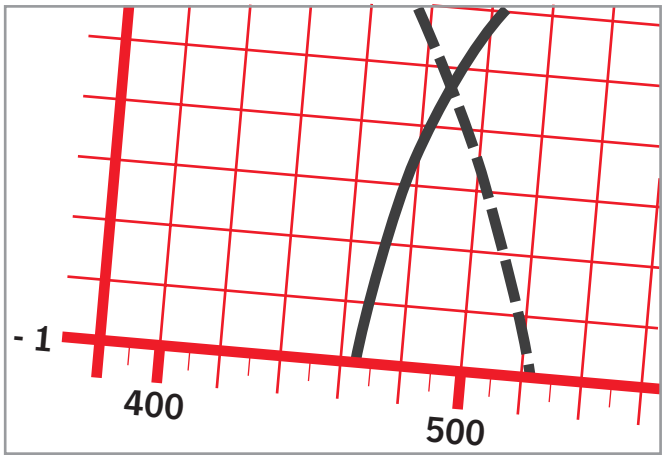
TECHNICAL DATA
AGFA BLACK-AND-WHITE CHEMICALS
Film processing



Along with lab equipment and film and paper quality, chemicals are a major factor for the efficient operation of a photographic lab. They contribute to the smooth running of both finisher and amateur labs. Fluctuations in picture quality and unnecessary costs caused by rejects and wasted time must be prevented.

The variety of a photographic lab's work calls for a wide range of developers, fixers and auxiliary products to guarantee the consumer reliability and economy. Agfa's range of photo-chemicals meets these requirements.

With the ever-rising quality standards optimum results can no longer be achieved solely by emulsion technology. The following characteristics decide the choice of the negative developer:

- speed of development
- control of contrast
- speed yield
- fine-granularity
- resolving power
- sharp contours
- yield
- replenishability
- storage life

These features vary from developer to developer. The consumer has to decide which developer characteristics are needed, for instance sharpness or fine-granularity.

Index

Page

1. Storage, safety at work, handling photochemicals

Storage

The chemicals should be stored in their original packaging at temperatures between 8 °C and 25 °C. If the temperature is too low, certain substances may crystallise in the liquid concentrates, which could result in wrong bath mixtures if this is not taken into account when making up the mixing. The effects of direct heat must also be avoided, because high temperatures can trigger a premature chemical reaction in concentrates that are prone to oxidation, and this in turn can lead to the bath becoming spoilt.

Safety aspects when working with photochemicals

There are certain precautions (e.g. avoiding contact with food and drinks) and safety measures which should be observed when working with photographic processing chemistry. They include adequate ventilation at the workplace and, where necessary, the wearing of protective gloves and goggles.

Observing all the safety precautions will ensure a high level of safety at work. Nevertheless, with particularly sensitive people, the possibility of irritation to the skin and mucous membranes and, in isolated cases, allergic skin reactions, cannot be excluded when working with photographic chemicals.

There are special regulations concerning the transport and handling of dangerous substances which apply to certain photochemicals.These are given on the packs of all products which must be specially labelled. The instructions enclosed with the products or the labels on the packs contain extra safety recommendations.

Safety data sheets in several languages are available for all photochemical products from the appropriate Agfa sales organisation. These safety data sheets also contain specific information on the substances contained in the products.

2. Short product descriptions

Developers

- RODINAL

  The traditional one-shot developer with very good contour sharpness and high speed yield. The concentrate can be matched to any subject contrast by diluting as appropriate.

- RODINAL SPECIAL

  The fine-grain developer for individual negative development. It balances contrast, and produces sharp and fine-grain negatives.

- STUDIONAL LIQUID

  The liquid negative developer with exceptional sharpness and fine-granularity, good speed yield and constant contrast over a long period.

- ATOMAL FF

  Negative developer with exceptionally fine-grain action for use in tank equipment with replenishment. Very good yield and processing consistency.

- REFINAL

  The allround fine-grain balancing developer, with high speed yield and constant contrast. For processing both in small tanks and drums and in tank processors with replenishment.

Fixers

- AGEFIX

  Liquid fixer concentrate. Depending on dilution can be used as standard or fast fixer.

- ACIDOFIX

  Acid fast fixing salt on ammonium thiosulphate basis.

Auxiliary products

- AGEPON

  Wetting agent concentrate for making up the final bath. Ensures that the water drains evenly from the film surface, and so cuts the drying time.

- ALGEZID II

  Highly active biocide to stop the formation of micro-organisms in washing tanks and wash water desilvering units.

- SISTAN

  Image silver stabilizer. Protects films from the deterioration of image silver caused by environmental pollution.

3. Processing instructions

3.1 General instructions

It is a well-known fact that the results of development depend not only on the time, temperature and type of solution, but also on the process method used (tray, small tank, drum, large tank). To obtain reproducible results, the following instructions should be followed:

- For processing in small tanks, agitate (tilt) the tank continuously for the first minute, and then tilt every thirty seconds. Avoid developing times under three minutes.
- For processing in drums (rotary process), choose a speed greater than 30 rpm (changing the direction of rotation). Avoid developing times under three minutes.

In both cases the mixed developer solution is put into the developing tank at the specified temperature (as a rule 20 °C). During development make sure that the chosen temperature is kept constant.

3.2 Temperature

If the specified developer temperature of 20 °C cannot be kept to, the developing time must be correspondingly shortened or lengthened. The developing times at different temperatures (18 °C to 24°C) are shown in the relevant time/temperature graphs.

3.3 Speed

The film speed given is the effective speed for the film-developer system involved (with a mean contrast of γ 0.65).

If mistakes are made in exposure, it is still possible to produce standard negatives with the aid of this figure. For instance, a slightly overexposed AGFAPAN film can be developed in RODINAL 1 + 25 with standard results, in spite of the wrong exposure.

3.4 Contrast

The developing times given are guides. Depending on the subject contrast, the negative contrast (gradation of the negatives) may be affected by the developing time, i.e. the films are developed at a lower or higher contrast (gamma value). If the subject contrast is very great, the negatives are developed flatter ($\gamma = 0.55$). With low subject contrast the negatives are developed to higher contrast ($\gamma = 0.75$).

Remember that the speed yield can rise or fall, i.e. a development-induced lower or higher film speed than that specified by the manufacturer must be compensated by a longer or shorter exposure. (This must be individually found for each film/developer combination).

Generally development aims at medium negative contrast ($\gamma = 0.65$). Remember however that condenser enlargers require flatter negatives, and enlargers with colour mixing heads sometimes require steeper negatives.

3.5 Lengthening time for multiple batches (small tank, tray, drum)

To ensure consistent speed yield and contrast, the developing times for each successive batch must be lengthened. It is not possible to give exact times, since these are governed by the idle time between two batches and the method of storing the developer (glass or plastic bottles, brimful or part-full, capped bottle). If used developer is kept in brimful tightly capped bottles between batches, the guiding figures given in the table below should be used.

The following is a guide: after processing one film in 500 ml developer, lengthen the developing time by about 10 %. With a five-litre tank volume lengthen the time after ten films.

Idle time between two batches	Development lengthened by
few hours (but development on same day)	none *
1 – 3 days	+ 5 %
4 – 8 days	+ 10 %
1 – 2 weeks	+ 15 %
over 2 weeks	+ 20 %

* with ATOMAL FF: + 10 %.

The extra times given above do not change if several films are simultaneously processed in one batch.

3.6 Development times* of AGFAPAN films (with different speed ratings)

AGFAPAN APX 25 PROFESSIONAL

Developer	Temperature	Exposed as ISO 25/15°	Exposed as ISO 50/18°
REFINAL	20 C°	6 min	10 min
	24 C°	–	6 min
STUDIONAL LIQUID	20 C°	4 min	7 min
RODINAL SPECIAL	24 C°	–	4 min
RODINAL 1 + 25	20 C°	6 min	–
	24 C°	–	–

AGFAPAN APX 100 PROFESSIONAL

Developer	Temperature	Exposed as ISO 100/21°	Exposed as ISO 200/24°
REFINAL	20 C°	6 min	9 min
	24 C°	–	5 min
STUDIONAL LIQUID	20 C°	4 min	6 min
RODINAL SPECIAL	24 C°	–	3.5 min
RODINAL 1 + 25	20 C°	8 min	11 min
	24 C°	–	8 min

* Development in small tanks and trays.

AGFAPAN APX 400 PROFESSIONAL

Developer	Temperature	Exposed as ISO 400/27°	Exposed as ISO 800/30°
REFINAL	20 C°	6 min	16 min
	24 C°	–	10 min
STUDIONAL LIQUID	20 C°	4.5 min	–
RODINAL SPECIAL	24 C°	–	–
RODINAL 1 + 25	20 C°	7 min	–
	24 C°	–	–

* Development in small tanks and trays.

Further information on the individual negative developers is given in the respective product description.

Depending on the film/ developer combination used, different speed settings and different negative contrasts may result.
A higher negative contrast can be compensated by a flatter paper grade.

4. Use of developer concentrates

Use some of the mixing water for rinsing out the chemical tanks. This removes chemical residues, making it easier to reuse the tanks properly.

4.1 RODINAL

An allround developer concentrate, tried and tested for more than hundred years, on p-aminophenol basis for mixing one-shot developers. RODINAL features very good contour sharpness and a high speed yield. The concentrate can be diluted to match any special subject contrast.

Mixing instructions

RODINAL is diluted with water as shown in the tables (1 part concentrate + 25 or 50 parts water). The water must be brought to 20 °C before the concentrate is added. Use a finely graduated measure or pipette for making up the solution.

RODINAL diluted for use will only keep for a short time, and should therefore be mixed immediately before use.

Yield

One-shot developer.

With 500 ml concentrate about fifty films (135-36 or 120 roll-film) can be developed.

Life

RODINAL will keep for at least two years in the original pack. The concentrate will keep for at least six months. The working solution cannot be reused after development.

Dilution and developing times (at 20 °C)

RODINAL 1 + 25

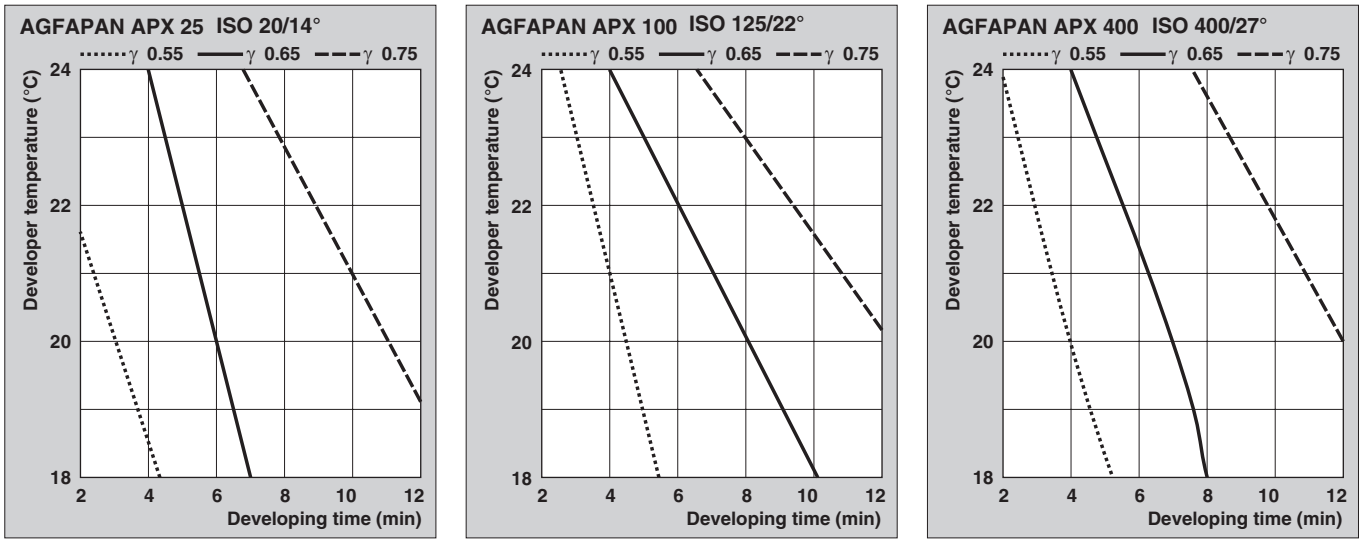
Rotary process (drum)

Contrast	AGFAPAN APX 25	AGFAPAN APX 100	AGFAPAN APX 400
γ 0.55	–	4 min	4 min
γ 0.65	4 min	7 min	5 min
γ 0.75	8 min	10 min	6 min

Small tank, tray

Contrast	AGFAPAN APX 25	AGFAPAN APX 100	AGFAPAN APX 400
γ 0.65	6 min	8 min	7 min

Developing times at different temperatures RODINAL 1 + 25 (small tank)



Agitation

Tray: Continuous agitation.

Small/big tank: Continuous for the first minute, then every 30 seconds.

Drum: Continuous, changing the direction of rotation.

Dilution and developing times (at 20 °C)

RODINAL 1 + 50

Rotary process (drum)

Contrast	AGFAPAN APX 25	AGFAPAN APX 100	AGFAPAN APX 400
γ 0.55	4 min	8 min	7 min
γ 0.65	9 min	14 min	9 min
γ 0.75	15 min	19 min	11 min

Small tank, tray

Contrast	AGFAPAN APX 25	AGFAPAN APX 100	AGFAPAN APX 400
γ 0.65	10 min	17 min	11 min

Agitation

Tray: Continuous agitation.

Small/big tank: Continuous for the first minute, then every 30 seconds.

Drum: Continuous, changing the direction of rotation.

Film speed (exposure index)

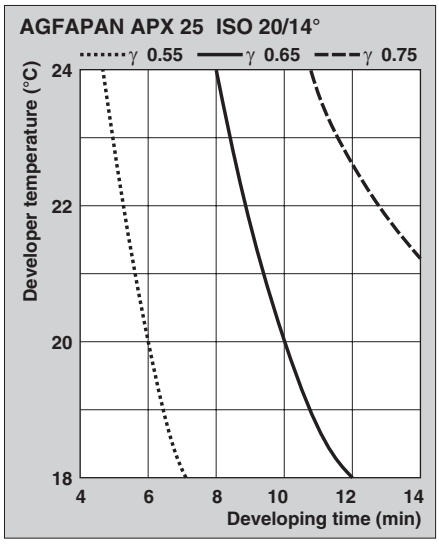
Depending on the film/developer combination used, in practice film speeds may differ from the nominal speed rating. The following table shows the speed to be set (in practice) for the various film types (γ 0.65).

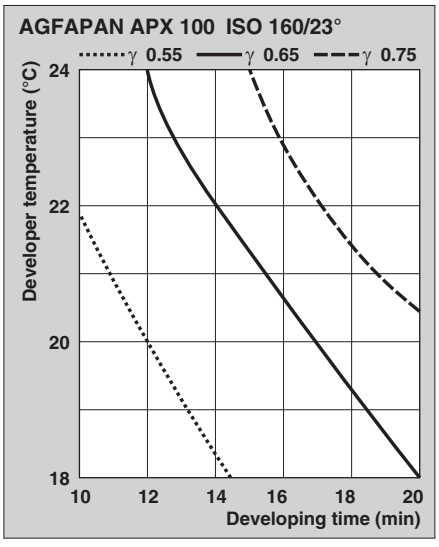
Film type	Dilution	Time *	Speed
AGFAPAN APX 25	1 + 25	6 min	ISO 20/14°
	1 + 50	10 min	ISO 20/14°
AGFAPAN APX 100	1 + 25	8 min	ISO 125/22°
	1 + 50	17 min	ISO 160/23°
AGFAPAN APX 400	1 + 25	7 min	ISO 400/27°
	1 + 50	11 min	ISO 500/28°
Fuji Neopan 400 Prof.	1 + 25	4.5 min	ISO 250/25°
	1 + 50	8 min	ISO 250/25°
Fuji Neopan 1600 Prof.	1 + 25	3.5 min	ISO 400/27°
	1 + 50	8 min	ISO 400/27°
Ilford PAN-F Plus	1 + 25	6 min	ISO 50/18°
	1 + 50	12 min	ISO 64/19°
Ilford FP 4 Plus	1 + 25	8 min	ISO 100/21°
	1 + 50	18 min	ISO 125/22°
Ilford HP 5 Plus	1 + 25	8 min	ISO 400/27°
	1 + 50 **		
Ilford Delta 100	1 + 25	9 min	ISO 100/21°
	1 + 50	16 min	ISO 125/22°
Ilford Delta 400	1 + 25	8 min	ISO 400/27°
	1 + 50	18 min	ISO 400/27°
Ilford Delta 3200	1 + 25	11 min	ISO 1250/32°
	1 + 50 **		
Ilford SFX 200	1 + 25	6 min	ISO 100/21°
	1 + 50	15 min	ISO 125/22°
Kodak Plus-X	1 + 25	6 min	ISO 125/22°
	1 + 50	13 min	ISO 125/22°
Kodak Tri-X	1 + 25	7 min	ISO 500/28°
	1 + 50	14 min	ISO 500/28°
Kodak T-MAX 100	1 + 25	5.5 min	ISO 64/19°
	1 + 50	15 min	ISO 80/20°
Kodak T-MAX 400	1 + 25	6 min	ISO 400/27°
	1 + 50	11 min	ISO 400/27°
Kodak T-MAX p3200	1 + 25	8 min	ISO 1250/32°
	1 + 50	16 min	ISO 1250/32°
Kodak Recording 2475	1 + 25	4.5 min	ISO 640/29°
	1 + 50	10 min	ISO 640/29°

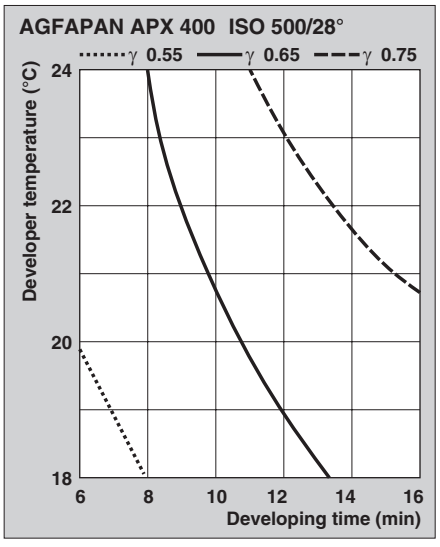
* Small tank or tray processing at 20 °C.

** Not recommended.

Developing times at different temperatures RODINAL 1 + 50 (small tank)







4.2 RODINAL SPECIAL

Developer concentrate ready for multiple use after dilution. It produces fine-grain sharp negatives with balanced contrast. Processing times are particularly short.

Mixing instructions

The concentrate is diluted with water 1 + 15 (= 1 part concentrate + 15 parts water).

Yield

- 10 –12 films 135-36 or rollfilms 120 per litre
- 50 – 70 sheet films 9 × 12 cm per litre (= 0.5 – 0.75 m²)

To ensure uniform speed yield and contrast, the developing time must be lengthened for each successive batch (see page 4).

Life

The concentrate will keep for at least two years in the original pack. Developer mixed ready for use will keep for three months in brimful tightly capped bottles. Used developer should be stored separately from fresh.

Developing time (at 20 °C)

Rotary process (drum)

Contrast	AGFAPAN APX 25	AGFAPAN APX 100	AGFAPAN APX 400
γ 0.55	–	–	3 min
γ 0.65	3 min	3.5 min	4 min
γ 0.75	5 min	5 min	5 min

Small tank, tray

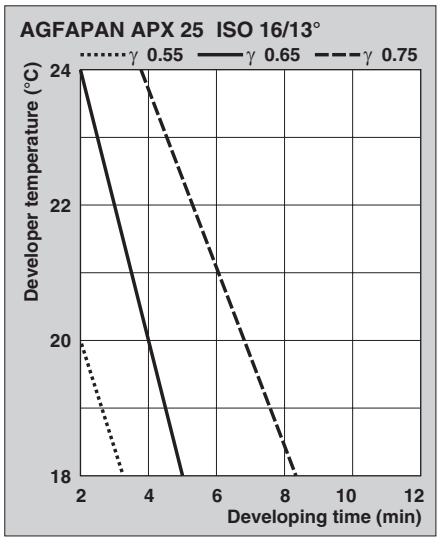
Contrast	AGFAPAN APX 25	AGFAPAN APX 100	AGFAPAN APX 400
γ 0.65	4 min	4 min	4,5 min

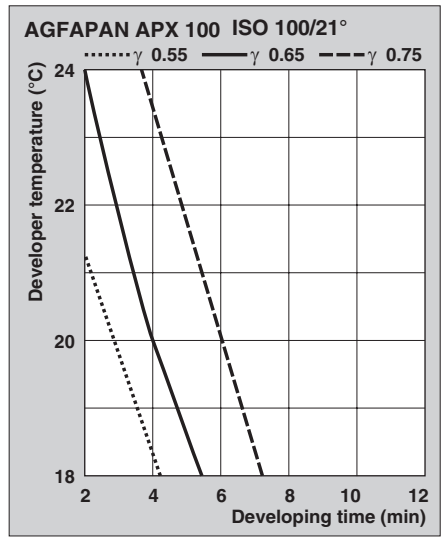
Film speed (exposure index = γ 0.65)

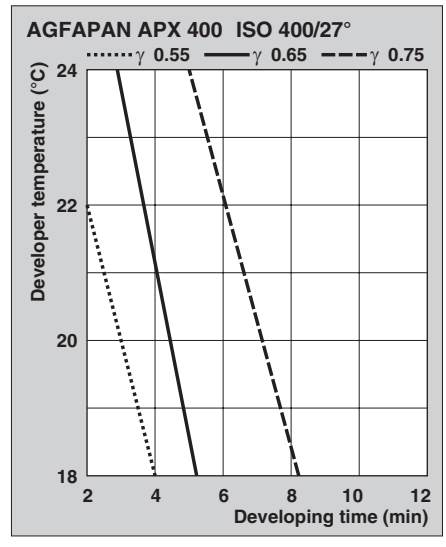
Film type	Time *	Speed	
AGFAPAN APX 25	4 min	ISO	16/13°
AGFAPAN APX 100	4 min	ISO	100/21°
AGFAPAN APX 400	4.5 min	ISO	400/27°
Fuji Neopan 400 Prof.	3 min	ISO	320/26°
Fuji Neopan 1600 Prof.	3 min	ISO	800/30°
Ilford PAN-F Plus	3 min	ISO	50/18°
Ilford FP 4 Plus	3.5 min	ISO	100/21°
Ilford HP 5 Plus	4 min	ISO	400/27°
Ilford Delta 100	3.5 min	ISO	160/23°
Ilford Delta 400	4.5 min	ISO	400/27°
Ilford Delta 3200	6 min	ISO	1250/32°
Ilford SFX 200	4 min	ISO	125/22°
Kodak Plus-X	5 min	ISO	125/22°
Kodak Tri-X	3.5 min	ISO	400/27°
Kodak T-MAX 100	5 min	ISO	80/20°
Kodak T-MAX 400	5 min	ISO	400/27°
Kodak T-MAX p3200	6 min	ISO	1250/32°
Kodak Recording 2475	6 min	ISO	640/29°

* Small tank or tray processing at 20 °C.

Developing times at different temperatures RODINAL SPECIAL (small tank)







4.3 STUDIONAL LIQUID

Developer concentrate ready for use after dilution. Outstanding sharpness and fine-grain. Good speed yield and consistent gradation over long processing periods. Active, rapid developer.

Mixing instructions

STUDIONAL LIQUID is diluted with water 1 + 15 (= 1 part concentrate + 15 parts water). If only a part-quantity of the concentrate is used, squeeze the plastic bottle before recapping to protect the concentrate from oxidation. The best method is to mix the complete quantity and keep the solution in full bottles.

Specific gravity of freshly mixed solution (at 20°C):

1.019 – 1.025.

Yield

- 10 – 12 films 135-36 or rollfilms 120 per litre
- 50 – 70 sheet films 9 × 12 cm per litre (= 0.5 – 0.75 m²)

To ensure uniform speed yield and contrast, the developing time must be lengthened for each successive batch (see page 4).

Life

The concentrate will keep for at least two years in the original pack. Developer mixed ready for use will keep for three months in brimful tightly capped bottles. Used developer should be stored separately from fresh.

Developing times (at 20 °C)

Rotary process (drum)

Contrast	AGFAPAN APX 25	AGFAPAN APX 100	AGFAPAN APX 400
γ 0.55	–	–	3 min
γ 0.65	3 min	3.5 min	4 min
γ 0.75	5 min	5 min	5 min

Small tank, tray

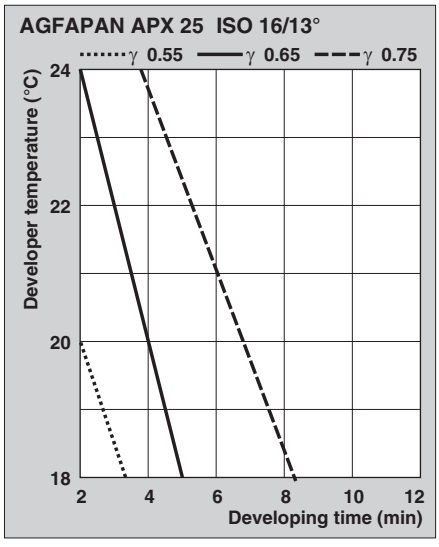
Contrast	AGFAPAN APX 25	AGFAPAN APX 100	AGFAPAN APX 400
γ 0.65	4 min	4 min	4.5 min

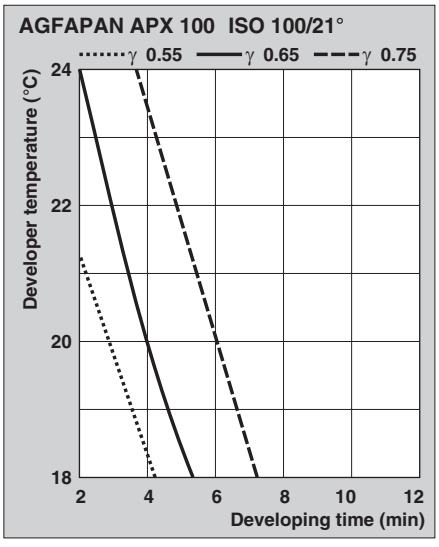
Film speed (exposure index = γ 0,65)

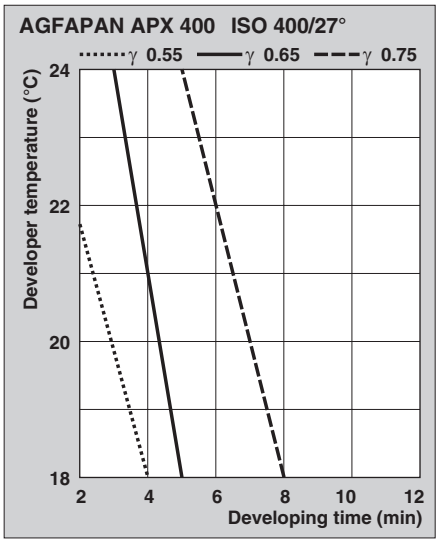
Film type	Time *	Speed
AGFAPAN APX 25	4 min	ISO 16/13°
AGFAPAN APX 100	4 min	ISO 100/21°
AGFAPAN APX 400	4.5 min	ISO 400/27°
Fuji Neopan 400 Prof.	3 min	ISO 320/26°
Fuji Neopan 1600 Prof.	3 min	ISO 800/30°
Ilford PAN-F Plus	3 min	ISO 50/18°
Ilford FP 4 Plus	3.5 min	ISO 100/21°
Ilford HP 5 Plus	4 min	ISO 400/27°
Ilford Delta 100	3.5 min	ISO 160/23°
Ilford Delta 400	4.5 min	ISO 400/27°
Ilford Delta 3200	6 min	ISO 1250/32°
Ilford SFX 200	4 min	ISO 125/22°
Kodak Plus-X	5 min	ISO 125/22°
Kodak Tri-X	3.5 min	ISO 400/27°
Kodak T-MAX 100	5 min	ISO 80/20°
Kodak T-MAX 400	5 min	ISO 400/27°
Kodak T-MAX p3200	6 min	ISO 1250/32°
Kodak Recording 2475	6 min	ISO 640/29°

* Small tank or tray processing at 20 °C.

Developing times at different temperatures STUDIONAL LIQUID (small tank)







5. Use of powder developers

5.1 ATOMAL FF

Extremely fine-grain negative developer with balancing action in powder form for processing in replenished tank equipment. Very good yield, storage life and processing consistency.

Mixing instructions

Stir Part A into at least 75 % of the total quantity of water needed at 40 °C until it is completely dissolved. Then stir in Part B. When it is dissolved, top up with water to the final volume. Developer and replenisher are ready for use after cooling to the working temperature.

It is not advisable to weigh part-quantities for smaller volumes, since the chemicals may have been separated by vibration during transport.

Specific gravities of freshly mixed solutions (at 20 °C):

1.046 – 1.052 = developer

1.050 – 1.056 = replenisher

Developing times

Process in tanks

The optimum developing time is governed by the printing process concerned, the processing temperature and the gradation required. The times can be individually determined, depending on the film type and the above criteria. The following developing times are given here as guides.

Temperature	Time
18 C°	8 – 10 min
20 C°	6 – 8 min
22 C°	4 – 6 min
24 C°	3 – 5 min

Yield

With replenished processes – approx. 14 ml replenisher per 135-36 film: 71 135-36 films with 1 litre replenisher.

Yield without replenishment:

- 10 – 12 films 135-36 or rollfilms 120 per litre
- 50 – 60 sheet films 9 × 12 cm per litre (= 0.5 – 0.65 m²)

Replenishment: see page 11.

Life

The developer can be kept dry in the original pack at room temperature for at least two years. Unused fresh solution will keep in brimful tightly capped bottles for about six months. Used developer should be stored separately from fresh. The life of used developer is reduced to about three months. The life of continuously replenished developer in tanks with floating lids is at least twelve months.

Developing times (at 20 °C)

ATOMAL FF

Rotary process (drum)

Contrast	AGFAPAN APX 25	AGFAPAN APX 100	AGFAPAN APX 400
γ 0.65	8 min	6 min	7 min
γ 0.75	11 min	9 min	12 min

Small tank, tray

Contrast	AGFAPAN APX 25	AGFAPAN APX 100	AGFAPAN APX 400
γ 0.65	10 min	8 min	10 min

Agitation

Tray: Continuous agitation.

Small/big tank: Continuous for the first minute, then every 30 seconds.

Drum: Continuous, changing the direction of rotation.

Film speed (exposure index)

Depending on the film/developer combination used, in practice film speeds may differ from the nominal speed rating. The following table shows the speed to be set (in practice) for the various film types (γ = 0.65).

Film type	Time (20 C°) Small tank/tray	Time (20 C°) drum	Speed (ISO)
AGFAPAN APX 25	10 min	8 min	16/13°
AGFAPAN APX 100	8 min	6 min	50/18°
AGFAPAN APX 400	10 min	7 min	160/23°
Fuji Neopan 400 Prof.	8.5 min	6.5 min	160/23°
Fuji Neopan 1600 Prof.	7.5 min	5 min	250/25°
Ilford PAN-F	8 min	6 min	25/15°
Ilford PAN-F Plus	7.5 min	5.5 min	20/14°
Ilford FP 4 Plus	12 min	10 min	100/21°
Ilford Delta 100	7.5 min	5.5 min	40/17°
Ilford Delta 400	11 min	9 min	160/23°
Ilford HP 5 Plus	11 min	9 min	200/24°
Kodak Tri-X	10 min	8 min	250/25°
Kodak T-MAX 100	12 min	11 min	50/18°
Kodak T-MAX 400	12 min	10 min	250/25°
Kodak T-MAX p3200	14 min	12.5 min	640/29°

5.2 REFINAL

Allround very high yield balancing developer in powder form which, as drum, small tank or tray developer and – with proper replenishment – as deep tank developer, will ensure a consistently high speed yield and uniform gradation over particularly long periods. REFINAL produces fine grain and sharp contours.

Mixing instructions

Stir Part A into at least 75 % of the total quantity of water needed at 40 °C until completely dissolved. Then stir in Part B. After it has dissolved, top up with water to the final volume.

It is not advisable to weigh part-quantities for smaller volumes, since the chemicals may have been separated by vibration during transport.

Specific gravities of freshly mixed solutions (at 20 °C):

1.064 – 1.070 = developer/ 1.072 – 1.078 = replenisher

Yield

With replenished processes – approx. 14 ml replenisher per 135-36 film: 71 films 135-36 with 1 litre replenisher.

Yield without replenishment:

- 10 – 12 films 135-36 or rollfilms 120 per litre
- 50 – 60 sheet films 9 × 12 cm per litre (= 0.5 – 0.65 m²)

Replenishment: see page 11.

Life

The developer can be kept dry in the original pack at room temperature for at least two years. Unused fresh solution will keep in brimful tightly capped bottles for about six months. Used developer should be stored separately from fresh. The life of used developer is reduced to about three months. The life of replenished developer in tanks with floating lids is at least twelve months.

Developing times (at 20 °C)

Rotary process (drum)

Contrast	AGFAPAN APX 25	AGFAPAN APX 100	AGFAPAN APX 400
γ 0.55	3 min	3 min	3 min
γ 0.65	5 min	5 min	5 min
γ 0.75	8 min	8 min	8 min

Small tank, tray

Contrast	AGFAPAN APX 25	AGFAPAN APX 100	AGFAPAN APX 400
γ 0.65	6 min	6 min	6 min

Agitation

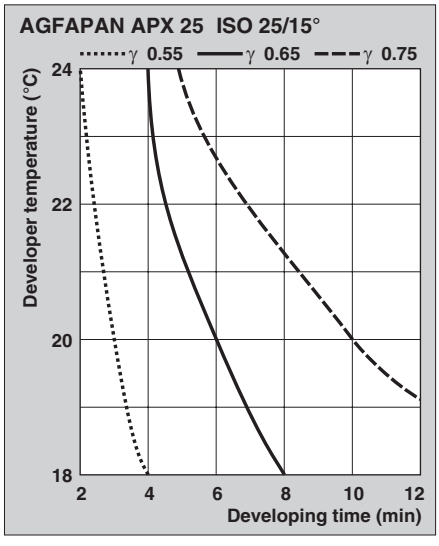
Tray:	Continuous agitation.
Small/big tank:	Continuous for the first minute, then every 30 seconds
Drum:	Continuous, changing the direction of rotation.

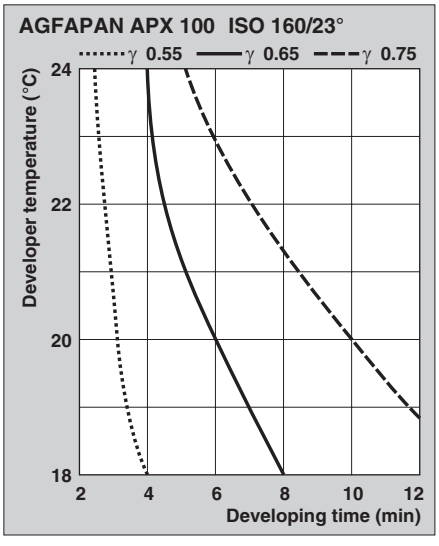
Process in tanks

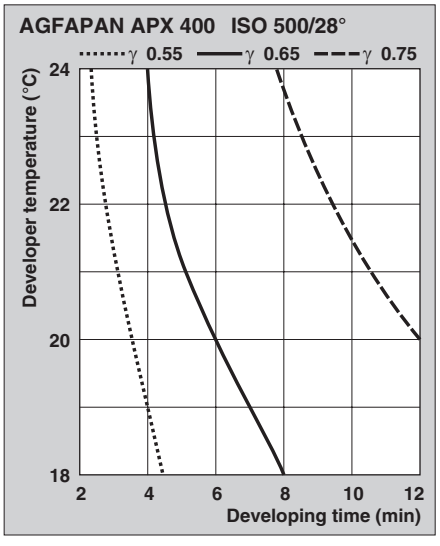
The optimum developing time is governed by the printing process concerned, the processing temperature and the gradation required. The times can be individually determined, depending on the film type and the above criteria. The following developing times are given here as guides.

Temperature	Time
18 C°	7 – 9 min
20 C°	5 – 7 min
22 C°	4 – 5 min
24 C°	3 – 4 min

Developing times at different temperatures REFINAL (small tank)







Film speed (exposure index = γ 0,65)

Film type	Time *	Speed
AGFAPAN APX 25	6 min	ISO 25/15°
AGFAPAN APX 100	6 min	ISO 160/23°
AGFAPAN APX 400	6 min	ISO 500/28°
Fuji Neopan 400 Prof.	3.5 min	ISO 320/26°
Fuji Neopan 1600 Prof.	3.5 min	ISO 400/27°
Ilford PAN-F Plus	4 min	ISO 50/18°
Ilford FP 4 Plus	7 min	ISO 160/23°
Ilford HP 5 Plus	5 min	ISO 640/29°
Ilford Delta 100	5 min	ISO 125/22°
Ilford Delta 400	5 min	ISO 400/27°
Ilford Delta 3200	6 min	ISO 1250/32°
Ilford SFX 200	4 min	ISO 125/22°
Kodak Plus-X	4 min	ISO 125/22°
Kodak Tri-X	4 min	ISO 400/27°
Kodak T-MAX 100	5 min	ISO 80/20°
Kodak T-MAX 400	4 min	ISO 400/27°
Kodak T-MAX p3200	6 min	ISO 1600/33°
Kodak Recording 2475	5 min	ISO 800/30°

* Small tank or tray processing at 20 °C.

5.3 Replenishment of B/W developers

Continuous replenishment of ATOMAL FF, REFINAL and REFINAL M developers ensures consistent results over long periods of processing. This means the speed yield is uniformly good and the gradation is constant. Theoretically the developers can be replenished indefinitely. Replacement is only necessary if the tank solution has been contaminated (e.g. by glue residues, gelatine and silver sludge).

Level replenishment in tanks

The replenishment rate is the same as the amount of solution carried over by the films. The tank contents are topped up to the correct level with replenisher as needed. Then stir the tank solution well and let any suspended particles settle.

Automatic replenishment

The effective replenishment rate depends on the throughput. The rates for a high throughput are relatively lower than for a small throughput, or when there are long idle times between batches.

The following replenishment rates should serve only as guides:

- per m² film = 250 ml
- per 135-36 film = 14 ml
- per 120 rollfilm = 17 ml
- per 9 × 12 cm sheet film = 2.7 ml

Remedies for over- and under-replenishment

Incorrect replenishment is indicated by the negatives being too flat or too steep and/or having too low or high density in spite of accurate exposure, developing time and developer temperature.

In the case of **over-replenishment** (= developer activity too high) top up with developer tank solution until the fresh state is reached.

NB! The replenisher must never be mixed with fresh solution or diluted with water. In the case of under-replenishment (= developer activity too low), the replenishment rate must be raised or part of the tank contents replaced with replenisher.

Adjustments of this kind can be repeated a number of times.

6. Stop bath (interrupter)

A stop bath is recommended between developer and fixer if the machine configuration permits. This has the following functions:

- It stops post-development.
- It stops alkaline developer being carried over into the fixer. This prevents the formation of dichroic fog.
- It permits the use of a neutral fixer (e.g. FX-UNIVERSAL) in combination with FX recycling.
- It lengthens the life of the fixer.

The 2 % acetic acid stop bath is mixed as follows:

- 1 part acetic acid (60 %) + 30 parts water.

With machine processing, the stop bath can be replenished with a 5 % acetic acid solution. Formula for the replenisher:

- 1 part acetic acid (60 %) + 11 parts water.

Process data

Stop bath tank solution	Time (at 20 – 25 C°)	Replenisher	Replenishment rate
2 % acetic acid	10 – 30 s	5 % acetic acid	910 ml/m² film 50 ml/film 135-36 60 ml/roll film 120 9.8 ml/sheet film 9 × 12 cm

7. Use of fixers

7.1 AGEFIX

Highly concentrated liquid fixer on ammonium thiosulphate basis with optium chemistry for fixing speed, yield and storage life. Depending on dilution, AGEFIX can be used as standard or rapid fixer.

Mixing instructions

The concentrate is diluted with water (at approx. 30 °C) at a ratio of 1 + 7 or 1 + 5. The fixer is ready for use after thorough stirring.

Standard fixer:
1 part concentrate + 7 parts water

Rapid fixer:
1 part concentrate + 5 parts water

Specific gravities of freshly mixed solutions (at 20 °C):

1.048 – 1.054 = dilution 1 + 7

1.062 – 1.068 = dilution 1 + 5

AGEFIX process data

Stop bath tank solution	Time (at 20 – 25 C°)	Replenisher	Replenishment rate
AGEFIX 1 + 5	3 – 5 min	AGEFIX 1 + 4	910 ml/m² film 50 ml/film 135-36 60 ml/roll film 120 9.8 ml/sheet film 9 × 12 cm
AGEFIX 1 + 7	6 – 8 min	AGEFIX 1 + 6	as stated above

Yield without replenishment (per litre):

- approx. 1 square metre film
- 15 – 30 films 135 - 36
- 15 – 30 rollfilms 120
- 100 sheet films 9 × 12 cm

During use the composition of the fixer changes. To achieve perfect results the fixer should therefore be checked regularly and replaced in good time with fresh solution (see Fixer monitoring).

Continuous replenishment of machine processes ensures uniform results over lengthy periods, and consequently a long fixer life.

Life

AGEFIX will keep for up to two years in the unopened original pack. Opened packs and ready solutions should be used within three months.

7.2 ACIDOFIX

Rapid fixer in powder form on ammonium thiosulphate basis with optimum chemistry for fixing speed, yield and storage life.

Mixing instructions

The pack contents are stirred into the appropriate quantity of water at about 40 °C. After cooling to working temperature the fixer is ready for use.

Specific gravity of freshly mixed solution (at 20 °C):

1.074 – 1.080

ACIDOFIX process data

Tank solution	Fixing time (at 20 – 25 C°)	Yield per litre
ACIDOFIX	2 – 3 min	approx. 1 m² 15 – 30 films 135-36 15 – 30 roll films 120 100 sheet films 9 × 12 cm 50 ml/film 135-36

The fixing times depend on the film type (emulsion, silver coating), temperature, agitation and the state of exhaustion of the solution. The shorter times apply to freshly mixed fixers. Used solutions require longer fixing times.

During use the composition of the fixer changes. To achieve perfect results the fixer should therefore be checked regularly and replaced in good time with fresh solution (see Fixer monitoring).

Life

ACIDOFIX can be kept dry in the unopened original pack for at least two years. Ready solution should be used within three months.

7.3 Fixer monitoring

A rising silver content, dilution and changes in acidity reduce the fixer's strength. The PH, silver content and specific gravity – particularly in unreplenished processes – should be continuously monitored.

The chemical trade supplies acid test paper for checking the pH, e.g. Lyphan L 669 paper from Kloz Co., Berlin. The paper strip is dipped into the solution and the change in colour compared with a test chart. This paper is accurate enough for the fixer pH.

The specific gravity is measured with a hydrometer (aerometer). The fixer is poured into a graduated cylinder, into which the hydrometer is then put. The specific gravity can be read off on the hydrometer scale from the highest point of the solution level. The viewer's eye should be level with the surface of the solution. The higher the hydrometer floats, the greater the specific gravity is.

To test the silver content of used fixers, a strip of standard silver test paper about 5 cm long is dipped into the solution. After a few seconds the test strip is compared with the colour chart.

The values for solution in use are:

- acidity between pH 4 and pH 8
- the specific gravity should not fall much below the reading for fresh solution
- silver content not over 4 g/litre (in properly replenished machine processes the silver content does not exceed this figure).

If the figures obtained vary very much from those given above, it is advisable to mix fresh fixer to maintain the quality of the results.

7.4 Silver recovery

Electrolytic silver recovery is possible from fixers which contain up to 4 g silver per litre. If the quantities of fixer are large enough, it may be worthwhile to use a silver recovery unit. Smaller quantities should be dealt with by a suitable external company.

7.5 Fixer recycling

In the same way as with the AGFACOLOR processes, finishers can also recover the silver from black and white fixer overflow, and recycle the solution to produce replenisher. For this FX-UNIVERSAL must be used. Detailed information on this subject is available from Agfa agents.

8. Final wash

A thorough final wash is essential to ensure good storage lives for all black and white negatives. Depending on temperature, agitation and wash water throughput rate, the following washing times are needed for all films:

- 15 + 5 minutes at 20° – 25 °C
- 20 + 5 minutes at 15° – 20 °C

The temperature of the wash water should not vary by more than + 5 °C from the temperature of the process solutions.

Washing rate: approx. 2 – 3 litres per minutes (running).

The washing time can be reduced to about 6 minutes for Agfa black and white films – at water temperatures of approx. 20 °C – by the following measures:

- running wash, water quantity 6 litres per minute
- several exchanges of water (at least three) with adequate agitation (tilt the developing tank at least five times).

Drying

- At 30° – 40 °C in a drying cabinet.
- At room temperature in a dust-free place.

9. Use of auxiliaries

9.1 AGEPON

This is a concentrated wetting agent used as a final bath after the last wash. It ensures even draining of the water off the film surface, so that no droplets, stains or streaks are left. AGEPON cuts down the drying time.

Mixing instructions

AGEPON is diluted with water 1 + 200 (= 1 capfull AGEPON to one litre water). Higher concentrations do not improve the results.

The films are agitated in the wetting solution for a half to one minute, and then dried without rinsing.

Yield

About 100 to 200 films can be treated in one litre of AGEPON. The solution must be replaced when the water does not drain evenly off the film surface.

Life

The concentrate will keep virtually indefinitely in closed bottles. The life of ready solution depends on the type of water used. Diluted AGEPON should not be used for longer than two weeks.

9.2 ALGEZID II

This is a powerful biocide for stopping fungi and algae formation in wash tanks and silver recovery units. Properly used ALGEZID II does not have any adverse effects on photographic materials. It must not be put into the processing solutions.

Use

After shut-down 2 ml ALGEZID II per ten litres is added to the washing tanks. The water does not need to be drained off before the next batch.

Life

The concentrate will keep virtually indefinitely in closed bottles.

9.3 SISTAN

This is an image silver stabilizer for black and white materials. SISTAN protects films from changes in the silver image caused by environmental effects. These faults initially appear as reddish to yellowish-brown highlight discoloration, and the complete negative may be destroyed by the silver being converted to a colloidal form. Its causes are industrial and traffic fumes, and fumes from heating oil, plastic paints, compressed boarding, cardboard with an acid content, glues, sticky tape, freshly cut PVC and brittle rubber, and also ozone and all substances giving off peroxide.

Mixing instructions

For use 50 ml SISTAN is diluted with 950 ml water. The correctly processed and washed negatives are agitated for one minute in SISTAN solution after the final wash.

NB! Too high a SISTAN concentration can lead to stains which take some time to appear. Care should then be taken that the fronts and backs of negatives are wiped before drying to avoid partial over-concentration caused by dried drops of SISTAN. Transport rollers on mechanical processors should be carefully wiped clean to stop the SISTAN solution crystallizing on them.

Yield

Up to 2 m² black and white film per litre ready solution (equivalent to approx. 30 – 40 roll or 35 mm films). The solution can be used down to the last drop.

Life

The concentrate will keep virtually indefinitely in closed bottles. Mixed solution should be kept in capped glass bottles.

10. Environmental protection and disposal

Wash water from processors containing small quantities of process solutions are subject to local and often general effluent regulations covering disposal into the public sewage system.

If the effluent regulations do not permit used photographic solutions to be discarded into the public sewers even after treatment, they must be disposed of as special waste.

The packaging of Agfa photo-chemicals conforms to the requirements for safety (during transport, storing and handling) and recycling.

Photo-chemical packaging must not contain any harmful impurities if it takes part in collection and recycling systems. For this purpose the packs must be absolutely empty, that is free of leftover powder, sludge and drops. Photo-chemical containers should preferably be rinsed out as well. It is best to use some of the mixing water for this.

Queries on environmental protection and waste disposal can be answered by the environment officers in the Agfa Sales organisations, or referred to the central Environmental Protection Department in Leverkusen, Germany.

11. Further information

The information given here is based on the evaluation of typical products at the time when this technical data was printed. Slight deviations are possible through production tolerances. Agfa-Gevaert is constantly endeavouring to improve the quality of the products and therefore reserves the right to change product specifications without notice.

Notification of any technical changes, such as replenishment rates or mixing instructions, will be given immediately in the pack instructions and will be updated in all publications.

Additional information on the Agfa black-and-white chemicals is contained in the following publication:

Technical Data C-SW56-E:

Agfa black-and-white paper processing chemicals.

12. Chemical range

Process solution	Product name	Pack size	Code
Negative developers/ liquid concentrates	RODINAL	10 × 125 ml	BVL2E
		6 × 500 ml	BVL3G
	RODINAL SPECIAL	10 × 125 ml	BVL4J
	STUDIONAL LIQUID	for 3 × 16 litres	BVL5L
Negative developers/ powder form	ATOMAL FF	for 5 × 5 litres	BVLW3
	ATOMAL FF replenisher	for 5 × 5 litres	BVLX5
	REFINAL	for 5 × 5 litres	BVLZA
	REFINAL replenisher	for 5 × 5 litres	BVL1C
Stop bath	Acetic acid (60 %)	5 litres	BQEBX
Fixers	AGEFIX	10 × 125 ml	BVJ6E
		6 × 500 ml	BVJ7G
		6 × 1 litre	BVJ8J
		3 × 5 litres	BVJ9L
	ACIDOFIX	for 5 × 5 litres	BVJ4A
		for 5 × 10 litres	BVJ5C
Auxiliary products	AGEPON	5 × 250 ml	BVMPS
		3 × 1 litre	BVMQU
	ALGEZID II	1 litre	BUNDZ
		5 litres	BR88G
	SISTAN	500 ml	5G6UL

Technical Data Sheet C-SW16-E15
Date: 05/2002 15th edition