

INFORMATION LEAFLET

# PROCESSING YOUR FIRST BLACK & WHITE FILM

A STEP BY STEP GUIDE TO FILM PROCESSING IN SMALL TANKS FOR HOBBYISTS, STUDENTS AND SCHOOLS

## PROCESSING A FILM IS EASY

Even if you have never developed a film before, you are unlikely to find it very difficult. You do not need a specially-built darkroom to process a film, any room will do provided it can be 'blacked out' to stop any light entering it while the film is loaded into the developing tank. Alternatively a light-tight changing bag can be used. Once this is done, the rest of the process takes place in daylight or room lighting.

Processing is a simple three-step routine. It does not take long: after approximately 15 minutes you can open the tank and look at the film. But you will still need to wash the negatives for a few minutes in tap water to remove waste chemicals before you can dry and print them.

## ESSENTIAL EQUIPMENT

Besides the film you're going to process, you will need a few inexpensive pieces of photographic equipment.

- developing tank and spirals
- ILFORD film cap remover
- ILFORD film leader retriever
- plastic measuring cylinder
- plastic beakers
- plastic storage bottles
- funnels
- stirring rod
- thermometer
- stop clock/watch
- film clips or pegs
- scissors
- negative storage bags
- squeegee or chamois cloth

In addition processing dishes/trays, a water bath (washing up bowl) and hair dryer are useful items.

Of these, the developing tank is the most important. The tank keeps the film in total darkness, yet its top incorporates channels through which you can fill it with processing solutions. Inside, a special spiral ensures the solutions reach every part of the film surface. The most useful measuring cylinders are 50ml, for measuring chemicals, and either 300ml or 600ml for making up solutions.

If you use plastic beakers or bottles, buy different colours, so that you can use a different colour for each solution. Even a trace of fixer can contaminate the developer, and possibly ruin your next film.



**USING CHEMICALS**

**Note** Photographic chemicals are not hazardous when used correctly. It is recommended that gloves, eye protection and an apron or overall are worn when handling and mixing all chemicals. Always follow the specific health and safety recommendations on the chemical packaging. Photochemical material safety data sheets containing full details for the safe handling, disposal and transportation of ILFORD chemicals are available from ILFORD agents or directly from the ILFORD web site at [www.ilford.com](http://www.ilford.com).

Do not use utensils for food preparation to make up and store photochemicals. Keep all foodstuffs away from areas where photographic chemicals are being prepared and used.

Do not use soft drink bottles to store chemicals. Always label containers clearly, and store them safely, out of reach of children.

Do not allow children to use photochemicals unsupervised.

**THE CHEMICALS YOU NEED**

For your first film, the ILFORD chemicals mentioned below are recommended. They are easy to mix and use, because they are supplied in liquid form. All are available in small bottles, so they are economical if you process films only occasionally.

ILFORD ILFOTEC DD-X developer makes the image appear on the film. You should mix up only as much ILFORD ILFOTEC DD-X developer as you need to completely cover the spiral in the developing tank with solution: you pour the used solution down the drain after processing your film.

ILFORD ILFOSTOP stop bath brings development to an end, and prolongs the life of the fixer. The amount of solution used must completely cover the processing spiral. ILFORD ILFOSTOP works quickly, and after processing you can store it to use again.

ILFORD RAPID FIXER makes the developed image permanent. The amount of solution used must completely cover the processing spiral. ILFORD RAPID FIXER works quickly, and after processing you can store it to use again.

Adding a few drops of ILFORD ILFOTOL wetting agent to your final wash water ensures that the film dries quickly and evenly.

**PROCESS SUMMARY**

The step-by-step instructions are for ILFORD 100 DELTA PROFESSIONAL film using ILFOTEC DD-X developer. If you are developing a different ILFORD film or using another developer, check the film development time chart on page 3 to find the development time used.

Step	Time	Temperature
<b>Development</b> ILFORD ILFOTEC DD-X developer diluted 1+4	12 minutes	20°C/68°F
<b>Stop bath</b> ILFORD ILFOSTOP stop bath diluted 1+19	10 seconds	About 20°C/68°F – preferably no warmer than 25°C/79°F and no cooler than 15°C/59°F
<b>Fix</b> ILFORD RAPID FIXER diluted 1+4	3 minutes	as above
<b>Wash</b>	In running water for 5–10 minutes or... In ten changes of water each lasting one minute	as above 20°C/68°F
<b>Dry</b>	Variable	Room temperature or with a cool hair dryer

During development, temperature control is important, and you must use an accurate photographic thermometer to make sure the developer is not too hot or too cold. Temperature is not as critical with the two remaining steps, or during washing but should be within 5°C/9°F of the developer temperature. The step-by-step instructions on pages 8–11 are for a processing temperature of 20°C/68°F, and if you have never processed film before, it is best to follow them exactly. However, you can process film at other temperatures, and on page 4 you will find a chart which gives the necessary adjustment in development time.

**Going further**

Once you have developed your first film, you will probably want to process more, and perhaps experiment with different combinations of film and developer.

**Other Ilford film developers**

ILFORD produces a wide range of film developers, in both liquid and powder form. Liquids make processing simple, quick and convenient, and they are the best choice for occasional users. But when economy is more important you may prefer a powder developer. In unopened packets the crystals keep almost indefinitely, and dissolve rapidly at low temperatures.

**Liquid developers**

ILFORD ILFOSOL S is especially suitable for developing slow and medium speed films such as 100 DELTA Professional, FP4 Plus and PAN F Plus. It improves sharpness without loss of film speed or increased grain.

ILFORD ILFOTEC HC is a highly concentrated general purpose developer. It is a particularly good partner for fast films such as ILFORD HP5 Plus.

ILFORD ILFOTEC LC29 is a very flexible high-dilution developer. Diluted 1+29, it is very economical, but not at the expense of quality: it yields fine grain, and excellent sharpness.

**Powder developers**

ILFORD ID-11 is the ILFORD 'standard' powder developer, and gives the ideal balance of fine grain, sharpness and tonal rendition.

ILFORD MICROPHEN can produce a speed increase of up to 1/3 stops with suitable films such as HP5 Plus and DELTA 400 Professional, yet it retains fine grain. It is highly recommended for push-processing.

ILFORD PERCEPTOL gives the very finest image quality, and is ideal when you need to enlarge 35mm negatives to produce very large prints.

**APPLICATIONS**

● Ideal  
 ◐ Suitable  
 ○ Not recommended

	General purpose	Fine grain	High sharpness	Push processing	Economy	Ease of use	Shelf life
<b>LIQUIDS</b>							
ILFOTEC DD-X	●	●	◐	◐	◐	◐	◐
ILFOTEC HC	●	◐	◐	◐	◐	◐	◐
ILFOTEC LC29	●	◐	◐	◐	◐	◐	◐
ILFOSOL S	●	◐	◐	○	◐	◐	◐
<b>POWDERS</b>							
ID-11	●	●	●	◐	◐	◐	◐
MICROPHEN	◐	◐	◐	◐	◐	◐	◐
PERCEPTOL	○	●	◐	○	◐	◐	◐

**Recommended development times at 20°C for 35mm films**

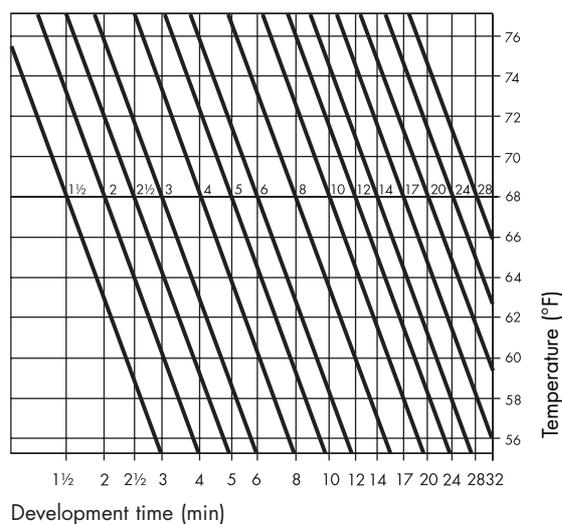
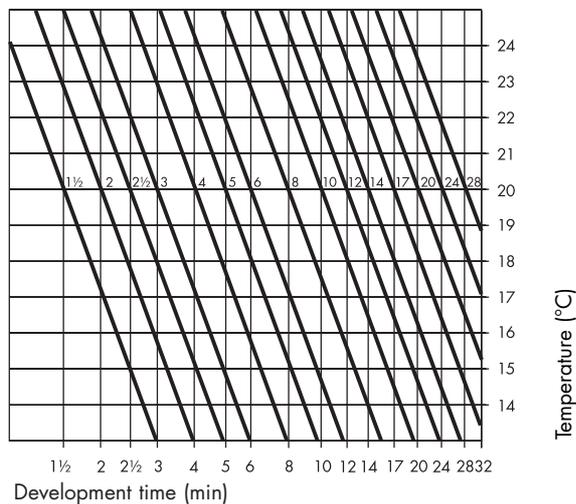
Film	100 DELTA Professional	DELTA 400 Professional	DELTA 3200 Professional	PAN F Plus	FP4 Plus	HP5 Plus	SFX 200
Film speed (ISO)	100/21°	400/27°	3200/36°	50/18°	125/22°	400/27°	200/24°
ILFOTEC DD-X (1+4)	12	8	9½	8	10	9	10
ILFOSOL S (1+9)	6	9	13	4	6½	7	9½
ILFOSOL S (1+14)	10	13	—	6	9½	9½	13
ILFOTEC LC29 (1+9)	—	—	8	—	4	—	5
ILFOTEC LC29 (1+19)	6	7½	14½	4	8	6½	9
ILFOTEC LC29 (1+29)	7½	11½	—	5½	12	9	11
ILFOTEC HC (1+15)	—	—	8	—	4	—	5
ILFOTEC HC (1+31)	6	7½	14	4	8	6½	9
ID-11 stock	8½	9½	10½	6½	8½	7½	10
ID-11 (1+1)	11	14	—	8½	11	13	17
ID-11 (1+3)	20	—	—	15	20	20	—
MICROPHEN stock	6½	6½	9	4½	8	6½	8½
MICROPHEN (1+1)	10	11½	—	6	10	12	15½
MICROPHEN (1+3)	14	—	—	11	14	23	—
Film speed (ISO)	50/18°	200/24°	3200/36°	25/15°	50/18°	320/26°	200/24°
PERCEPTOL stock	12	10	18	9	9	—	14½
PERCEPTOL (1+1)	13	12½	—	10½	13	18	20
PERCEPTOL (1+3)	16	18½	—	15	17	25	—

**Different temperatures**

Though 20°C/68°F is the 'standard' temperature for film processing, you can actually develop film over a much wider range of temperatures.

You may want to use a warmer temperature to cut development time. If you are working in a cold room, and find that the developer temperature drops rapidly, you might find it easier to process film at a lower temperature. In the chart below, find the recommended development time from the row of figures alongside 20°C/68°F; then follow the diagonal line up or down until it crosses the horizontal line corresponding to your chosen processing temperature. Now follow the vertical line down to read off the new development time on the base of the chart.

For example if 12 minutes at 20°C/68°F is recommended, the time at 23°C/73°F will be 8½ minutes and the time at 16°C/61°F 17 minutes.



**Push processing film**

All camera films have a basic speed shown as the ISO rating on the packaging, e.g. HP5 Plus ISO 400/27°. This rating gives you a measure of the film's sensitivity to light when it is processed to normal contrast.

However there are occasions when you may not be able to use the stated ISO speed rating. The lighting level may be too low to make an exposure or you may need a higher shutter speed and/or smaller aperture.

In these cases the solution is to uprate the film to a higher speed, e.g. 800/30° (1 stop), 1600/33° (2 stops), etc. and compensate for this known amount of under exposure by extending the development time.

This technique is known as push processing and it allows you to set your camera's film speed dial to a higher value, so that you can use faster shutter speeds or smaller apertures. Push processing like this is a useful technique when you need to stop action or take pictures with a hand-held camera in dim light. You can push process any film and use most developers, but some combinations work better than others. Faster films such as ILFORD HP5 Plus ,DELTA 400 Professional and DELTA 3200 Professional are specially formulated to give extra shadow detail with prolonged development. ILFORD MICROPHEN developer is formulated to boost film speed, but ILFORD ID-11 and ILFOTEC DD-X developer work well, too. The charts below show the development time for your chosen speed setting on your camera.

**NB** If you are going to uprate a film and use push processing then use the whole film at the higher rating. We do not recommend changing the rating for different parts of the same film.

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The following development times are for push processing in MICROPHEN stock solution at 20°C/68°F.

Exposure Index (EI)	Development time (mins)						
	200/24	400/27	800/30	1600/33	3200/36	6400/39	12500/42
FP4 Plus	9	–	–	–	–	–	–
HP5 Plus	–	6½	8	11	16	–	–
100 DELTA Professional	8	–	–	–	–	–	–
DELTA 400 Professional	5	6½	8½	10½	14	–	–
DELTA 3200 Professional	–	6	7	8	9	12	16½
SFX 200	8½	10½	14½	–	–	–	–

The following development times are for push processing in ILFOTEC DD-X 1+4 at 20°C/68°F.

Exposure Index (EI)	Development time (mins)						
	200/24	400/27	800/30	1600/33	3200/36	6400/39	12500/42
FP4 Plus	12	–	–	–	–	–	–
HP5 Plus	–	9	10	13	20	–	–
100 DELTA Professional	14	–	–	–	–	–	–
DELTA 400 Professional	6	8	10½	13½	18	–	–
DELTA 3200 Professional	–	6	7	8	9½	12½	17
SFX 200	10	14	–	–	–	–	–

### **The ILFORD Range of films**

The processing procedure outlined in this leaflet makes reference to ILFORD 100 DELTA Professional film but this is just one of the eight black and white films that ILFORD produces for general photographic use. With the exception of ILFORD XP2 SUPER, a chromagraphic B&W film that is processed using standard C-41 colour film processing, the processing sequence for the other seven films remains the same as that summarised in the chart on page 2. All that is needed is to choose the right development time for the film/developer combination you are using.

Detailed information about these films and other ILFORD products is available from our website at [www.ilford.com](http://www.ilford.com).

### **The *Plus* Range**

Traditional films which produce easy-to-print negatives with a rich, full tonal range.

#### **HP5 *Plus* ISO 400/27°**

ILFORD HP5 Plus is a fast black and white film, the best choice when lighting levels are low and speed is crucial. HP5 Plus is normally rated at 400/27° but can be rated up to EI 3200/36 with push processing. It is an excellent choice for all action, available light and general purpose photography.

#### **FP4 *Plus* ISO 125/22°**

For high quality photography, ILFORD FP4 Plus is unbeatable. It is an exceptionally fine grain, medium speed, black and white film normally rated at 125/22° but with suitable processing can be rated at 200/24°. It is ideal for high quality indoor and outdoor photography, particularly when big enlargements are to be made. In addition to general photography, FP4 Plus is also suited to copying and internegative work, and has many application in scientific, technical and industrial photography.

#### **PAN F *Plus* ISO 50/18°**

The slowest of the Plus family, PAN F Plus excels when very high image quality is of the greatest importance. Its exposure latitude makes the film especially useful with high contrast subjects or for copying purposes.

ILFORD PAN F Plus is an extremely fine grain black and white film. It has outstanding resolution, sharpness and edge contrast. These characteristics make it the natural choice where fine detail and lack of grain are more important than film speed. Mural size enlargements from PAN F Plus negatives show an outstanding range of tone and detail when the film is carefully exposed and processed.

#### **Ilford XP2 SUPER ISO 400/27°**

ILFORD XP2 SUPER is a very convenient, sharp, fast, fine grain black and white film which uses the dye technology of colour film.

XP2 SUPER can be used for any photographic subject, but ensures excellent results when there is a wide subject brightness range.

XP2 SUPER is easy to expose, and has extremely wide exposure latitude.

XP2 SUPER is easy to process. It is a black and white film which is processed in C41 type colour processing chemicals alongside colour negative films. It can be processed by your local colour minilab. You will receive a set of proof prints, as you do with colour negatives, from which you can decide which negatives you want to enlarge onto black and white paper.

XP2 SUPER is very easy to print. Negatives are printed on black and white paper in the same way as conventional black and white negatives. It gives exceptionally sharp, crisp prints. The excellent highlights and improved shadows of XP2 SUPER give enhanced negative contrast for optimum black and white print quality.

**ILFORD SFX 200 ISO 200/24°**

ILFORD SFX 200 is a medium speed black and white camera film for creative photography. It has extended red sensitivity (up to 740nm) and is especially suited for use with a filter to create special effects. Using a very deep red filter, for example the ILFORD SFX filter, skies can be rendered almost black and most green vegetation almost white. Its unusual tonal rendition ensures interesting results for a range of subjects, including portraits, landscapes, townscapes and architecture.

Best results are often obtained in bright sunshine or in the studio under tungsten lighting.

SFX 200 also has full panchromatic sensitivity to ensure good pictorial contrast with or without the use of a filter. It has a wide exposure latitude, is compatible with all normal developers and has a wide tonal range.

**The DELTA PROFESSIONAL Range**

By using an advanced crystal structure, DELTA Professional films provide very much better image quality than traditionally-formulated films of similar speed.

**DELTA 400 PROFESSIONAL  
ISO 400/27°**

ILFORD DELTA 400 PROFESSIONAL is a fast, fine grain, black and white professional film. It is ideal for action and available light photography, and also gives fine grain results for pictorial and fine art photography.

Although rated at ISO 400/27°, DELTA 400 Professional film can produce high quality prints when exposed at meter settings up to EI 3200/36 and given extended development in ILFORD ILFOTEC DD-X, ILFOTEC HC, MICROPHEN or ILFOTEC ID-11 developers.

**100 DELTA PROFESSIONAL  
ISO 100/21°**

ILFORD 100 DELTA PROFESSIONAL is a medium speed, fine grain, black and white professional film, ideal for pictorial and fine art photography.

For sharpness and freedom from grain it is simply the best in its class. Prints have more sparkle and sharpness than images shot on other films of the same speed, especially when printing giant enlargements.

**DELTA 3200 PROFESSIONAL  
ISO 3200/36°**

ILFORD DELTA 3200 PROFESSIONAL is a high speed, black and white professional film for making quality photographs in difficult exposing conditions. It is ideal for action and available light photography. It is designed to be exposed at EI 3200/36 but with appropriate adjustments to development can be rated between ISO 400/27° and ISO 12500/42°. Recommended developers are ILFORD ILFOTEC DD-X, ILFORD MICROPHEN and ILFORD ID-11.

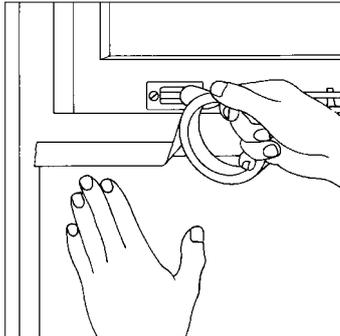
## PROCESSING YOUR FIRST BLACK AND WHITE FILM STEP BY STEP

Processing a film is easy: just follow the step-by-step instructions given here carefully and you are virtually certain to get it right. Even so, it is a good idea to start by making a test film of exposures that are easy to repeat such as, views around your garden, a still life or portraits of family and friends rather than an important film of a wedding, or unrepeatable holiday pictures.

Often the most difficult part of processing is getting the film into the spiral. For ease of loading it is important to ensure that the spiral is completely dry.

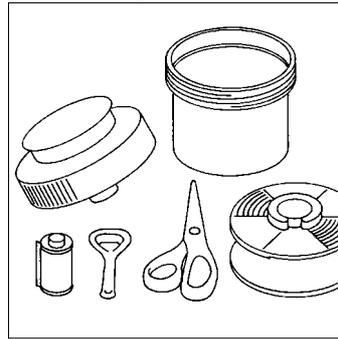
The grooves of the spiral hold the different parts of the film away from one another, so that the developer can circulate freely. If the film is not loaded correctly, uneven development causes spoiled pictures. Start by practising loading a spiral in daylight (using an old, or wasted film) until you can thread it in easily. Then practice with your eyes closed, before finally attempting it in the dark with a real film.

### 1 Setting up your darkroom



Whichever room you choose as your darkroom (kitchen, bathroom or cupboard), it needs to be completely blacked out to stop light from entering. For windows use thick card cut to shape and held in place with black canvas tape. For doors use tape or black cloth or canvas to seal the edges. When finished, spend five minutes in the dark to check that it really is light-tight. Alternatively, use a black changing bag available from photographic dealers.

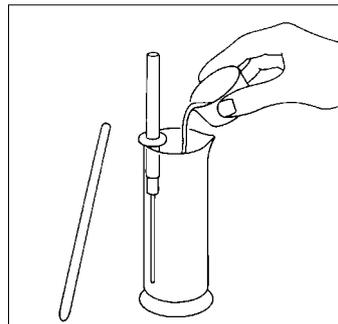
### 2 Preparing your equipment



Set out the film and equipment in a logical order, so that you will be able to find them in the dark. You need only the equipment to get the film out of the cassette and into the light-tight developing tank.

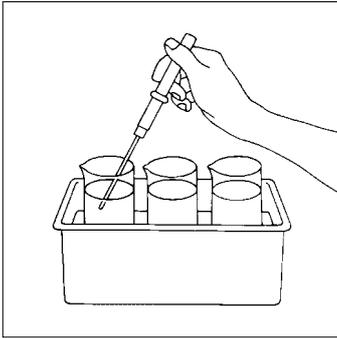
Note: if the film end has not been wound completely into the cassette, you can trim the end and start it in the spiral in daylight. Of course the exposed part of the film must be wound on in complete darkness.

### 3 Mixing your chemicals



To process one 35mm film, mix the developer. Pour exactly 60ml of ILFOTEC DD-X into a measuring cup. The dilution needed is 1+4, so pour 240ml of water into a large (600ml size) cylinder. Mix hot and cold so the water is at about 23°C/73°F. Pour the developer into the water, stir with a stirring rod, and measure the temperature of the solution.

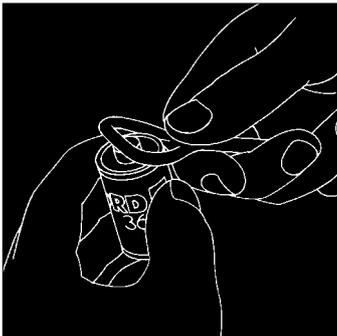
## 4 Adjusting and maintaining solution temperature



If you have three cylinders or plastic containers, mix up the stop bath and fixer as well. For the stop bath 1+19 use 15ml of ILFOSTOP plus 285ml of water. For the fixer 1+4, use 60ml of ILFORD RAPID FIXER plus 240ml of water.

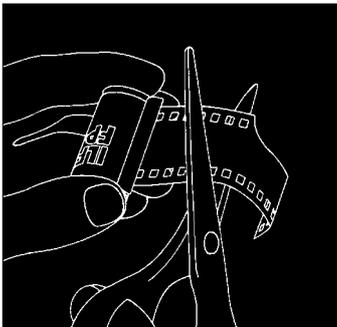
Stand the three containers in a bath of water that is a couple of degrees warmer than the chosen working temperature of 20°C/68°F.

## 5 Preparing the film for loading



Take hold of the cassette and your end cap remover and turn out the light. Lever the cap off the cassette, and slide the film spool part way out. Find the film's shaped leader, slot this through the light-trap opening, then slide the spool back. This saves having 1.4m/4ft 8in of loose film falling on the floor.

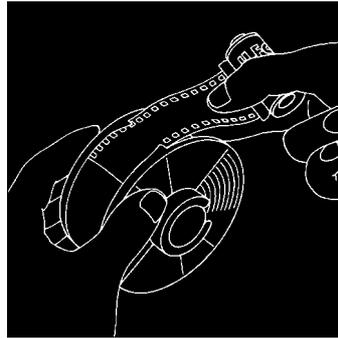
## 6 Preparing the film leader



Pull all of the leader (the cutaway portion) beyond the lips of the cassette.

Hold the cassette as shown in the diagram, so your finger-ends are out of the way of the scissors, and cut off the leader.

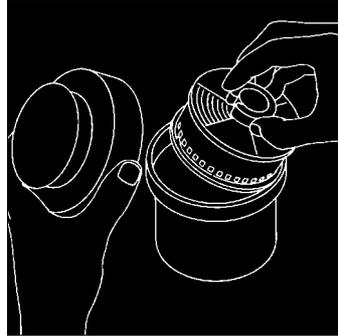
## 7 Loading the spiral



Pick up the spiral and find the projecting lugs which mark the film entry point.

Have these lined up and pointing towards you. Grip the end of the film and pull about 5cm/2in into the first channel, between the lugs. Pull about 30cm/1ft of film out of the cassette. Rotate the sides of the reel back and forth to wind the film into the spiral.

## 8 Loading the development tank



Continue step 7 until you reach the end of the film, then cut this away from the cassette spool. Give a few extra turns to wind the film all the way on. Finally, put the spiral into the developing tank with its plastic sealing ring (if needed), and screw on the tank lid. The film is now sealed inside a light-tight container, so you can switch on the room lights.

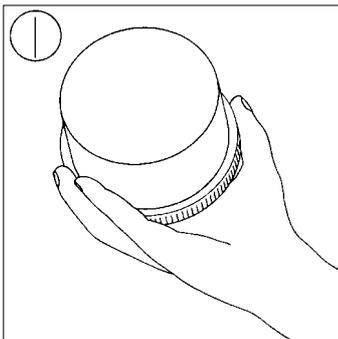
## 9 Start development



Start the development by pouring the ILFOTEC DD-X developer solution smoothly, but as quickly as possible, into the tank.

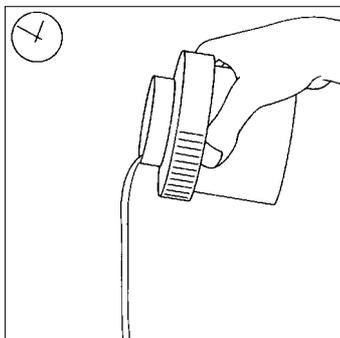
The developer should start at 21°C/70°F, to allow for a slight temperature drop during processing. The tank should stand in a development dish or tray, to collect drips. Start your timer when you finish pouring.

## 10 Agitation



Fit the sealing cap and turn the tank upside down four times during the first 10 seconds and again for 10 seconds (that is, four inversions) at the start of every further minute to agitate the developer. Each time you invert the tank tap it on the bench to dislodge any air bubbles which may have formed on the film.

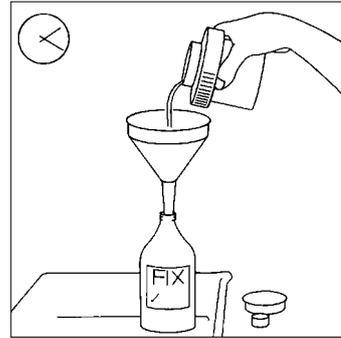
## 11 End development



100 DELTA PROFESSIONAL film needs 12 minutes in ILFOTEC DD-X (1+4) at 20°C/68°F. Therefore, 15 seconds before the 12 minute mark is reached, start to pour the developer out of the tank.

This developer solution won't be used again, so it can be poured straight down the sink. The timer should come to 12 minutes just as you finish pouring.

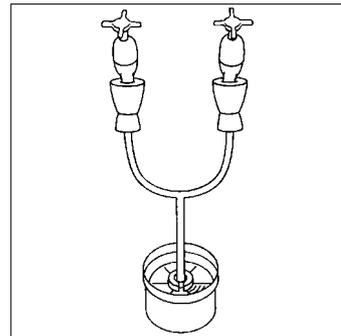
## 12 Stop bath and fixer



Pour the ILFOSTOP stop bath solution (at 20°C/68°F) into the tank. Agitate by turning the tank upside down twice. After 10 seconds, pour it out. The time in the stop bath is not critical. It must be at least 10 seconds. Zero the timer and pour in the ILFORD RAPID FIXER solution (also at 20°C/68°F).

Start the clock as you finish pouring, then agitate, as during development, until fixation is complete, this will take 3 minutes. Once again the time is not critical provided it is over 3 minutes. Then pour the fixer into a storage bottle.

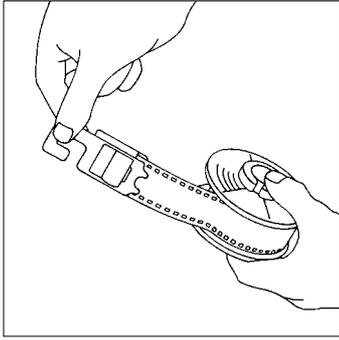
## 13 Wash



Now the film is fixed you can remove the tank lid. If you have running water at about 20°C/68°F, use a piece of rubber tubing to feed this down the centre of the spiral to the bottom of the tank. Wash the film in running water for about 5 to 10 minutes.

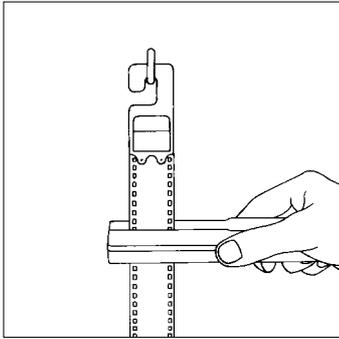
Alternatively, fill the spiral tank with water at the same temperature, +/- 5°C (9°F), as the processing solutions and invert it five times. Drain the water away and refill. Invert the tank ten times. Once more drain the water away and refill. Finally, invert the tank twenty times and drain the water away.

## 14 Rinse and prepare for drying



Add 5ml/l (1+200) of ILFOTOL wetting agent to the final rinse water, stir briefly, then lift the film spiral out of the tank. Pull the end of the film out of the spiral, and securely attach a wooden or plastic film clip to it. (To get a tight grip you may have to double over the end of the film.)

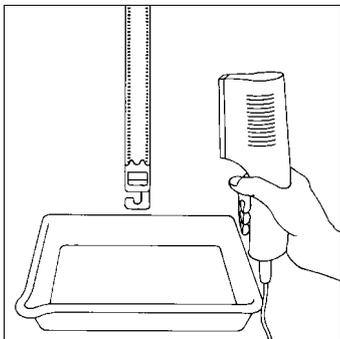
## 15 Squeegee



Hang the film from a hook, nail or line which must be about 2m/6ft 6in off the ground. Slowly unwind the film out of the grooves of the spiral.

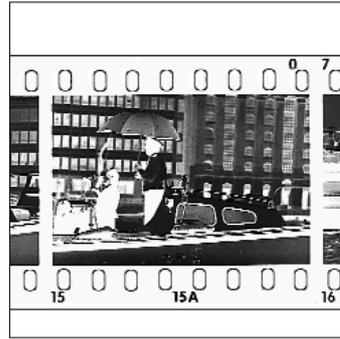
To remove any excess water carefully run squeegee tongs or a clean piece of chamois cloth down the length of the film. (Take care as any grit caught up here will scratch the whole film.)

## 16 Drying



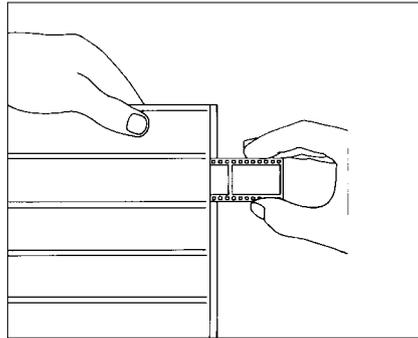
Attach a weighted film clip to the bottom end of the film, with a developing dish or tray under it for drips. Leave it to dry in a still, dust-free atmosphere. Drying can be speeded up by using a hair-dryer on a low setting, kept moving and about 30cm/1ft away from the shiny side of the film.

## 17 Examining the negative



When dry, examine the negatives. The film edges (rebates) should be clear, with legible frame numbers along the bottom. A correctly exposed and processed negative should have a full range of tones, with some parts almost clear (like the rebates) and other parts so dense you can only just read print through them. Handle your negatives by the edges only.

## 18 Storage



Count the negatives: a 36-exposure film may give 37 or 38 pictures. The best way to store them is in filing sheets which take six or seven strips of six negatives, so try to cut them up in this way. (You may be able to drop a blank shot or bad exposure to do this.) Date and label the filing sheet straight away, and they are ready for making prints. Particularly recommended are ILFORD MULTIGRADE papers.

Solution volumes in this step-by-step guide are metric measurements. If you use US liquid measurements please use the table of conversion factors below.

1 litre = 33.8 US fluid oz  
 3.8 litre = 1 US gallon  
 29.6ml = 1 US fluid oz

A wide range of fact sheets is available which describe and give guidance on using ILFORD products. Some products in this fact sheet might not be available in your country.

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