3)

MACHINE PROCESSING		
Dip and Dunk	ILFOTEC DD	Best overall image quality (liquid)
	ILFOTEC HC	Flexible process time, range of dilutions
Leader Card	ILFOTEC RT RAPID	Rapid processing, best overall image quality
	ILFOTEC HC	Range of dilutions, flexibility & economy
Roller Transport	ILFOTEC RT RAPID	Rapid processing, best overall image quality
	ILFOTEC HC (1+11)	Economy

4 PROCESSING METHODS

400 DELTA PROFESSIONAL can be processed in all types of processing equipment including spiral tanks, deep tanks and automatic processors. This new technology film will not cause premature exhaustion of the developer, so standard capacity figures and replenishment rates can be maintained. When fixing 400 DELTA PROFESSIONAL, however, slightly longer times than usual are recommended for best results.

4.1 SAFELIGHT RECOMMENDATIONS

Handle 400 DELTA PROFESSIONAL film in total darkness. For very brief inspections during processing, use the ILFORD 908 (very dark green) or Kodak 3 safelight filter, with a 15W bulb, fitted in a darkroom lamp. Do not allow direct lighting from the safelight to fall on the film.

When processing 400 DELTA PROFESSIONAL film by inspection, the safest way is to use infrared illumination in the darkroom, with infrared goggles to see the film. This method ensures the film cannot be fogged and makes it easy to see the image.

4.2 SPIRAL TANK PROCESSING

The recommended agitation for spiral tank processing with ILFORD chemicals is to invert the tank four times during the first 10 seconds and again for 10 seconds (four inversions) at the start of every further minute. Use this method of agitation for both developing and fixing. At the end of each agitation sequence, tap the tank firmly to dislodge any air bubbles.

4.3 ROTARY PROCESSORS

Rotary processors, such as those made by Jobo, have very similar processing conditions to spiral tank processing by hand, except they process with small amounts of solution and can be pre-programmed. Follow any guidance given by the processor manufacturer when adjusting processing times for these types of processors. Standard development times are given in section 5.2 Development Times; these may need reducing by up to 15% for use in rotary processors without a pre-rinse because of the continuous agitation given in these processors. Alternatively, if using a pre-rinse, use the development times for spiral tank processing as a guide.

4.4 MACHINE PROCESSING

400 DELTA PROFESSIONAL can be processed in all types of general purpose film processors, including dip and dunk, short leader and roller transport processors—see the developer recommendations in section 3.1 Developers.

After development, fix 400 DELTA PROFESSIONAL in ILFORD UNIVERSAL Rapid fixer (1+3). When roller transport processing, add one part ILFORD FIX HARDENER* to every 40 parts working strength UNIVERSAL Rapid fixer. Hardener protects the film during the remainder of the roller transport processing sequence.

*ILFORD FIX HARDENER *CAN NOT* be used with ILFORD MULTIGRADE or ILFORD 2000 RT fixers.

5 DEVELOPMENT TIMES

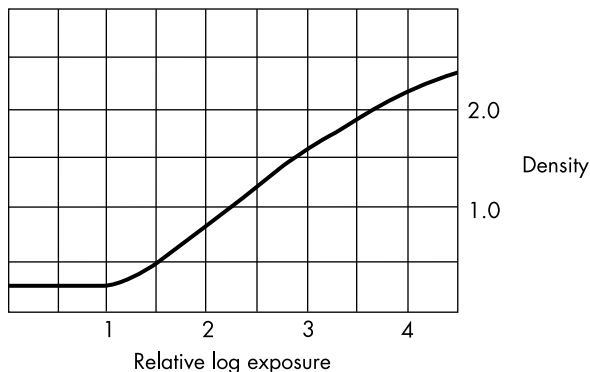
The tables give development times for both manual and machine processing 400 DELTA PROFESSIONAL film. These times will produce negatives of average contrast suitable for printing in all enlargers. The development times are intended as a guide only and may be altered if a different result is required.

To use the tables, determine the meter setting used, then choose the developer and dilution, and read off the development time. This time has been found to give the best quality with that meter setting in that developer. This simplified approach to development times with 400 DELTA PROFESSIONAL means there is no need to adjust the meter setting to suit the choice of developer.

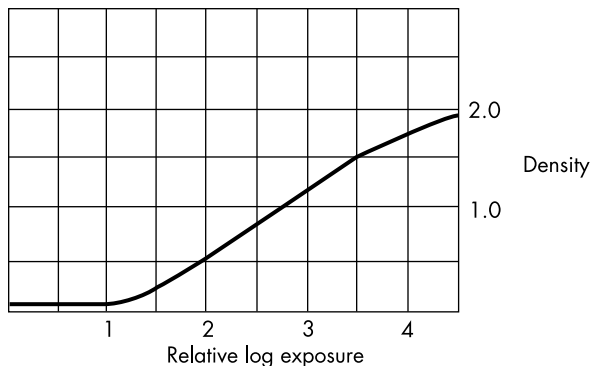
Note: The contrast level obtained using these development times is between the "normal" and "high" contrast levels that used to be recommended for use with condenser or diffuser enlargers respectively. This approach is no longer necessary, considering the enlarger types that are popular today.

5.1 CHARACTERISTIC CURVES

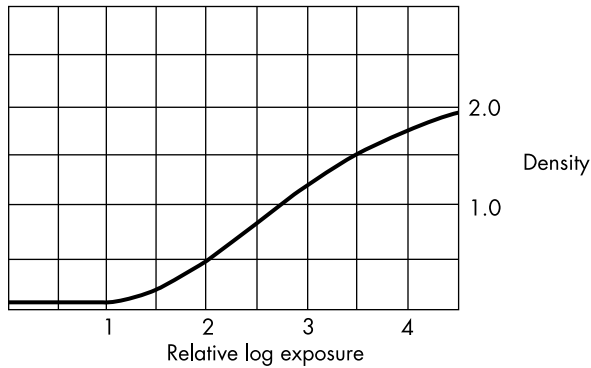
400 DELTA PROFESSIONAL 35mm developed in ILFORD ID-11 stock for 7 min. at 68°F (20°C) with intermittent agitation.



400 DELTA PROFESSIONAL roll film developed in ILFORD ID-11 stock for 7¼ min. at 68°F (20°C) with intermittent agitation.



400 DELTA PROFESSIONAL sheet film developed in ILFORD ID-11 stock for 7¼ min. at 68°F (20°C) with intermittent agitation.



5.2 DEVELOPMENT TIMES

SPIRAL TANK, DEEP TANK AND ROTARY PROCESSORS (Min/68°F/20°C)

35mm FILM

ILFORD Developer	Dilution	Meter Setting			
		EI 200/24	EI 400/27	EI 800/30	EI 1600/33
ILFOTEC HC - D	1+9	*	3.5**	5	8
	1+19	6	7.5	10	14
	1+29	*	13	*	*
ILFOSOL - S	1+9	7	9	13	*
	1+14	11.5	14	*	*
ILFOTEC HC	1+15	*	3.5**	5	8
	1+31	6	7.5	10	14
	1+47	*	13	*	*
ID-11	Stock	6	7	9	12.5
	1+1	9	10.5	12.5	*
	1+3	*	18	*	*
MICROPHEN	Stock	*	7	9	12.5
	1+1	*	10.5	13	18
	1+3	*	17	*	*
PERCEPTOL	Stock	10	13	*	*
	1+1	14	18	*	*
	1+3	*	22	*	*

Non-ILFORD Developer	Dilution	Meter Setting			
		EI 200/24	EI 400/27	EI 800/30	EI 1600/33
Kodak D76	Stock	6	7	9	12.5
	1+1	9	10.5	12.5	*
	1+3	*	18	*	*
Kodak HC-110	A	*	3.5**	5	8
	B	6	7.5	10	14
Kodak T-Max	1+4	*	7.5	10	14
Kodak Microdol-X	Stock	10	13	*	*
	1+3	*	22	*	*
Acufine	Stock	*	5	7	10
Agfa Rodinal	1+25	7	9	12.5	*
	1+50	12	16.5	*	*

■ Highlighted area indicates choice for first time testing
 *Not recommended
 **Not recommended due to the risk of uneven development

DIP AND DUNK MACHINES (Min/75.2°F/24°C)

35mm FILM

Developer	Dilution	Meter Setting			
		EI 200/24	EI 400/27	EI 800/30	EI 1600/33
ILFOTEC DD	1+4	5.5	6	7	11
Kodak T-Max RS	1+4	*	4.5**	6	8

ILFOLAB FP40, ROLLER TRANSPORT AND SHORT LEADER MACHINES (Sec/78.8°F/26°C)

35mm FILM

Developer	Dilution	Meter Setting			
		EI 200/24	EI 400/27	EI 800/30	EI 1600/33
ILFOTEC RT RAPID	Stock	*	75	84	115
Kodak Duraflo	Stock	*	75	84	115

*Not recommended
 **Not recommended due to the risk of uneven development

SPIRAL TANK, DEEPT TANK AND ROTARY PROCESSORS (Min/68°F/20°C)

ROLL FILM AND SHEET FILM

ILFORD Developer	Dilution	Meter Setting			
		EI 200/24	EI 400/27	EI 800/30	EI 1600/33
ILFOTEC HC - D	1+9	*	4**	5.5	9
	1+19	6.5	8.5	11	15.5
	1+29	*	14.5	*	*
ILFOSOL - S	1+9	7.5	10	14.5	*
	1+14	12.5	15.5	*	*
ILFOTEC HC	1+15	*	4**	5.5	9
	1+31	6.5	8.5	11	15.5
	1+47	*	14.5	*	*
ID-11	Stock	6.5	7.5	10	14
	1+1	10	11.5	14	*
	1+3	*	20	*	*
MICROPHEN	Stock	*	7.5	10	14
	1+1	*	11.5	14.5	20
	1+3	*	18.5	*	*
PERCEPTOL	Stock	11	14.5	*	*
	1+1	15.5	20	*	*
	1+3	*	24	*	*

Non-ILFORD Developer	Dilution	Meter Setting			
		EI 200/24	EI 400/27	EI 800/30	EI 1600/33
Kodak D76	Stock	6.5	7.5	10	14
	1+1	10	11.5	14	*
	1+3	*	20	*	*
Kodak HC-110	A	*	4**	5.5	9
	B	6.5	8.5	11	15.5
Kodak T-Max	1+4	*	8.5	11	15.5
Kodak Microdol-X	Stock	11	14.5	*	*
	1+3	*	24	*	*
Acufine	Stock	*	5.5	7.5	11
Agfa Rodinal	1+25	7.5	10	14	*
	1+50	13	18	*	*

■ Highlighted area indicates choice for first time testing
 *Not recommended
 **Not recommended due to the risk of uneven development

DIP AND DUNK MACHINES (Min/75.2°F/24°C)**ROLL FILM AND SHEET FILM**

Developer	Dilution	Meter Setting			
		EI 200/24	EI 400/27	EI 800/30	EI 1600/33
ILFOTEC DD	1+4	6	6.5	7.5	12
Kodak T-Max RS	1+4	*	6.5	7.5	10

ILFOLAB FP40, ROLLER TRANSPORT AND SHORT LEADER MACHINES (Sec/78.8°F/26°C)**ROLL FILM AND SHEET FILM**

Developer	Dilution	Meter Setting			
		EI 200/24	EI 400/27	EI 800/30	EI 1600/33
ILFOTEC RT RAPID	Stock	*	84	95	127
Kodak Duraflo	Stock	*	84	95	127

*Not recommended

**Not recommended due to the risk of uneven development

5.3 METER SETTINGS BELOW EI 200/24 OR ABOVE EI 1600/33

If 400 DELTA PROFESSIONAL has been exposed at a meter setting slower than EI 200/24 or faster than EI 1600/33, the following guide will ensure that usable negatives are obtained. Obviously, the quality of negatives processed in this way will not be as high as conventionally processed ones.

MANUAL PROCESSING (Min/68°F/20°C)

ILFORD Developer	Dilution	Meter Setting		
		EI 50/18	EI 100/21	EI 3200/36
PERCEPTOL	Stock	7	8.5	*
MICROPHEN	Stock	*	*	17.5

*Not recommended

For users who regularly like to shoot films slower than ISO 400/27°, other ILFORD films in that range can be recommended: ILFORD PAN F Plus (ISO 50/18°), ILFORD FP4 Plus (ISO 125/22°) and ILFORD 100 DELTA PROFESSIONAL (ISO 100/21°).

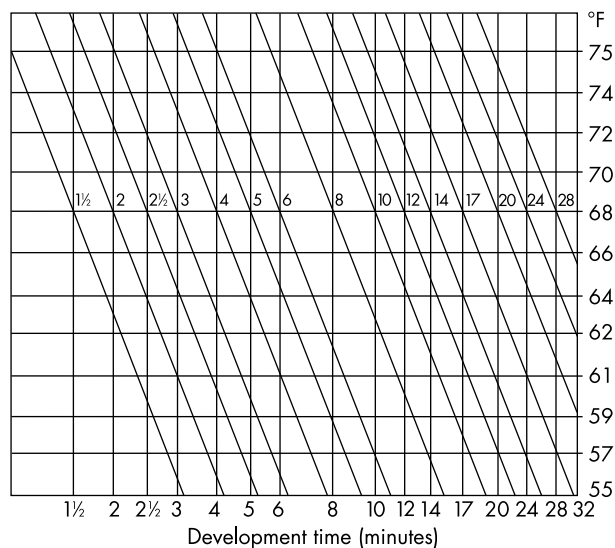
Also available is ILFORD XP2 (ISO 400/27°), a unique black and white film which can be exposed over meter settings from EI 100/21 to EI 800/30 on the same roll of film. It has very fine grain and must be processed through standard C-41 type color negative chemicals.

5.4 PROCESSING AT DIFFERENT TEMPERATURES

400 DELTA PROFESSIONAL film can be processed over a range of temperatures. Development times at temperatures other than 68°F may be calculated from the following chart.

1. Look up the development time at 68°F in the tables in section 5.2.
2. Find this time on the 68°F line—see the figures in the middle of the chart.
3. Follow the diagonal line for this time to where it cuts the horizontal line for the new temperature.
4. Draw a line straight down from this point and read off the approximate new development time on the base of the chart.

For example, if 4 minutes at 68°F is recommended, the time at 74°F will be 3 minutes and the time at 61°F will be 6 minutes.

**5.5 FIXING**

Use the standard ILFORD recommendations for agitation when fixing 400 DELTA PROFESSIONAL—see sections 4.2 and 4.3. For best results, it is advisable to give 400 DELTA PROFESSIONAL slightly longer fixing times than usual.

After development, rinse the film in water and fix in ILFORD UNIVERSAL Rapid fixer (1+3) 3–5 minutes at 68°F. If ILFORD FIX HARDENER* is added to the fixer, fix for 5 minutes at 68°F. A hardener is recommended only when processing at high temperatures (above 86°F) or in a roller transport processor.

*ILFORD FIX HARDENER *CANNOT* be used with ILFORD MULTIGRADE and ILFORD 2000 RT fixers.

5.6 WASHING

When a non-hardening fixer such as UNIVERSAL Rapid fixer has been used, wash the film in running water for 5–10 minutes at a temperature within $\pm 10^\circ\text{F}$ of the processing temperature.

For spiral tank use when a non-hardening fixer has been used, the following method of washing is recommended. This method of washing is faster, uses less water yet still gives negatives of archival permanence.

1. Process the film in a spiral tank.
2. Fix it using ILFORD UNIVERSAL Rapid fixer.
3. After fixing, fill the tank with water at the same temperature as the processing solutions, and invert it five times.
4. Drain the water away and refill. Invert the tank ten times.
5. Drain and refill it for the third time and invert the tank twenty times. Drain the water away.

When a hardening fixer has been used, wash the film in running water for 15–20 minutes at a temperature within $\pm 10^\circ\text{F}$ of the processing temperature. Use of a hardening fixer makes the film more difficult to wash and is therefore not recommended.

A final rinse in water to which a few drops of ILFOTOL Wetting Agent (1+200) has been added will aid rapid and uniform drying.

5.7 DRYING

To avoid drying marks, use a squeegee or chamois cloth to wipe 400 DELTA PROFESSIONAL film before hanging it to dry. Dry 400 DELTA PROFESSIONAL at 86–104°F in a drying cabinet or at room temperature in a clean, dust free area.

6 CONTRAST-TIME CURVES

For normal use at EI 400/27, develop 400 DELTA PROFESSIONAL film according to the development times given in the table in section 5.2 Development times. The development times for a meter setting of EI 400/27 correspond to zero contrast change on the contrast-time curves.

For subjects with an unusually large or small brightness range, and also to fine tune contrast to suit individual requirements, it is possible to vary the development time to obtain the type of negatives required. As a guide, try changing contrast in steps of 5%.

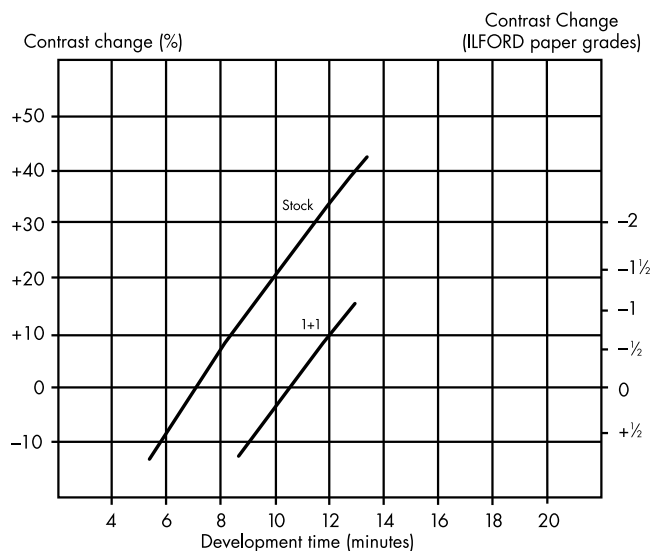
Note: In general, the best image quality is always obtained when the film is processed according to the recommendations given in section 5, and printed on the appropriate grade of paper for the resulting negatives.

The scale on the right hand side of the contrast-time curves gives the contrast changes in ILFORD printing paper contrast grades.

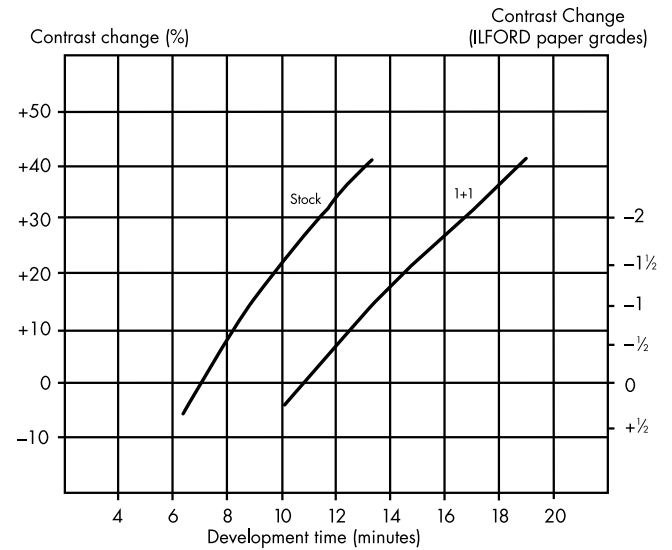
For example, if your negatives normally lie between paper grades 2 and 3, you may wish to increase the film development time, and so increase the contrast of the negatives, so they print on grade 2.

In such a case with ID-11 (Stock) developer, for example, instead of giving a development time of 7 minutes, read off the new development time of approximately 9 minutes where the -1 paper grade meets the contrast-time curve.

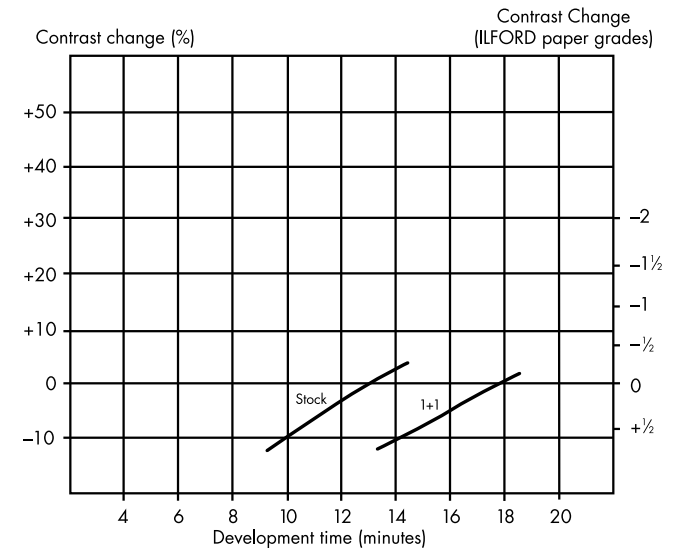
6.1 ID-11



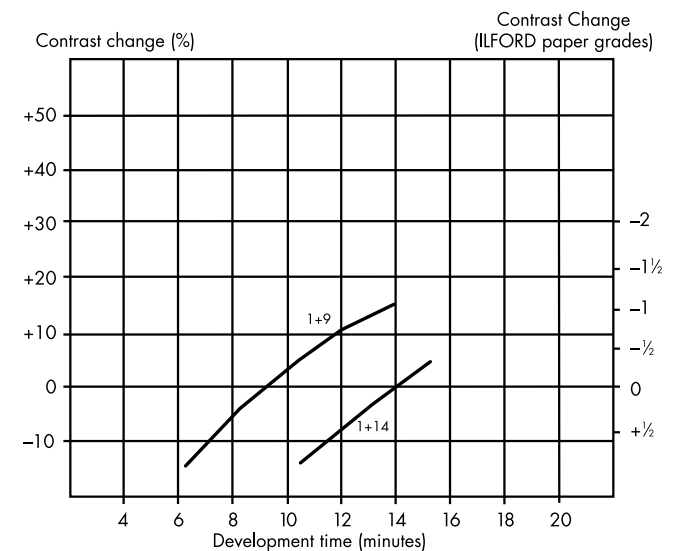
6.2 MICROPHEN



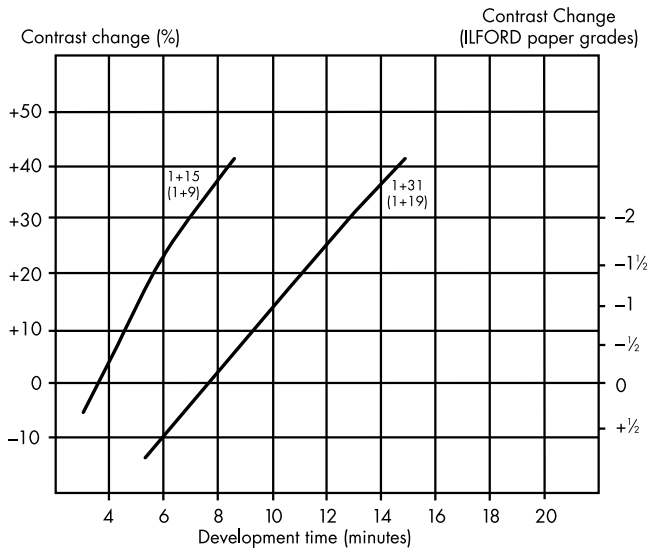
6.3 PERCEPTOL



6.4 ILFOSOL-S



6.5 ILFOTEC HC (HC-D)



7 STORAGE

In common with all film, store unexposed 400 DELTA PROFESSIONAL in a cool (50–68°F/10°–20°C), dry place in its original packaging. Never leave film in a hot place, such as near a radiator or in the glove compartment of a car. Similarly, never leave film in strong sunlight, such as near a window.

7.1 STORAGE OF EXPOSED FILM

As with any film, once exposed, process 400 DELTA PROFESSIONAL as soon as possible. Images on exposed but unprocessed film will not degrade during normal working periods, that is, up to one month when stored as recommended.

7.2 NEGATIVE STORAGE

Store processed negatives in a cool (50–68°F/10°–20°C), dry place, in the dark. Suitable storage sleeves include those made of cellulose triacetate, Mylar or paper (pH6.5–7.5) or inert polyester. Certain other plastics, PVC in particular, are not recommended for negative storage as the plasticizer used may affect the film and cause it to stick to the negative sleeves.

8 PRINT MAKING

400 DELTA PROFESSIONAL gives negatives with superb image quality which will ensure excellent quality prints, even from subjects with a wide brightness range. 400 DELTA PROFESSIONAL is designed for use with all papers to give a full range of tones including excellent highlight and shadow detail.

For best results, the ILFORD range of MULTIGRADE variable contrast papers, and graded papers such as ILFOSPEED RC Deluxe and ILFOBROM GALÉRIE FB are recommended. Additionally, the ILFORD MULTIGRADE 500 exposing system replaces the standard lamphouse on most professional enlargers and ensures fast and efficient printing on MULTIGRADE papers.

The development times in section 5 give negatives which are suitable for printing in all enlargers. These times, however, are only a guide and may be altered to suit individual printing requirements. Some guidance on altering the times is given in the contrast-time curves in section 6.

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