APPLICATION SHEET

PUSH PROCESSING

INCREASING APPARENT FILM SPEED BY OVER-DEVELOPMENT

All camera films have a basic speed, usually shown as an ISO rating on the packaging. This gives you a measure of how sensitive the film is to light, but only when processed to 'normal' contrast. If you expose the film at its rated speed and process it to normal contrast according to the standard recommendations you will get the best results for a wide range of conditions.

However, you cannot always use the rated exposure as the light level may be too low, or you may need a high shutter speed and/or small aperture. In these cases, the solution is to uprate the film to a higher speed and push process, that is deliberately underexpose the film and extend the development time to compensate for it.

You can uprate many films by one or two stops. Some films, which have been designed for push process, can be uprated further. Most films in the ILFORD range can be uprated by one stop, DELTA 400 PROFESSIONAL and HP5 Plus by up to three stops. After being uprated, a film will usually need push processing to give best results.

The exceptions are XP2 SUPER and DELTA 3200 PROFESSIONAL. XP2 Super is a black and white film processed in C41 type colour negative chemicals. It has an ISO speed of 400/27° yet can be exposed over the range EI 50/18 to EI 800/30 and given standard processing. DELTA 3200 Professional has an ISO speed rating of ISO 1000/31°. It is usually exposed at EI 3200/36 but can be exposed at EI 25000/45 with the appropriate development. At speed ratings above EI 6400/39 first make test exposures to ensure the results are suitable for the intended purpose.

Your choice of developer will influence the quality of your image as much as your choice of film. Most developers can be used for push processing, but a few, such as PERCEPTOL, are unsuitable as they lower film speed in order to obtain the finest grain. The best push processing developers, such as MICROPHEN and ILFOTEC DD–X, give a small increase in film speed at normal contrast.

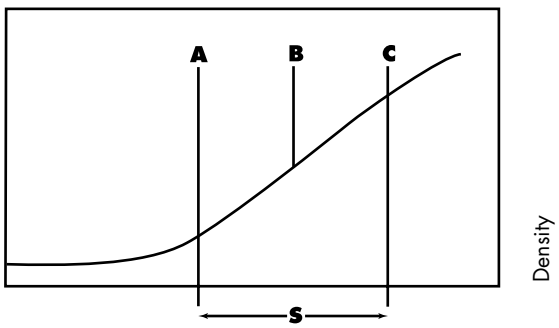
The development times at the end of the leaflet refer to all film formats. 35mm films are the most likely to be push processed, however, other formats of film will behave in a similar way. Please refer to the fact sheet or technical information leaflet on the individual film for further information.

PUSH PROCESSING

How well push processing works is much more dependent on the subject illumination than for standard processing. The push processing development times for recommended meter settings given in ILFORD information for films and chemicals are chosen to ensure that the maximum level of detail is recorded under all conditions, and especially in very poor lighting.

However, in many situations where film is uprated, the lighting is very unevenly distributed. In these cases, you can usually improve the quality of your final image by changing your exposing and processing. If in doubt though, follow the recommendations in ILFORD information for films and chemicals for the meter setting used.

The main aim when push processing is to ensure that the subject brightness range (S) fits as well as possible onto the mid-tone part (B) of the characteristic curve. If the subject brightness range is too far down the characteristic curve, because the film has been uprated, detail will be lost in the shadows (A).



Relative log exposure

A	Shadows
B	Mid-tones
C	Highlights
S	Ideal subject brightness range

There are three major types of scene where push processing may be of use to you. Examples of these are:

Low light – For example, interior photography under normal indoor lighting, but where a tripod cannot be used.

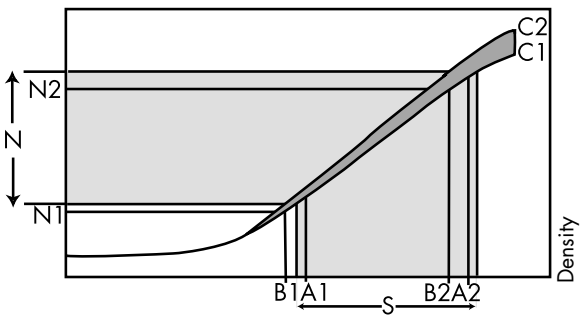
Floodlit – For example, theatre photography where the subjects are brightly lit against a dark background.

Action – For example, daylight sports photography with the need for fast shutter speeds and small apertures.

LOW LIGHT PHOTOGRAPHY

This type of subject is typically an indoor scene lit by the lighting available at the scene. This lighting is normally of very low power compared to most photographic lighting units, and usually has a narrow brightness range. A typical averaging exposure meter will give you an exposure that will position this narrow range in the centre of the characteristic curve (A1–A2 in the diagram). In this case, simply uprating the film (B1–B2) lowers the average density of the negative (N1–N2), which decreases the grain.

However, it also gives a negative that is very thin and almost impossible to print, as most of the density range is contained in the low contrast area close to the bottom of the curve. Push processing increases the contrast and makes the negatives printable (negative density range N). The slight grain increase due to the push process is, in this case, more than compensated for by the decrease in grain caused by underexposing. For this type of scene you should use the full push process appropriate to the amount you have uprated the film.



Relative log exposure

C1	Standard processing
C2	Push processing
S	Average subject density range
N	Average negative density range
A1–A2	Narrow subject brightness range
B1–B2	Narrow subject brightness range, uprated and push processed, leading to an average negative density range

Recommendations for push processing

Uprating	Subject lighting Poor
1 stop	+1 push
2 stops	+2 push
3 stops	+3 push

Example

For HP5 Plus developed in MICROPHEN stock in a spiral tank, if you uprate the film by 2 stops, use a +2 push (ie 11min at 20°C/68°F).

FLOODLIT PHOTOGRAPHY

With photography under floodlit conditions (theatre, indoor sports etc) there is usually enough light on the subject to give a nearly normal brightness range. What is common, however, is that the well-lit subject will be contrasted against an unlit background. This can fool metering systems into giving an average exposure which will record unwanted detail in the background and overexpose the main subject. To get the subject to stand out against a black background, you must compensate for this by underexposing relative to the meter reading.

In many cases, push processing will not be needed, even with a 1 or 2 stop uprating, as the brightness range of the subject will be large enough to suit the standard negative density range. However, a small amount of push processing may be useful as the shadows region of the characteristic curve will then be steeper, giving a sharper transition to pure black in the background. You should only use 2 or 3 stop push processing if you are unsure of the amount of light available. This will ensure that you have the maximum chance of getting a usable negative under awkward conditions, although at the expense of image quality.

Recommendations for push processing

Uprating	Subject lighting Good	Poor
1 stop	none	+1 push
2 stops	+1 push	+2 push
3 stops	+2 push	+3 push

Example

For FP4 Plus exposed under good lighting and developed in ILFOTEC DD 1+4 in a dip and dunk processor, if you uprate the film by 1 stop, use standard processing (ie 8 1/2 min at 24°C/75°F).

ACTION PHOTOGRAPHY

In this type of photography, you have a normal brightness range, but need to use a high shutter speed to capture fast action, or a small aperture because of a long lens, or both. This is the most difficult of the three situations, as there is little chance of uprating the film without losing some of the shadow detail in the scene. It is unlikely that full push processing will give you substantially better images than a small amount of push processing.

Recommnedations for push processing

Uprating	Subject lighting	
	Good	Poor
1 stop	none	+1 push
2 stops	+1 push	+2 push
3 stops	+2 push	+3 push

Example

For HP5 Plus exposed under good lighting and developed in ILFOTEC RT RAPID 1+1+2 in a roller transport processor, if you uprate the film by 2 stops, use a +1 push (ie 75 sec at 26°C/79°F).

DEVELOPMENT RECOMMENDATIONS

The development times are intended as a guide and may be altered if a different result is needed. The times given are for all film formats.

For manual procesing in spiral tanks and deep tanks, the development times are based on intermittent agitiation. Where continuous agitation is used (as in a dish or with some types of developing tank), reduce these times by up to 15%.

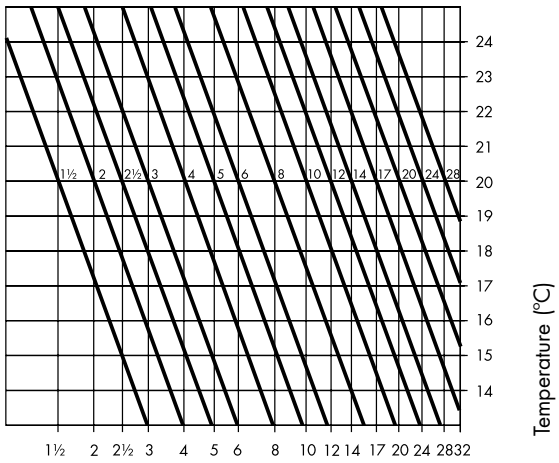
For use in a rotary processor without a pre-rinse, reduce the spiral tank development times by up to 15%. A pre-rinse is not recommended as it can lead to uneven processing.

Development times in other manufacturer's developers are included for your convenience, and are only a general guide. Other manufacturers can and do change their product specifications from time to time, and the development times may change as a result.

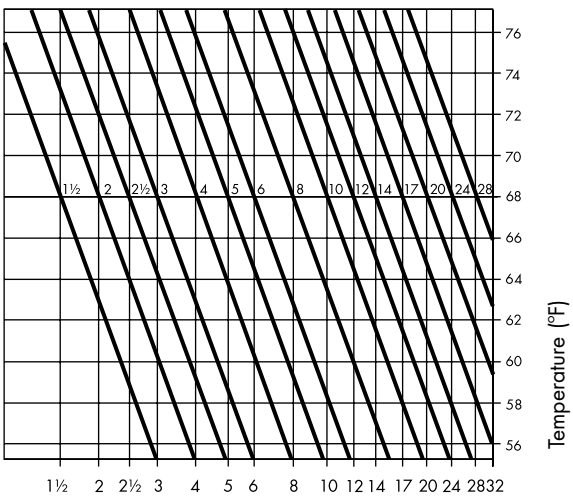
PROCESSING AT DIFFERENT TEMPERATURES

ILFORD films can be processed over a range of temperatures. Development at 20°C/68°F or 24°C/75°F is recommended and the times are given in the development times table. If development is not possible at either 20°C/68°F or 24°C/75°F, the following chart can be used. The chart is based at 20°C/68°F for a general developer, and can be used to give an estimate of development times at temperatures around 20°C/68°F.

For example, if 6 minutes at 20°C/68°F is recommended, the time at 23°C/73°F will be 4½ minutes and the time at 16°C/61°F will be 9 minutes.



New development time (min)



New development time (min)

Note The chart can only be a guide because different developers and processing techniques can vary the results.

Spiral tank, deep tank, rotary processors

MICROPHEN stock – min at 20°C/68°F

Film	0 push	+1 push	+2 push	+3 push
HP5 Plus	6½	8	11	16
FP4 Plus	8½	9	–	–
DELTA 400 PRO	6½	8½	10½	14
100 DELTA PRO	6½	8	–	–
DELTA 3200 PRO	9	12	16½	22
SFX 200	8½	10½	14½	–

ILFOTEC DD–X 1+4 – min at 20°C/68°F

Film	0 push	+1 push	+2 push	+3 push
HP5 Plus	9	10	13	20
FP4 Plus	10	12	–	–
DELTA 400 PRO	8	10½	13½	18
100 DELTA PRO	12	14	–	–
DELTA 3200 PRO	9½	12½	17	25
SFX 200	10	14	–	–

ILFOTEC HC 1+15 – min at 20°C/68°F

Film	0 push	+1 push	+2 push	+3 push
HP5 Plus	3½	5	7½	11
FP4 Plus	4	5	–	–
DELTA 400 PRO	4	5½	7½	13
100 DELTA PRO	–	–	–	–
DELTA 3200 PRO	8	13	–	–
SFX 200	5	7	10½	–

Kodak T-Max 1+4 - min at 20°C/68°F

Film	0 push	+1 push	+2 push	+3 push
HP5 Plus	6½	8	9½	11½
FP4 Plus	8	9	–	–
DELTA 400 PRO	6½	8½	10½	13½
100 DELTA PRO	7	8	–	–
DELTA 3200 PRO	8½	11	14	–
SFX 200	8½	10½	12½	–

Acufine Acufine stock – min at 20°C/68°F

Film	0 push	+1 push	+2 push	+3 push
HP5 Plus	4½	6½	9½	–
FP4 Plus	4	6	–	–
DELTA 400 PRO	9	13	16	–
100 DELTA PRO	–	5½	–	–
DELTA 3200 PRO	–	–	–	–
SFX 200	–	–	–	–

Dip and dunk machines

ILFOTEC DD 1+4 – min at 24°C/75°F

Film	0 push	+1 push	+2 push	+3 push
HP5 Plus	7	10	14	18
FP4 Plus	8½	11½	–	–
DELTA 400 PRO	7	10	13	14
100 DELTA PRO	9½	12½	–	–
DELTA 3200 PRO	10½	13½	19	–
SFX 200	8½	11½	14	–

Kodak T–Max RS stock – min at 24°C/75°F

Film	0 push	+1 push	+2 push	+3 push
HP5 Plus	4½	5	7	–
FP4 Plus	7½	–	–	–
DELTA 400 PRO	5	6½	9	12½
100 DELTA PRO	6	8	–	–
DELTA 3200 PRO	6½	8½	10½	–
SFX 200	6	7	9	–

ILFOLAB FP40, roller transport and short leader machines

ILFOTEC RT RAPID 1+1+2 – sec at 26°C/79°F

Film	0 push	+1 push	+2 push	+3 push
HP5 Plus	60	75	91	108
FP4 Plus	45	54	–	–
DELTA 400 PRO	65	71	84	104
100 DELTA PRO	40	50	–	–
DELTA 3200 PRO	84	104	–	–
SFX 200	54	65	88	–

ILFOTEC RT RAPID 1+1+5 sec at 26°C/79°F

Film	0 push	+1 push	+2 push	+3 push
HP5 Plus	70	95	120	166
FP4 Plus	65	84	–	–
DELTA 400 PRO	78	104	127	166
100 DELTA PRO	56	75	–	–
DELTA 3200 PRO	153	176	–	–
SFX 200	65	90	120	–

Kodak Duraflo RT stock – sec at 26°C/79°F

Film	0 push	+1 push	+2 push	+3 push
HP5 Plus	60	81	120	166
FP4 Plus	50	–	–	–
DELTA 400 PRO	65	71	84	104
100 DELTA PRO	45	55	–	–
DELTA 3200 PRO	84	104	–	–
SFX 200	100	135	200	–

All processing equipment

C41 type processing

Film	0 push	+1 push	+2 push	+3 push
XP2 Super	standard C41 type processing		–	–

A wide range of fact sheets is available which describe and give guidance on using ILFORD products. Visit our website at **www.ilford.com**. Some products mentioned in this fact sheet might not be available in your country.

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