

Action, Emotion, Memories

The Black & White Manual

Agfa Products for creative Black & White Photography
Film | Paper | Chemicals



AGFA 





Creativity and technology

Even today, black & white still represents professional photography. The image without colour is cult, art and nostalgia together. Documents contemporary events in journalism, industry and technology and captures the moment in the report.

Limiting oneself to black & white uncovers the greatest variety of expression and design. Every photographer stands here under the current of classic technology and modern materials. Whoever truly wants to be creative must know his tools and instruments well. Only then can creative or technical accents be formed – can the photographer develop his own style. And black & white photography opens up more scope for design than many other areas.

The results can be influenced by many factors. From the choice of the film material and its processing or from the conception on photo paper and the consequent “forming”. And each method of after-treatment increases the scope once more. The challenge for the photographer therefore lies in composing the various factors and leading them to his ideal result.

This handbook is intended as a help and incentive for this technological-creative challenge. The various products, their use and processing are described, all technical specifications are listed. Whether it is a single film or a

certain paper – or our total range: Agfa offers all components in modern technologies. For a perfect black & white system.

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The Agfa Black & White Films

Classic effect, modern technology

The progress in film technology is outstanding. The standard of quality has been considerably improved, particularly during the past decade. Today, for example, an ISO 100 material achieves the fine grain of previous ISO 25 film generations. This progress is also naturally to be found in films of other speeds. In addition, these innovations have created a boost in processing techniques, enabling 35 mm photographers to achieve the quality of previous medium size technology.

One thing, however, has not changed: the universal film, which holds first place in all spheres, remains a dream. Technically speaking, the demand for highest sharpness and speed together with finest grain faces clear limitations: this material is not available at present nor will this be the case in the near future. The laws of physical chemistry apply here. The final image quality is a result of the combination of the parameters sharpness and fine grain. This still stands at an inverse ratio to speed. The photographer, however, can reach a very good compromise with the modern materials. The mere combination of single products is decisive for good or excellent results, according to the requirements of the photograph.

Variety – the attraction of the BW system

In contrast to colour films, BW films may be modified in several parameters simply and effectively. Within certain limits, these films can be adapted very well to the specific demands of the photographic conditions as well as the desired result. Not only is the effectively usable film speed a part of this, but also such parameters as sharpness, fine grain and contrast behaviour.

Adjustable Parameters	Areas of Use
1. Film Speed	1. Light conditions/Subject movement
2. Gradation/Contrast behaviour	2. Subject contrast/Lighting contrast
3. Sharpness	3. Reproduction of detail/ Large print formats
4. Fine grain	4. Homogeneous areas/ Large print formats

Specially formulated developing variations (see Processing section) are available for individual adjustment.

The Agfa BW film range

The assortment and selection of the Agfa film range is defined by its clear aim: no complexity in the sense of innumerable products, but rather absolute concentration on a compact, concise range. A demand from photographic practice is carried out that greatly simplifies the use of the products and their combination.

The products

All Agfapan Professional films are panchromatic BW negative films. Their quality characteristics have been geared to the requirements of professional use. Each single product possesses an excellent performance ratio between image quality (sharpness/fine grain) and speed. The straight, long drawn out gradation curves guarantee an abundant trans-

mittal of the richness in the tonal quality of the print. A finely differentiated scale in grey tones, the clean tracing of both highlight and shadow lead to an authentic print transmittal.

The instant hardening technology during production ensures a high constancy of the sensitometric characteristics speed, gradation and latent image behaviour. Agfa provides an excellent anti-halo protection in the particularly effective AHU layer (Anti Halo Casting Layer). Blurredness and light diffusion in the emulsion can hereby be effectively suppressed. Added to this we have the reliability of the production, based on long experience. Only in this way can the preconditions be created to meet the demands of professional photography for absolutely even emulsions.

Agfapan APX 100 Professional

This universal film combines excellent image quality with speed for universal application. It is suitable for a very wide photographic spectrum, including, for example, portrait, landscape as well as abstract photography. Push processing makes its use up to ISO 200/24° possible.

Agfapan APX 400 Professional

The APX 400 is considered as an absolutely reliable partner for changing light conditions, where speed reserves are necessary. It is not limited to its basis of ISO 400/27°, but can be used, by means of a speed-increasing processing (pushing), up to ISO 800/30°. The APX 400, thereby, offers a wide sphere of applications. It may be used both as an all-round film as well as providing help in fringe areas, such as available-light photography with low light intensity. If fast movement or tele shots without tripod are planned, this film achieves exceptional results. Despite its high speed, the APX 400 permits high quality enlargements with fine grain distribution and good reproduction of detail.

Agfa Scala 200x Professional

The BW film for the direct way from photo to positive image. The transparency can be projected without prints, it serves directly as a printing or scanner original for digital posttreatment (posttreatment of prints, layout). Exceptional image quality data (sharpness, fine grain) in combination with a basic speed of ISO 200/24° make this film exceedingly interesting for many areas of application. The gradation has been adjusted to meet that of the Agfachrome RSX II 100 Professional. Professionals need not change when assessing the contrast of a subject. The speed can be increased further by pushing:

- Push 1: ISO 400/27°
- Push 2: ISO 800/30°
- Push 3: ISO 1600/33°

Push processing causes a slight reduction of the maximum density and a steepening of gradation. This effect can be used to improve the image (increase in image contrasts), as the film produces balanced contrasts when not pushed. Pull processing reduces speed to ISO 100/21° with a simultaneous increase of the maximum density and a flattening of gradation. The latter effect makes the use of the Scala 200x possible to surmount extremely high subject contrasts. In addition, the pulled film may be used as copy material for

APX 100

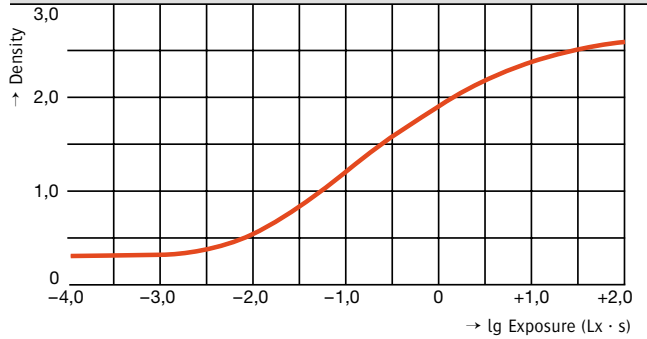
duplicating BW transparencies or negatives. The Scala 200x emulsions have been so designed that, linked with the original Scala process, they lead to a particularly high stability of the printed image.

Processing is carried out solely in the original Agfa Scala process, which is only available in authorized commercial laboratories.

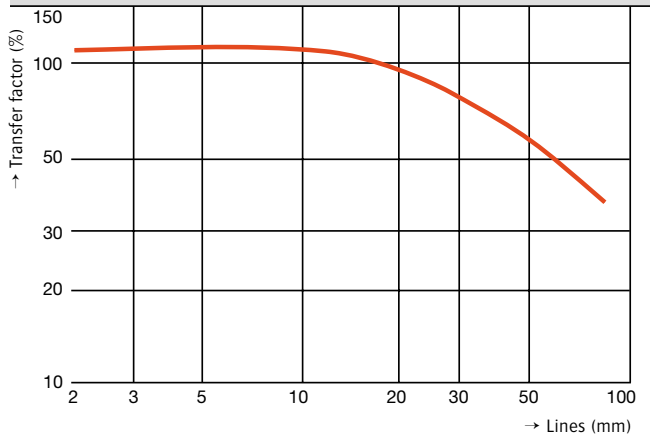
Technical data

The following list makes a quick comparison of technical data possible and also gives assistance when choosing suitable material. A comment on the definition of "sharpness": both resolution and MTF ratings are given. The MTF (modular transfer function) rating incorporates contrast thereby making objective judgement possible. Due to the diffusion of light within the emulsion layer, the contrast reproduction of the lines of a screen lineation exposed onto the film is reduced when the space between these lines decreases. The decrease in contrast measured with a microdensitometer is shown as a graph with the modular transfer function.

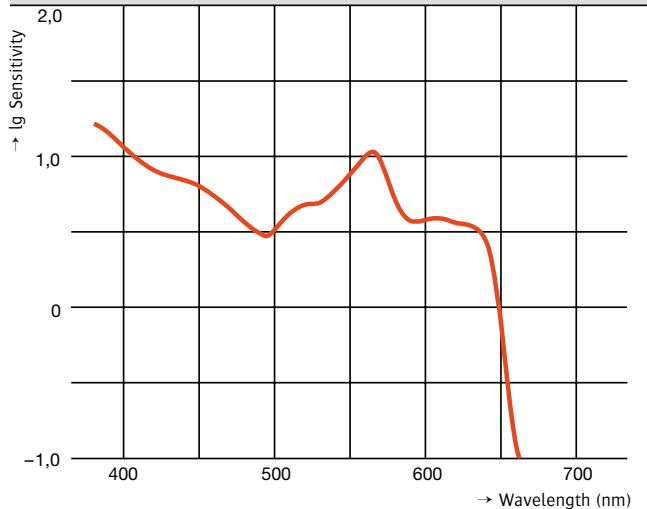
Density curve



Sharpness

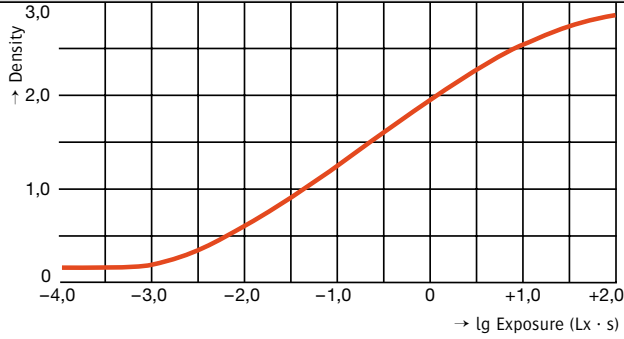


Spectral sensitivity

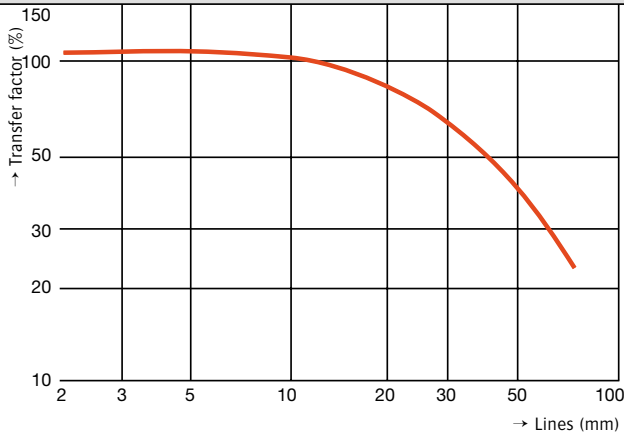


APX 400

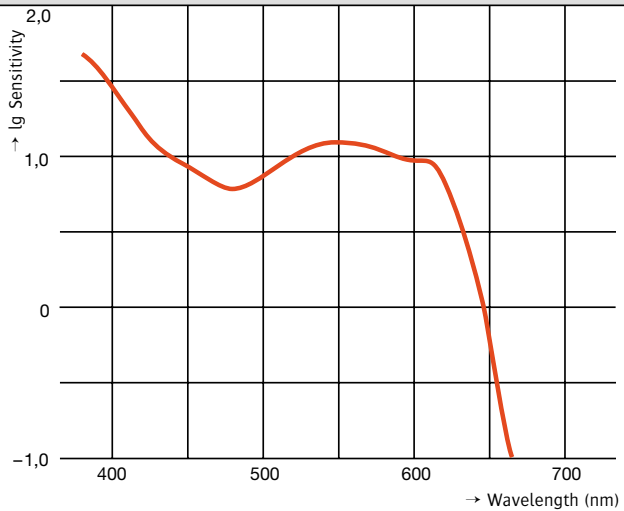
Density curve



Sharpness

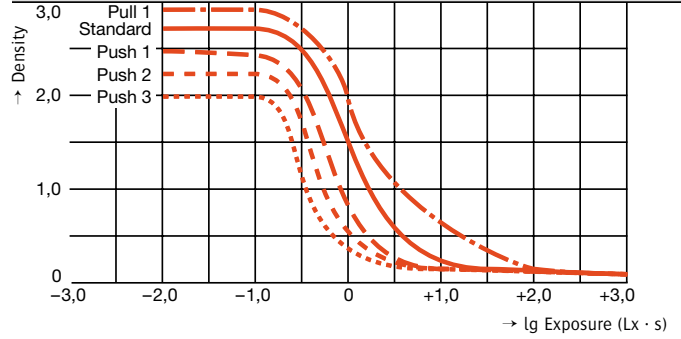


Spectral sensitivity

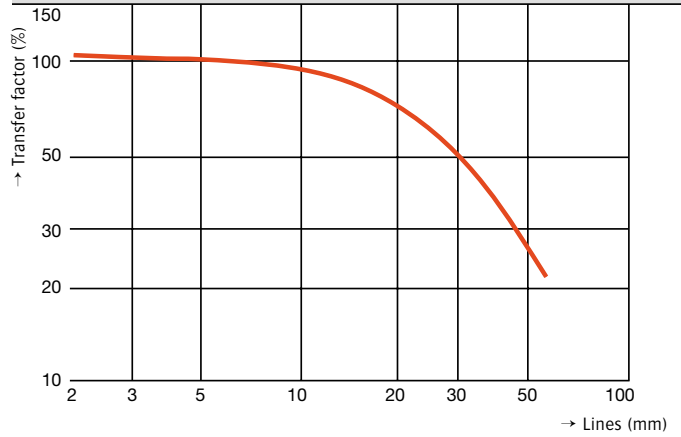


Scala 200

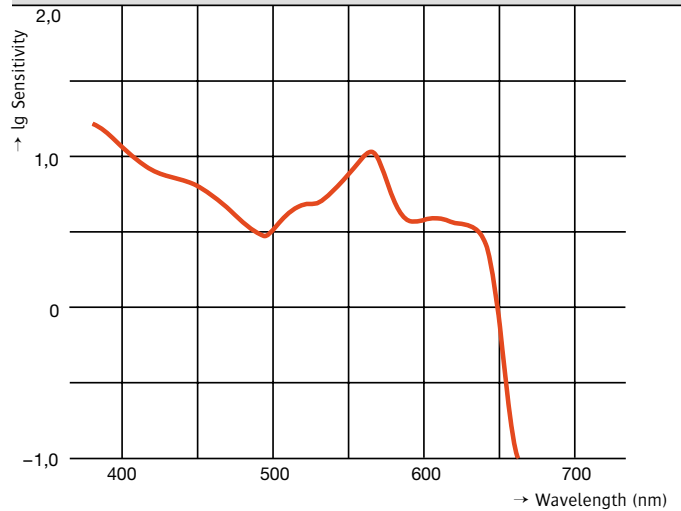
Density curve



Sharpness



Spectral sensitivity



	APX 100	APX 400	Scala 200x
Speed	ISO 100/21°	ISO 400/27°	ISO 200/24°
Granularity (RMS x 1000; Refinal 6 min, 20°C)	9.0	14.0	Scala Proc. 11.0
Resolving power (Contrast 1000:1/lines per mm)	150	110	120

Reciprocity Corrections: Exposure (f-stops)/processing (%)	APX 100	APX 400	Scala 200x
	1/10000-1/s	0/0	0/0
1 s	+1/-10%	+1/-10%	+1/2
10 s	+2/-25%	+2/-25%	+1
100 s	+3/-35%	+3/-35%	+2

General instructions

Filters

All those correction filters common to BW photography (e.g. UV blocking filters, polarization filters) as well as contrast filters (e.g. yellow, green, orange, red) may be used for Agfapan films.

Examples

- ▶ Yellow filter for contrast-increasing reproduction of clouds
- ▶ Orange filter for clear distant views
- ▶ Red filter for dramatizing image impact

The wide range of creative filters may also be utilized.

The resulting loss in speed is taken into account by the TTL reading in the camera,

otherwise the corresponding compensating factors must be included when setting time and stop. The instructions of filter manufacturers contain detailed information on this subject.

Flash exposure

The high illumination contrast often created by the use of direct flash can be compensated by over-exposure and following under-development (flatter gradation). Despite the exposure latitude of negative materials, a precise exposure reading is necessary for maximum graded grey scale reproduction. If the camera does not enable a TTL flashlight reading, or if the equipment is placed independently, the necessary working aperture can be calculated by means of the following formula:

$$f\text{-stop} = \frac{\text{guide number}}{\text{distance flash to subject (in m)}}$$

The guide number is determined by the speed used and the power of the flash unit (refer to the specifications of the manufacturer).

The luminous efficacy of the flash unit depends not only on the flash range but also on the degree of reflection of the area surrounding the subject and on the subject itself.

Storage

Unexposed films should be stored in the original packaging in a cool, dry place (temperature below + 20°C). The photographic characteristics can be kept stable over a longer period of time if the material is stored under deep-freeze conditions (below – 10°C). Refrigerated films should be acclimatized to room temperature for approx. 2 hours and deep-frozen films for approx. 8 hours before opening the original packaging. Otherwise, condensation may form on the film. Exposed films should be processed as soon as possible. If films are stored for a great length of time, a slight loss in sensitivity may occur through the diminishing of the latent image (in particular under the influence of unfavourable climatic conditions).

Processing Agfapan Films

Processing data for all films are to be found under the "Processing" section (Page 36–52 and 64–70).

Assortment Formats	APX 100	APX 400	Scala 200x
135-24	■		
135-36	■	■	MP5
135-36 MP 50	■	■	
120	■	■	MP5
35 mm x 17 m DP	■	■	
35 mm x 30.5 m DP	■		
6.5 x 9 cm / 2½ x 3½ inch	■		
9 x 12 cm / 3½ x 4¾ inch	■		
10.2 x 12.7 cm / 4 x 5 inch	■		■
13 x 18 cm / 5½ x 7½ inch	■		





The Black & White Photo Papers

A multitude of possibilities

The impact of a black & white photographic print has lost none of its fascination even in present times. The trend of capturing images in black & white still remains strong among ambitious photography. Various surfaces, image tones and bases can be put into use.

The BW papers with variable gradation are today high technology products that achieve a very high product and reproduction quality standard through their complex structure. The multi-layer structure of the papers enables high-class quality print results. The contrast reproduction can be adjusted in minute steps to the requirements of the negative.

Variability – analogue & digital

Apart from the high degree of manipulation possible in BW film development, the wide range of modern BW papers fulfil all the requirements for the most individual creation of the print subject. Even difficult negative originals can be mastered thanks to the infinitely variable contrast control, the specific exposure of certain motif areas with different contrasts makes them individually “malleable”.

A completely new world of manipulation alternatives and processes is opened by processing digital image data or exposing this data in laser printers on Agfa’s variable contrast RC/PE paper MULTICONTRAST PREMIUM.

Scanners currently provide a higher density of information from transparencies, negatives or prints than direct digital photography. The amount of data attained by scanners (file size) makes even extra large formats in good quality possible.

Image files can be evaluated on the computer’s monitor, corresponding programmes for image processing make later alteration possible for both technical (contrasts, brightness, sharpness) and creative (effects, setting of light, mounting) manipulation. Prints of such image files on original Agfa Multicontrast Premium resin-coated paper can be made on a laser printer. Even giant formats are possible when using a printer such as the Durst Lambda as, due to the high precision, separate exposures over two or more roll widths are possible. Large prints in small quantities thereby become affordable and transmit the original feeling and quality of a photograph, despite the most modern technology.

The products

The extensive assortment of products is representative for the Agfa BW photo paper range. It includes all types of paper relevant for daily use in the corresponding format sizes. Agfa BW papers are available in all common sizes (sheet and roll paper) and quantities. Complementary to the RC/PE paper with fixed grada-

tion BROVIRA-SPEED, a well-balanced range of papers with variable gradation is available. The RC/PE paper MULTICONTRAST PREMIUM is supplemented by a fibre base paper with variable contrast, the MULTICONTRAST CLASSIC.

All Agfa BW papers stand for detail reproduction close to the original, high richness in tonal quality with outstanding highlight and shadow definition, together with pure whites and deep blacks. The wide range of contrast (from extra soft to extra hard) found in the papers with variable gradation is most suitable for daily use. The RC/PE version of these papers is ideally suited even for ultrashort laser exposure times. The user achieves a very good overall flatness. A high image stability is achieved in the face of changes in the image silver due to environmental factors. The very high constancy in production together with very good stability as regards processing deviations may be considered as standards.

The multi-layered structure of Agfa Multicontrast papers, in particular, reflect Agfa's decades of experience in the manufacture of photographic materials. The addition of a protective layer guarantees the first-class quality of these products.

Variable graded papers

AGFA MULTICONTRAST PREMIUM (MCP) is a universal black & white paper with variable gradation on a RC/PE base. The print quality of this paper corresponds to the quality of the best papers with fixed gradation and even surpasses these in certain areas. MULTICONTRAST PREMIUM can be exposed in all enlargers and printers, just like traditional BW papers and can be processed in trays or developing machines.

AGFA MULTICONTRAST CLASSIC (MCC) is the classic, variable graded black & white photo paper on a fibre base. MULTICONTRAST CLASSIC combines the quality of fibre base papers with fixed gradation with the advantages of variable contrast control. Processing is carried out in trays, as with traditional fibre base paper.

It is especially suitable for exhibition prints. This paper is also distinguished by its very good retouching and post-print treatment features. In addition, Multicontrast Classic offers a high archival stability. **(1)**

Papers with fixed gradation

AGFA BROVIRA-SPEED is the fast, universal RC/PE paper with neutral to cold black image tone for all applications. The short trace time and the fast image formation are characteristic

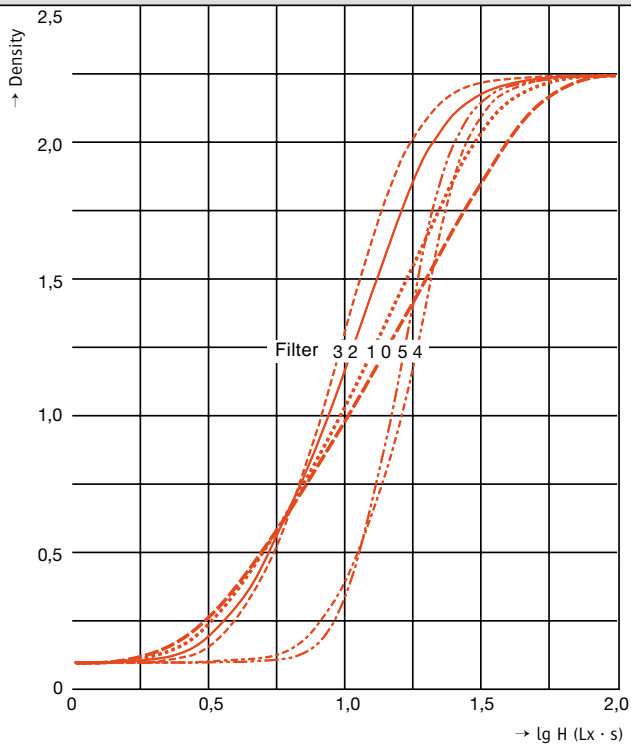
for this paper. The incorporated developer substances and the very short wash and drying times make machine processing possible. (2)

The Range

(1)	Variable graded papers	Surface	Product code	Grade code
	MULTICONTRAST PREMIUM		MCP	V = variable
	MULTICONTRAST PREMIUM 310	glossy		
	MULTICONTRAST PREMIUM 312	semi-matt		
	MULTICONTRAST CLASSIC		MCC	V = variable
	MULTICONTRAST CLASSIC 1	single weight, glossy		
	MULTICONTRAST CLASSIC 111	double weight, glossy		
	MULTICONTRAST CLASSIC 118	double weight, fine-grain matt		

(2)	Papers with fixed gradation	Surface	Product code	Grade code
	BROVIRA-SPEED			
	BROVIRA-SPEED 310	glossy	BW	1
			BS	2
			BN	3
			BH	4
	BROVIRA-SPEED 312	semi-matt	BS	2
			BN	3

(3) MULTICONTRAST PREMIUM (MCP)



Technical data

Density curves

**MULTICONTRAST PREMIUM (MCP)
MULTICONTRAST CLASSIC (MCC)**

Exposure: tungsten light 3000 K
time: 10 s

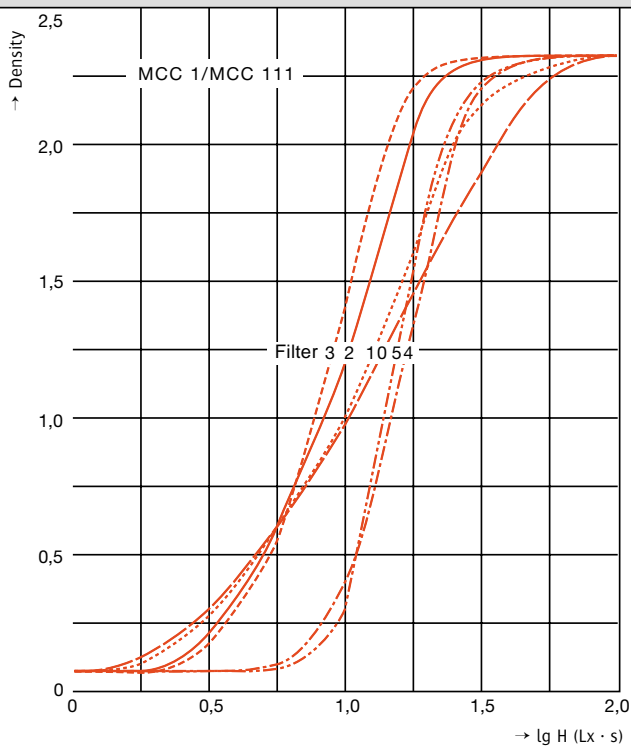
Filter: contrast control filter
0, 1, 2, 3, 4, 5 and
UV blocking filter

Development: AGFA MULTICONTRAST
DEVELOPER

Densitometry: Reading with visual filter
(Vλ)

The given exposure in lux seconds refers to the
combination of paper and filter. **(3)(4)**

(4) MULTICONTRAST CLASSIC (MCC)



(5) **BROVIRA-SPEED**

BROVIRA-SPEED

Exposure: tungsten light 3000 K
time: 4 s
Development: AGFA NEUTOL
LIQUID NE
Densitometry: Reading with visual filter
(V_λ) (5)

Maximum blacks

Depending on type of paper and surface – assuming that exposure and development are correct – the following maximum blacks can at the least be achieved:

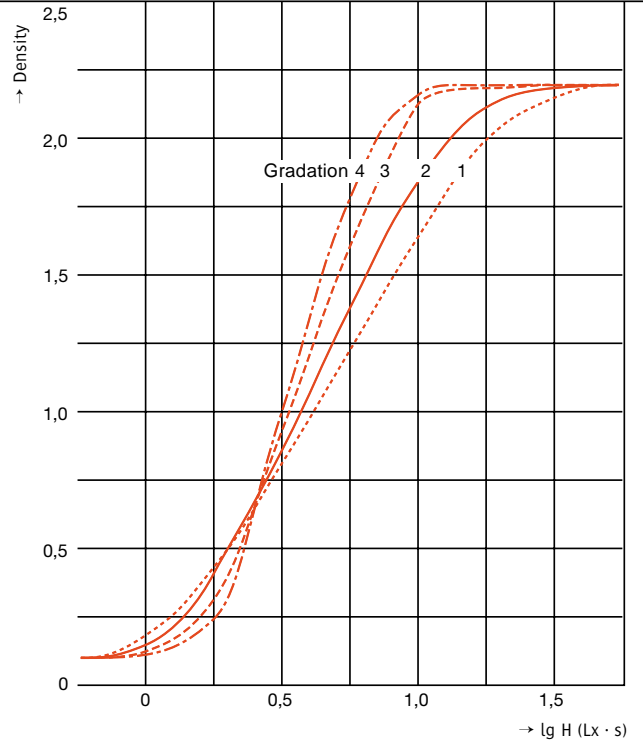
Variable graded papers:

MCP 310 RC: $D_{max} = 2.25$
MCP 312 RC: $D_{max} = 2.25$
With laser exposure: $D_{max} = 2.20$

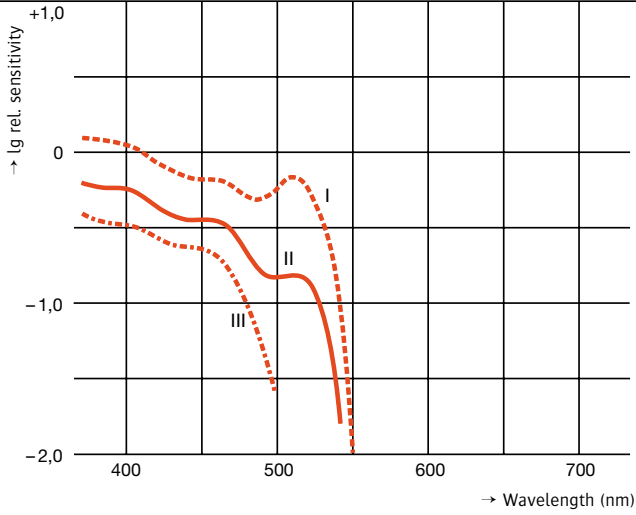
MCC 1/MCC 111: $D_{max} = 2.30$
MCC 118: $D_{max} = 1.60$

Papers with fixed gradation:

Brovira Speed 310 RC: $D_{max} = 2.20$
Brovira Speed 312 RC: $D_{max} = 2.10$



(6) MULTICONTRAST PREMIUM

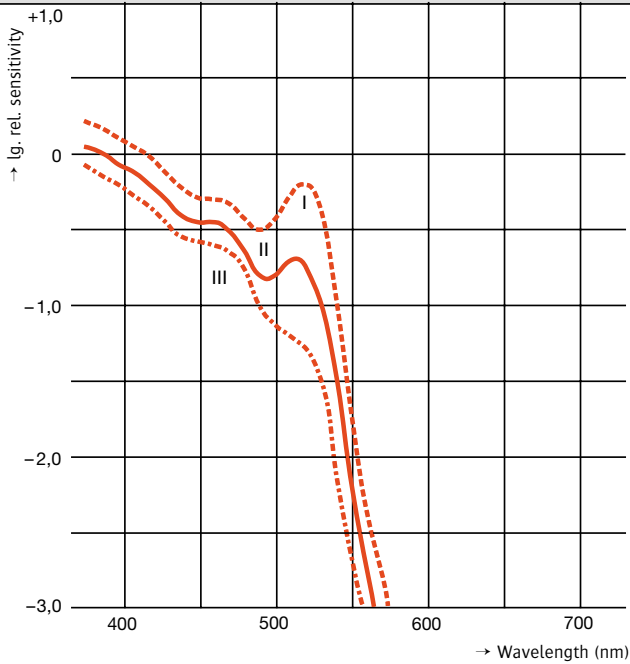


**Spectral sensitivity
(related to equal energy spectrum)**

**MULTICONTRAST PREMIUM
MULTICONTRAST CLASSIC**

The values stated show the densities of 0.5 (I), 1.0 (II) and 1.5 (III) measured in reflection. The sensitivity is the reciprocal of the exposure (in mJ/m^2) needed to produce the relevant densities. (6)(7)

(7) MULTICONTRAST CLASSIC (MCC)



BROVIRA-SPEED

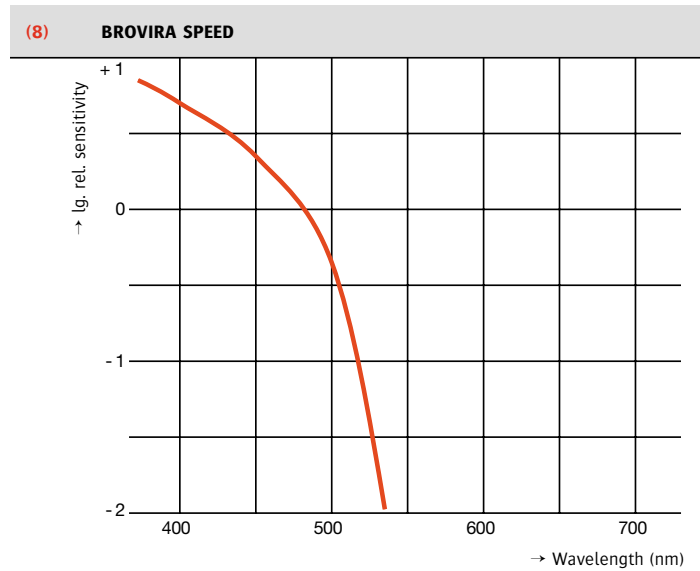
The values stated show the density of 1.0 in reflection. The sensitivity is the reciprocal of the exposure (in mJ/m^2) needed to produce the relevant density. (8)

Speed

Parallel to the speed specification of films, there also exists a speed rating standard for black & white photo papers. This international standard (ISO 6846) is an arithmetic indication of the speed: doubling or halving the number means that the speed is doubled or halved. This corresponds to the pattern of ISO speeds in camera films. In contrast to this, a shift of 1 f-stop represents an interval of 3 DIN in the DIN standards.

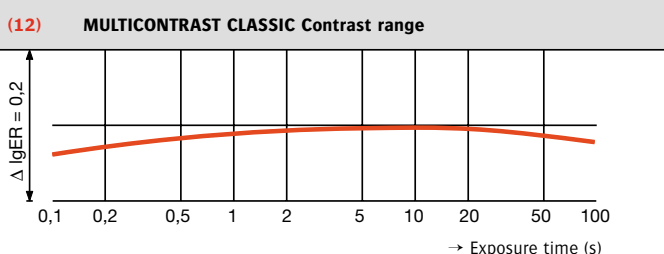
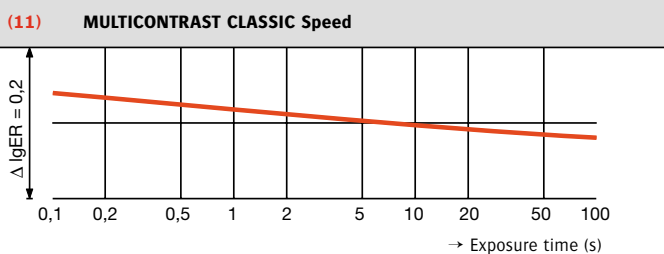
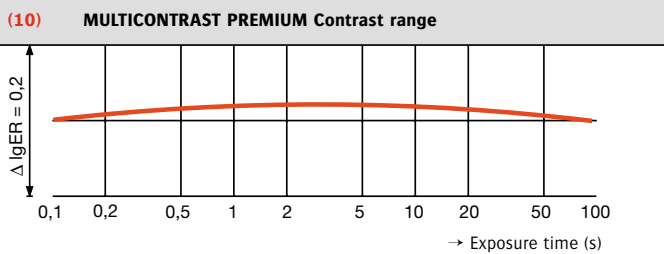
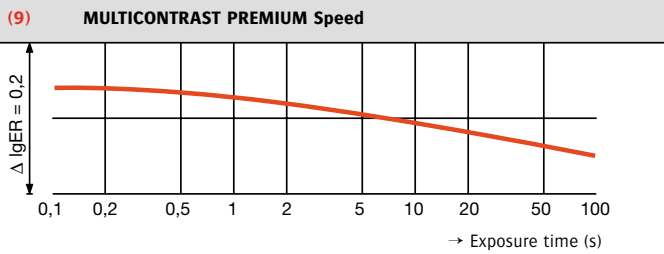
During production of Agfa black & white papers, great care is taken to ensure uniform speed from emulsion number to emulsion number and from grade to grade, within the production tolerances which can be achieved. It should however be noted that slight variations in speed, caused by ageing and storage, are inevitable.

AGFA MULTICONTRAST PREMIUM and AGFA MULTICONTRAST CLASSIC both have a speed of ISO P 400 when exposed to white light (without filter). The gradation thus achieved is about equivalent to the gradation with filter "2".



If contrast filters are used, the speed is:

- ▶ for filters "0" to "31/2" = ISO P 160
- ▶ for filters "4" to "5" = ISO P 80



Reciprocity – only for Multicontrast papers

The reciprocity characteristics indicate the actual reduction in sensitivity during very long or very short exposures. The former occur in very dense negatives or large format sizes, the latter in laser exposures. This effect is virtually independent of filtering (adjustment of contrast) in the AGFA MULTICONTRAST PREMIUM and CLASSIC. There is only a minimal reduction in sensitivity for longer exposure times. The contrast remains almost constant. Even ultrashort laser exposure times produce rich image blacks (only MCP). (9)(10)(11)(12)

Paper design

In RC/PE papers, the raw paper is coated on both sides with polyethylene. The light-sensitive emulsion is applied directly to the smooth plastic layer, without an intercoat.

In fibre base papers, there is a layer of barium sulphate (baryta) between base and emulsion. The fibre base layer prevents the emulsion from sinking into the paper fibres, and so improves definition and print blacks. The fibre base coating, depending of surface, is between 20 and 45 g/m². (13)

Emulsion

The light-sensitive emulsion consists of silver halide crystals filled in gelatine (silver bromide or silver chlorobromide mixed crystals).

The emulsion on RC/PE papers contains developing substances which permit fast mechanical processing. Because of these occlusions, BROVIRA-SPEED is also suitable for activator processing.

The silver coating is approx. 1,5 g/m². The protection layer protects the paper from friction fog and mechanical damage.

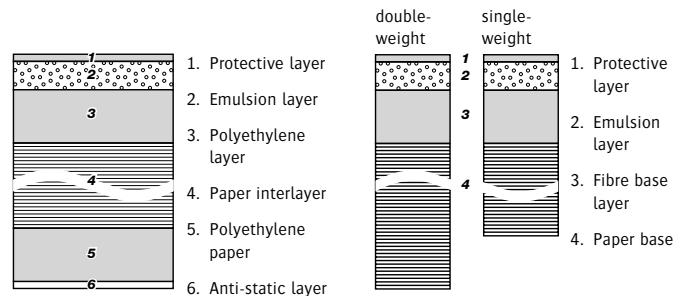
Exposure and contrast grading in variable graded papers

AGFA MULTICONTRAST PREMIUM and CLASSIC can be exposed in all customary enlargers, AGFA MULTICONTRAST in laser printers as well. BW tungsten or machine heads with opal lamps are just as suitable as colour mixing heads.

The use of special enlarging modules for variable contrast papers is particularly practical. These offer automatic density balance between the continuously adjustable grades.

As can be seen on the diagram for spectral sensitivity (see page 20), MULTICONTRAST PREMIUM and CLASSIC have been sensitized for both blue and green spectral ranges.

(13) Layer structure RC/PE paper (schematically) Layer structure fibre-base paper (schematically)



The contrast grading is set through exposure with colour-filtered light:

- ▶ Magenta filtration affects the green spectral range and produces steep contrast
- ▶ Yellow filtration affects the blue spectral range. The resulting contrast is flatter.

The contrast grading can be varied virtually continuously, from extra hard to extra soft, depending on the blue and green light content of the exposure.

The following methods are suitable for varying contrast: Standard filter sets (contrast grading filters) for variable contrast black & white papers are on offer. They are available as:

- ▶ filter foils (in several formats) for use in the filter drawer of the enlarger
- ▶ filter set (framed filter) with an adapter for mounting directly under the enlarger lens.

The filter designations "0" to "5" correspond to the grade numbers of conventional black & white photo papers. Each filter set additionally includes filters with intermediate values, for fine contrast correction.

The desired contrast is found by varying the filters:

- ▶ for high-contrast negatives, filters "0" to "1"
- ▶ for negatives with normal contrast range, filters "2" to "3"
- ▶ for low-contrast negatives, filters "4" to "5"

The density of the filters has been designed so that the exposure time determined when testing remains the same, when the filters "0" to "3½" are used. The time should be doubled when the filters "4", "4½" and "5" are used. If the exposure time is determined using the filters "4", "4½" or "5", then this exposure time should be halved for a flatter contrast (that is filters "3½" to "0"). (14)

Partial filtering

MULTICONTRAST PREMIUM and CLASSIC both have the advantage that individual areas of negatives, which are difficult to copy, can be exposed using different contrast control filters. When photographing landscapes, for example, a better definition of the sky area is achieved with the use of filter "1". A brilliant total impact of the rest of the print is achieved, for example, with the use of filter "4". Partial dodging and shading with filter foils within a single print can not only balance the differences in brightness, but can also create different contrasts.



Michael Nischke/Germany

Optimized image dodging through of the light image parts with an aperture plate and shading of the dark parts.



Adequate definition but an overall "flatter" print effect due to use of a softer gradation.



Brilliant reproduction (hard gradation) but inadequate definition both in light and dark print parts.

Exposing and filtering
MULTICONTRAST PREMIUM and CLASSIC
(ISO 6846)

(14)	Gradation and gradation numbers for graded papers	Real speed	Contrast control filters	Effective speed
		without filters		with filters
	EW 0	ISO P 400	0	ISO P 160
		ISO P 400	1/2	ISO P 160
	W 1	ISO P 400	1	ISO P 160
		ISO P 400	1 1/2	ISO P 160
	S* 2	ISO P 400	2	ISO P 160
		ISO P 400	2 1/2	ISO P 160
	N 3	ISO P 400	3	ISO P 160
		ISO P 400	3 1/2	ISO P 160
	H 4	ISO P 400	4	ISO P 80
		ISO P 400	4 1/2	ISO P 80
	EH 5	ISO P 400	5	ISO P 80

* Basic gradation which can also be achieved without filtering. The effective speed is then ISO P 400.

Exposure without filters

MULTICONTRAST PREMIUM and CLASSIC can also be exposed without filters. In this case, the resulting contrast grade is "2" and the speed is either more than doubled or the exposure time shortened by more than half. (14)

Vario-Contrast modules

The use of special modules with a continuous contrast control of the values from "0" to "5" makes working very simple and easy. It is not necessary to change the exposure times by changing the density of the filters.

Colour mixing heads

Each single contrast grade can be attained just as precisely by setting the magenta and yellow values on the colour mixing head. The manufacturers' filter density ratings vary. The exposure time has to be converted or found for each type of filter. In addition, high filter values lead to a physical loss of light, which must be taken into consideration. If using combination filterings, the second filter could act as a density balance, thereby making constant exposure times possible. Moreover, some colour heads do not cover the total contrast range, above all in the area of hard to extra hard contrast grades.

All filter specifications are merely recommendations. They are relative to the filter characteristics, the condition of the filter and the condition of the enlarger lamp (age) as well as on the technology of the enlarger (plus colour mixing head) as a whole.

Further filter characteristics should be obtained from the respective manufacturers. (15)(16)

Laser exposure (only MCP)

The following basic set values are valid for the digital exposure of Multicontrast Premium in Durst Lambda laser exposure systems:

attainable D_{\max} : 2.20

Y = 54.8

M = 0.0

C = 18.0

D = 42.0

Useful exposure range

The exposure range is the term used to describe the ratio of the exposure times needed to achieve a defined maximum or minimum density. This ratio is not normally given arithmetically, but rather logarithmically, i.e. 0.6 – 1.0 – 1.5.

These figures also represent the maximum density difference of a given negative. The exposure range, therefore, is the greatest range in which details can be distinguished both in shadow and in light. It provides information on which negative contrast – utilizing the entire grey scale from white to black – can be achieved on a photo paper. Soft graded papers have a wide exposure range. They are able to reproduce the wide density range of a high-contrast, hard negative. In contrast, hard graded papers have a low exposure range and are therefore suitable for low-contrast, soft negatives with a narrow density range.

Filtration with colour printing filters or colour mixing heads

(15)	Contrast control filter	Filtering with Kodak CP- or CC-filters*	Filtering with Durst colour mixing head**/**
	0	80 Y	60 Y
	1/2	55 Y	45 Y
	1	30 Y	30 Y
	1 1/2	15 Y	10 Y
	2	–	–
	2 1/2	25 M	20 M
	3	40 M	30 M
	3 1/2	65 M	50 M
	4	100 M	70 M
	4 1/2	150 M	100 M
	5	200 M	130 M

* Exposure factors must be individually found by test exposures.

** Our tests were carried out with Durst CLS 501.

Constant exposure times for gradations from 0 to 5 (The second filter serves to balance the density)

(16)	Contrast control filter	Filtering with Durst colour mixing head*
	0	80 Y 10 M
	1	48 Y 20 M
	2	32 Y 40 M
	3	16 Y 45 M
	4	5 Y 88 M
	5	– 130 M

* Our tests were carried out with Durst CLS 501.

These figures are guides only, and may vary with the mixing head used.

Useful exposure range (ISO range)

(17)	Paper types	Filter/Gradation					
		0	1	2	3	4	5
	MC PREMIUM	R 130	R 110	R 90	R 75	R 60	R 50
	MC CLASSIC	R 140	R 120	R 100	R 85	R 70	R 55
	BROVIRA-SPEED	–	R 130	R 110	R 90	R 70	–

These figures represent average values in used state, which depend on age, storage and processing.

So that the exposure range data can be provided without a comma, the logarithmic figures according to the ISO standard 6846 have been multiplied by 100 and signified by an "R" (= Range) before the number. The exposure ranges of the examples given above according to the standard are therefore:

R 60 – R 100 – R 150. (17)

The print tone

The print tone is above all a feature of the emulsion. It is dependent on the size and structure of the processed image silver. Larger silver grains produce a colder, and finer grains produce a warmer print tone. Development and post-treatment can influence the grain size and thereby the print tone of black & white photo papers. For the influence of corresponding developers on print tone: see page 55

The print tone of black & white photo papers can furthermore be influenced by the following factors:

- ▶ Papers harden during lengthy storage, and the print tone generally becomes colder.
- ▶ As the developer is exhausted, changes in the print tone may occur.

- ▶ Slight contamination of the developer with thiosulpahte makes print tone initially somewhat warmer. Stronger contamination produces a change to a cold tone, and also an increased tendency to fog can be observed.
- ▶ An inadequate intermediate wash or an almost completely exhausted stop bath can lead to a change in the print tone in the high density areas (to blue).
- ▶ Too long fixing times, changes in concentration and contamination of the fixer will also affect the original print tone.
- ▶ Papers treated for either far too long or too short in the final wash may also be subject to a change in print tone.
- ▶ Air and hot drying result in varying print tones: hot drying produces a considerably warmer print effect.

General instructions

Darkroom safelights

The following protection filters or lamps can be recommended as possible sources of direct lighting for the working place in the darkroom:

- ▶ Lamp with AGFA / METEOR darkroom filter "G 7" and 15 watt bulb, minimum distance 1 m, maximum working time 3 min.
- ▶ Lamp with KODAK protection filter "OC" and 15 watt bulb, minimum distance 1 m, maximum working time 4 min.

- ▶ Lamp with ILFORD protection filter “902” and 15 watt bulb, minimum distance 1.2 m, max. working time 2 min.
- ▶ OSRAM “Duka 50” with red filter, minimum distance 1 m, max. working time 4 min.
- ▶ KINDERMANN “Dukalux Electronic”, minimum distance 1 m, max. working time 4 min.
- ▶ ILFORD SL 1-Lamp, minimum distance 1.2 m, max. working time 2 min.

Other lamps may also be used. It is, however, advisable to run a test before working with these lamps. As the contrast grade tends to become “softer” before fog occurs, the test should be carried out in the following way: Two prints with the same exposure time should be produced from a negative with medium contrast or from a neutral step wedge. The one print should be developed immediately, the second according to the working time recommended for the darkroom lamp. If both prints show the same contrast, then the darkroom lamp is safe to use. If the second print is softer, this should be remedied through a reduction in lamp power, greater distance between lamp and working surface or indirect lighting.

Shortening the exposure time or changing the darkroom filter also naturally solve the

problem. Due to the fact that the AGFA MULTI-CONTRAST papers are orthochromatically sensitized photo papers (sensitive to blue or green light), the choice of darkroom lighting must be made with great care.

Processing

The processing data for all papers are to be found in the Black & White Chemicals section of this brochure from page 53.

Drying the papers

RC/PE papers

The following drying methods are possible for MULTICONTRAST PREMIUM and BROVIRA-SPEED:

- ▶ Drying in special infrared dryers. This type of drying produces a particularly good gloss on high gloss papers.
- ▶ Drying in RC/PE dryers which blow warm air on the prints passing through.
- ▶ Hot air drying in cabinets.
- ▶ Air drying on racks (first wipe the print surfaces with a damp cloth to prevent drying stains).

Fibre base papers

The papers MULTICONTRAST CLASSIC 1 and 111 with their hardened emulsions are especially suitable for hot drying on drums and in

glazing presses. Drying on heated dry presses, with the emulsion side facing the fabric, is also possible. In this way, a semi-matt print surface is created. MULTICONTRAST CLASSIC 118 can also be dried using this method.

The following should be observed if using this method of drying:

- ▶ The temperature of the dry press should not exceed 70°C.
- ▶ The drying fabric should not be stretched too tight.
- ▶ The drying fabric should let water vapour through and should not be not clogged with gelatine residues.

If the drying fabric is very soiled, it can be cleaned with an enzyme, e.g. Papain made by E. Merck, Darmstadt/Germany.

If fibre base papers are air dried at room temperature, the gloss may vary between different types and grades. The degree of variation depends on the age of the paper and also on the processing and drying conditions in the lab.

Stabilization and Improvement in Durability of Black and White Prints

The durability of black and white prints can be negatively affected by incorrect processing, unsuitable glue, framing materials and environmental influences. Oxidating pollutants in the surrounding air, in particular, can impair image stability. The accumulation of such negative influences mostly leads to a reddish to yellowish-brown discoloration of the print silver. The formation of a metallic silver mirror is also possible.

Sistan

Prints which are exhibited over a longer period of time are at particular risk, especially if they are framed behind glass. Prints intended for exhibition or archival purposes therefore require corresponding stabilization against oxidation of the print silver. Posttreatment with the Agfa print silver stabilizer SISTAN offers prevention against such effects. The prints are bathed for 1 minute in a SISTAN solution after the final wash and subsequently dried.

SISTAN brings about a precipitation of the soluble silver salts which have formed (in the case of oxidation) into an insoluble colourless silver thiocyanate. This wraps the silver grain in a protective coating. Silver thiocyanate is light-insensitive and extremely stable.

The common toning processes such as sulphur (AGFA VIRADON), selenium or gold toning also offer effective protection. However if a selenium or gold toner is used, the process must be continued until a visible change in the image tone appears in order to achieve optimal protection.

One of the advantages of SISTAN is that the natural image tone is maintained. SISTAN is odourless and free of toxic heavy metals.

However, chemical reactions in the print silver of posttreated prints cannot be completely ruled out should they be exposed to unfavourable conditions over a longer period of time.

Toning

The toning process gives the black-grey print a new colour - the extent depends on the paper type used. Coloured metal compounds are taken up by the silver grain and so improve stability against pollutants.

We differentiate between direct and indirect toning. During direct toning, the silver image is transformed into a different silver compound in one step. During indirect toning, the image is re-constructed in a second bath with a silver compound of a different colour. The use of the direct toning process is beneficial for increased archival stability.

The concrete use of SISTAN and toners such as Agfa VIRADON is described from page 71 of this brochure.

Marking and retouching

The marking (with a pencil), stamping and retouching of fibre base papers is simple due to the absorbent paper carrier. The following are tips for RC/PE papers whose paper fibres have been sealed against fluids:

Marking

The following special pens are suitable for marking back and front:

- ▶ "Quickpoint" slide marker, Loersch, D-47639 Straelen
- ▶ OH P Plus, Faber-Castell, D-90547 Stein
- ▶ Lumocolor Permanent, Staedtler Mars, D-90419 Nürnberg
- ▶ Edding 400 and 3000 C.W., Edding, D-22926 Ahrensburg

Ball point pens are also suitable for marking the backs of prints.

Stamping

Special stamping inks are available in black for stamping the backs of RC/PE papers:

- ▶ e.g. Universal Stamping Ink S from the Gutenberg Werk mbH, D-55122 Mainz

Retouching

Retouching is possible with standard retouching paints. Use a moderately moist brush. If possible, the prints should be retouched when they are wet, to avoid matt marks. It is more difficult to scrape RC/PE than fibre base papers. The standard transparent and opaque retouching paints are suitable for spraying all paper types.

Mounting of prints

Standard liquid glues or double-sided cold or hot adhesive foils can be used. It is advisable to test these glues before use.

Packaging and storage

The original packaging protects the papers from light and brief exposure to humidity and fumes. The inside packaging for sheet and roll material is made out of light-proof PE bags or foils. The outer packaging is either a red cardboard wallet or a box with tongued lid for sheets and a corrugated cardboard tongued box for rolls.

The outer packaging alone does not provide adequate protection from light. Both the inner and outer packaging should be used for storing papers in already opened packs.

Black & white photo papers should be stored in a cool, dry place away from harmful fumes. Temperatures below 20°C and a relative humidity of 50% to 60% guarantee good stability over a very long period of time. Open packs should be re-closed after use (both inner and outer packaging) and should, if possible, not be kept in the darkroom, but rather in a cool, dry place or in the refrigerator.

The natural ageing process of photo papers is greatly retarded by refrigeration or storage in the deep freezer. However, the papers should be taken out of the cold store several hours before use and brought to room temperature.

The storage of finished prints

Photos with and without passe-partouts (from acid-free cardboard) should be stored in special archive boxes also made from acid-free material. Special enamel metal cupboards are suitable for storing larger quantities.





The Black & White Chemicals

From the film development to the finished image

Along with lab equipment and the photo materials in use, modern photo chemicals are a decisive factor for the quality standard of the image achieved. The image is only made visible by means of the photo chemicals, irrespective of whether it is a negative or a paper print. Photo chemicals make it possible to form the image according to personal preferences, e.g. the film can be processed so that the result is steeper, flatter, finer or coarser grained. Incorrect exposures can be corrected. The image tone can be influenced depending on the paper developer used.

A selection of fixers enable processing both with and without stop baths. A range of auxiliaries simplify lab work and prevent subsequent incorrect image results. All of these various photo chemicals give the user a wide scope for his personal creativity and imagination.

This part of the brochure describes the different photo chemicals and their use.

Apart from its renowned and established film and paper developers – RODINAL has recently been included in the Guinness Book of World Records due to the extraordinary length of production – Agfa also offers modern developments. The NEUTOL plus BW paper developer is completely free of hydroquinone and is also distinguished by further advantages.

The fixers enable fast, safe fixing of photo materials. Archival stability can be guaranteed with SISTAN and with certain toners, and the image tone can also be changed by toning to correspond with personal ideas.

The Products

The correct film developer

The range of black and white technology is very varied. The special composition of each developer has been optimized for specific areas of use. Here, along with the photographic characteristics, yield, storage life and also replenishment of the ready solution are decisive factors. A suitable, product-orientated packaging which ensures good storage stability of the packed photo chemicals is also of importance.

The processing of all common film materials is done manually in small tanks and trays (preferred for sheet films of larger format). Machine development with easy dosage is to be found in drum developers. Continuous processing machines complete the range of common technologies used. The criteria of development with particularly fine grain and, at the same time, a good use of speed are naturally of greatest importance.

The following criteria are relevant when choosing the developer suitable for the film used:

- ▶ good use of speed
- ▶ fine grain
- ▶ sharp contours
- ▶ resolving power

The correct paper developer

The positive developer should have a wide developing range. Only in this way can under- or over-exposure of the paper be balanced through a longer or shorter development, without loss of quality. A stability in print tone, even with greater utilization, can hereby be achieved. Contrast grading can also be minimally controlled by different processing times.

The following criteria should be considered when choosing the paper developer:

- ▶ developing latitude
- ▶ achievable print tone
- ▶ print tone consistency
- ▶ processing stability through high yield

When choosing both film and paper developers, further factors always play an important role:

- ▶ speed of development (activity)
- ▶ contrast characteristics (gradation)
- ▶ yield of the concentrates
- ▶ durability of opened concentrates and working solutions

- ▶ economy through simple mixes, partial quantity mixes, handling (liquid concentrates, one-shot developers and so on)

The AGFA film developers

Short product descriptions

RODINAL

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

RODINAL SPECIAL

The fine-grain developer for individual negative development. It balances contrast, and produces sharp and fine-grain negatives. The particularly short processing times should be noted.

STUDIONAL LIQUID

The liquid negative developer with exceptional sharpness and fine grain, good utilization of speed and constant contrast. These parameters can be held stable over a long period of time, due to the optimum oxidization protection.

ATOMAL FF

This negative developer with extremely fine grain has been especially designed for tank processing with replenishment. It is well-known for its very high yield and processing stability.

REFINAL

REFINAL is the universal, extremely high yield balancing developer which, as drum, small tank or tray developer, will ensure a consistently high speed yield and uniform gradation over particularly long periods. REFINAL produces fine grain and sharp contours.

Technical Data and Processing Instructions

General instructions

It is well-known that development results not only depend on time, temperature and type of developer, but also on the processing method used (tray, small tank, drum, large tank).

The following instructions should be followed to gain reproducible results:

- ▶ For processing in small tanks, agitate (tilt) the tank continuously for the first minute, and then tilt every thirty seconds. Developing times under three minutes should be avoided!
- ▶ For processing in drums (rotary process), the rotating speed should be higher than 30 rpm (changing the direction of rotation). Developing times under three minutes should be avoided!

In both cases the mixed developer solution is put into the processor at the required temperature (in general 20°C).

Do not use the total amount of water stated for mixing. Use part of the mixing water to rinse out the chemical containers. This removes residues in the tanks, making it easier to re-use the containers.

Agitation:

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

Storage life

Liquid concentrates will keep for at least two years in the original packaging. The concentrate can be kept for some months in the opened, tightly screwed bottle. Developer mixed ready for use can be kept in brimful, tightly screwed bottles for three months. Apart from RODINAL where the ready solution cannot be re-used.

Powder Developers can be kept dry in the original packaging at room temperature for at least two years. Unused fresh solution will keep in brimful, tightly screwed bottles up to six months. Used developer should be stored separately to fresh mixes. The life of used developer is reduced to about three months. The life in tanks with floating lids (continuously replenished) is at least 12 months.

Processing temperatures

If the specified developer temperature of 20°C is not maintained, then the developing time should be shortened accordingly (higher tem-

peratures) or lengthened (lower temperatures). The developing times at different temperatures (18°C to 24°C) can be found in the relevant time-temperature graphs (see instructions with products).

Speed yield

The film speed given is the effective speed for the film developer system used (with a medium contrast of gamma 0.65).

If mistakes are made in exposure, these guides still make it possible to produce standard negatives. For instance, a slightly overexposed AGFAPAN film can be developed in RODINAL with the corresponding dilution, achieving suitable results, despite the wrong exposure.

Contrast

The developing times given are guides. The negative contrast (gradation of the negative) can be influenced by the developing time, depending on the subject contrast: Films are developed to a lower or higher contrast (gamma value). If the subject contrast is very high, then the negatives are developed flatter ($\gamma = 0.55$). With low subject contrast, the negatives are developed to higher contrast ($\gamma = 0.75$).

It should be taken into consideration that the utilization of speed can either increase or

decrease. A development-induced lower or higher speed than that specified by the manufacturer must be compensated by a longer or shorter exposure. In general, overexposure with a subsequently shorter development produces softer negatives, whereas harder results are produced by lengthening the developing time with a shorter exposure. This should be individually tested for each film/developer combination.

Development generally aims at a medium negative contrast ($\gamma = 0.65$). It should however be taken into consideration that condenser enlargers with colour mixing heads sometimes require steeper negatives.

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

To ensure consistent and reproducible utilization of speed and contrast, the developing time should be lengthened for each second and subsequent batch). It is not possible to give exact times, as these are determined by the idle time between two batches as well as the method of storing the developer (glass or plastic bottle, full or partly full, bottle cap). If used developer is stored between each mix in brimful, tightly closed bottles, the figures given in the table should be used in addition.

The following is a guide: after processing one film in 500 ml developer, the developing time should be lengthened by approx. 10%.

With a 5 litre tank volume, the time should be lengthened after ten films. (1)

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

* With ATOMAL FF: +10%.
The extra times given above do not change if several films are simultaneously processed in one batch.

Dilution and developing times*
(at 20°C) for AGFAPAN films
(with different speed ratings)

(2)	Developer	Temperature	APX 100 ISO 100/21°	APX 100 ISO 200/24°	APX 400 ISO 400/27°	APX 400 ISO 800/30°
	RODINAL 1+25	20°C	8 min	11 min	8 min	–
	RODINAL 1+25	24°C	–	8 min	–	–
	RODINAL special	20°C	4 min	6 min	4.5 min	–
	RODINAL special	24°C	–	3.5 min	–	–
	STUDIONAL liquid	20°C	4 min	6 min	4.5 min	–
	STUDIONAL liquid	24°C	–	3.5 min	–	–
	REFINAL	20°C	6 min	9 min	6 min	9 min
	REFINAL	24°C	–	5 min	–	–

* Development in small tanks and trays

Extensive information on the individual negative developers is given in the corresponding product descriptions. Different speed settings (see table) and negative contrasts may result from the different developing times, depending on the film/developer combination used.

(2)

A higher negative contrast can be compensated by a flatter paper gradation.

The concentration of solutions in use

RODINAL

Mixing Instructions

RODINAL is diluted with water. (1 part concentrate + 25 or 50 parts water) at the ratio 1+25 or 1+50. The water must have a temperature of 20°C before the concentrate can be added. A finely graduated measure or pipette is needed for exact mixing.

Diluted RODINAL will only keep for a short period of time and should therefore be mixed immediately before use. (3)

Film speed (exposure index)

Depending on the film/developer combination used, film speeds may differ in practice from the nominal speed rating. The table shows the effective speed for the various film types ($\gamma = 0.65$). (4)

Yield

One-shot developing: approx. 50 35 mm films 135-36 or roll films 120 can be developed with 500 ml of concentrate.

Dilution and developing times

(at 20°C) for AGFAPAN films

(with different ratings)

(3)	Film type	Dilution	Rotary processing (drum)			Small tank/tray $\gamma = 0.65$
			$\gamma = 0.55$	$\gamma = 0.65$	$\gamma = 0.75$	
	APX 100	1+25	4 min	7 min	10 min	8 min
	APX 100	1+50	8 min	14 min	19 min	17 min
	APX 400	1+25	4 min	5 min	6 min	7 min
	APX 400	1+50	7 min	9 min	11 min	11 min

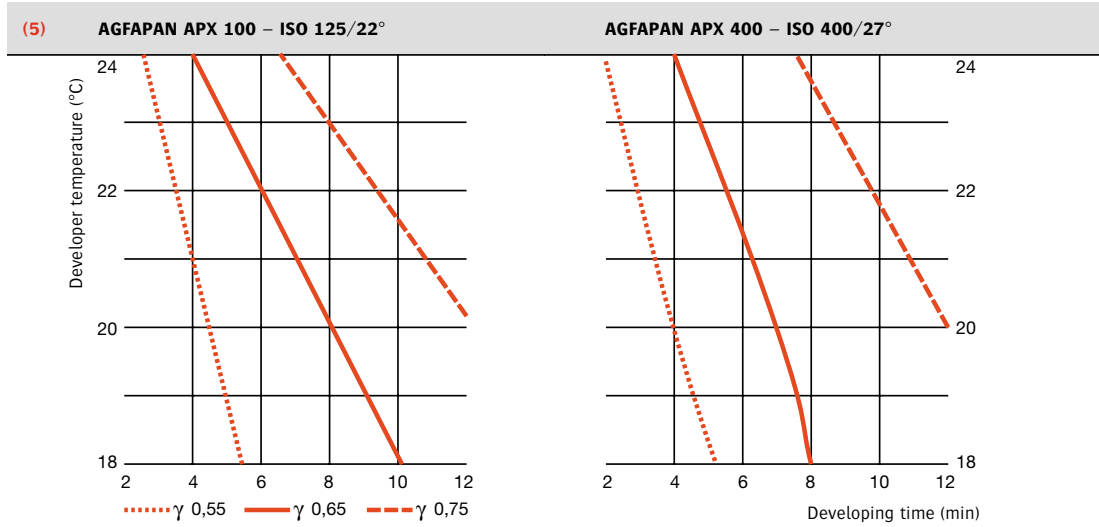
Film speed (exposure index) ($\gamma = 0.65$)

(4)	Film type	Dilution	Time*	Speed
	AGFAPAN	1+25	8 min	ISO 125/22°
	APX 100	1+50	17 min	ISO 160/23°
	AGFAPAN	1+25	7 min	ISO 400/27°
	APX 400	1+50	11 min	ISO 500/28°
	Fuji Neopan	1+25	4.5 min	ISO 250/25°
	400 Prof.	1+50	8 min	ISO 250/25°
	Fuji Neopan	1+25	3.5 min	ISO 400/27°
	1600 Prof.	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	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°

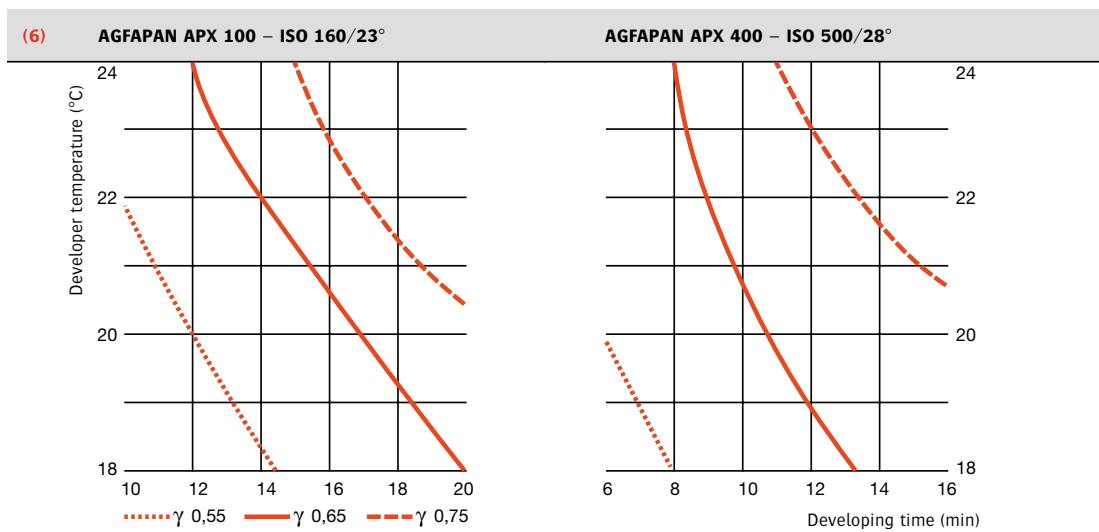
* Small tank or tray processing at 20°C.

** not recommended

**Developing times (at 20°C)
for AGFAPAN films
(with different speed ratings)
RODINAL 1+25 (small tank)**



**Developing times (at 20°C)
for AGFAPAN films
(with different speed ratings)
RODINAL 1+50 (small tank)**



RODINAL SPECIAL

Mixing instructions

The concentrate is diluted with water at the ratio 1 + 15 (= 1 part concentrate + 15 parts water). (7)(8)

Dilution and developing times

(at 20°C) for AGFAPAN films

(with different speed ratings)

(7)	Film type	Rotary processing (drum)			Small tank/tray $\gamma = 0.65$
		$\gamma = 0.55$	$\gamma = 0.65$	$\gamma = 0.75$	
	AGFAPAN APX 100	–	3.5 min	5 min	4 min
	AGFAPAN APX 400	3 min	4 min	5 min	4.5 min

Speed

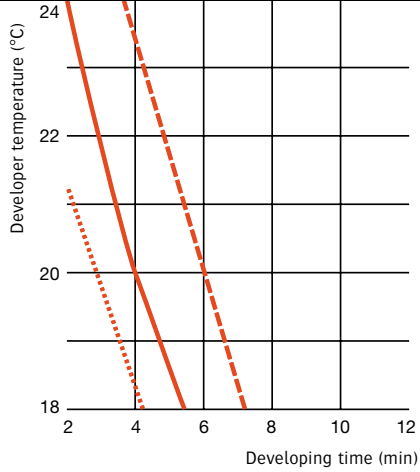
(exposure index) ($\gamma = 0.65$)

(8)	Film type	Time*	Speed
	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°

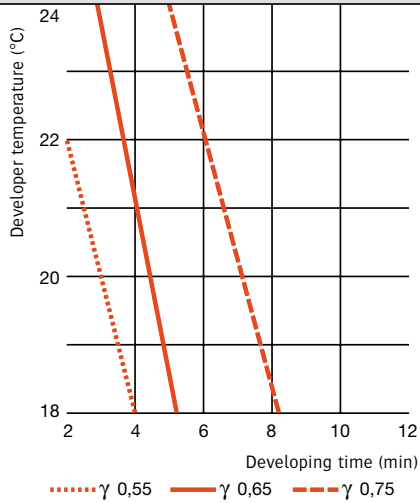
*Small tank or tray processing at 20°C.

**Developing times (at 20°C)
for AGFAPAN films
(with different speed ratings)
RODINAL SPECIAL (small tank)**

(9) AGFAPAN APX 100 – ISO 100/21°



(10) AGFAPAN APX 400 – ISO 400/27°



Yield

10 – 12 35 mm films 135-36 or
roll film 120 per litre
50 – 70 sheet films 9 x 12 cm per litre
(= 0.5 – 0.75 m²)

To ensure uniform utilization of speed and gra-
dation, the developing time should be lengt-
hened for the second and each subsequent
developing batch. (9) (10)

STUDIONAL LIQUID

Mixing instructions

STUDIONAL LIQUID is diluted with water at the ratio of 1 + 15 (= 1 part concentrate + 15 parts water). If the total quantity is not used, the plastic bottle should be squeezed after each use to prevent oxidization. It is, however, best to mix the total quantity and then fill in bottles. **(11)**

Speed

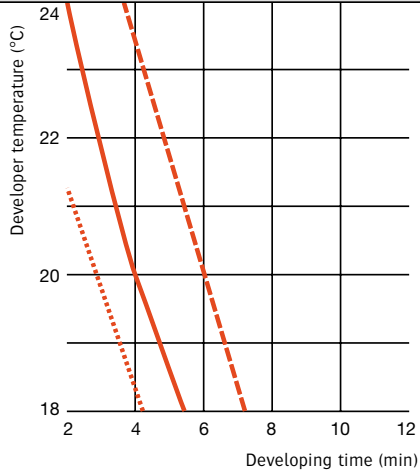
(exposure index) ($\gamma = 0.65$)

(11)	Film type	Time*	Speed
	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°

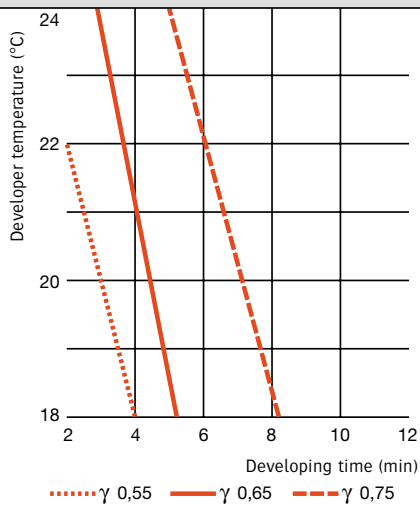
* Small tank or tray processing at 20°C.

**Developing times (at 20°C)
for AGFAPAN films
(with different speed ratings)
STUDIONAL LIQUID**

(12) AGFAPAN APX 100 – ISO 100/21°



(13) AGFAPAN APX 400 – ISO 400/27°



Yield

10 – 12 35 mm films 135-36 or
roll films 120 per litre
50 – 70 sheet films 9 x 12 cm per litre
(= 0.5 – 0.75 m²).

To ensure uniform utilization of speed and graduation, the exposing time should be lengthened for the second and each subsequent developing batch. (12) (13)

Powder developers in use

ATOMAL FF

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. When dissolved, fill up with water to the final volume. Developer and replenisher are ready for use immediately after cooling to room temperature.

Processing in tanks

The optimum developing time is established by the printing process used, the processing temperature and the desired gradation.

The times should be determined individually, depending on the film type and the above criteria. The developing times on the left are guides. (14) (15) (16)

(14)	Temperature	Time
	18°C	8-10 min
	20°C	6-8 min
	22°C	4-6 min
	24°C	3-5 min

(15)	Film type	Rotary processing (drum) $\gamma = 0.65$	$\gamma = 0.75$	Small tank/tray $\gamma = 0.65$
	AGFAPAN APX 100	6 min	9 min	8 min
	AGFAPAN APX 400	7 min	12 min	10 min

Speed

(exposure index) ($\gamma = 0.65$)

(16)	Film type	Time (20°C) Small tank/tray	Time (20°C) drum	Speed ISO
	AGFAPAN APX 100	8 min	6 min	ISO 50/18°
	AGFAPAN APX 400	10 min	7 min	ISO 160/23°
	Fuji Neopan 400 Prof.	8.5 min	6.5 min	ISO 160/23°
	Fuji Neopan 1600 Prof.	7.5 min	5 min	ISO 250/25°
	Ilford PAN-F	8 min	6 min	ISO 25/15°
	Ilford PAN-F Plus	7.5 min	5.5 min	ISO 20/14°
	Ilford FP 4 Plus	12 min	10 min	ISO 100/21°
	Ilford Delta 100	7.5 min	5.5 min	ISO 40/17°
	Ilford Delta 400	11 min	9 min	ISO 160/23°
	Ilford HP 5 Plus	11 min	9 min	ISO 200/34°
	Kodak Tri-X	10 min	8 min	ISO 250/25°
	Kodak T-MAX 100	12 min	11 min	ISO 50/18°
	Kodak T-MAX 400	12 min	10 min	ISO 250/25°
	Kodak T-MAX p3200	14 min	12.5 min	ISO 640/29°



Yield

Processing with replenisher – approx. 14 ml
replenisher per 35 mm films (135-36): 71
35 mm films with 1 litre replenisher.

Yield without replenisher:

10 – 12 35 mm films 135-35 or
roll films 120 per litre

50 – 60 sheet films 9 x 12 cm per litre
(= 0.5 – 0.65 m²)

For details on replenishment: see page 51.

REFINAL

Mixing instructions

Stir Part A into at least 75% of the total quantity of water at 40°C until completely dissolved. Then stir in Part B. After it is dissolved, fill up with water to the final volume. (17)(18)

(17)	Film type	Rotary processing (drum)			Small tank/tray
		$\gamma = 0.55$	$\gamma = 0.65$	$\gamma = 0.75$	$\gamma = 0.65$
	AGFAPAN APX 100	3 min	5 min	8 min	6 min
	AGFAPAN APX 400	3 min	5 min	8 min	6 min

Speed

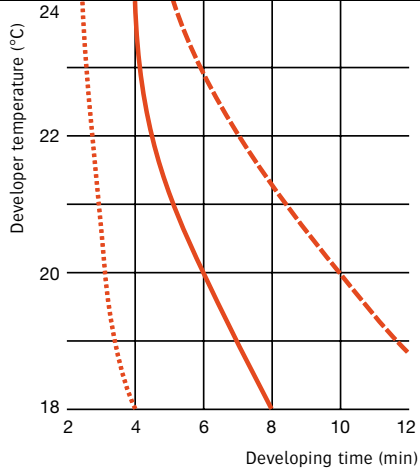
(exposure index) ($\gamma = 0.65$)

(18)	Film type	Time*	Speed
	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 400/32°
	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°

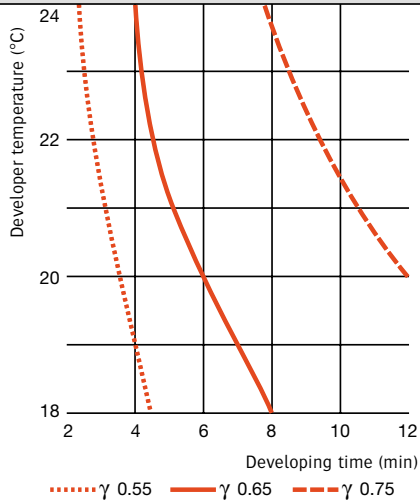
* Small tank or tray processing at 20°C.

**Developing time (at 20°C)
for AGFAPAN films
(with different speed ratings)
REFINAL (small tank)**

(19) AGFAPAN APX 100 – ISO 160/23°



(20) AGFAPAN APX 400 – ISO 500/28°



Yield

Processing with replenisher – approx. 14 ml
replenisher per 35 mm film (135-36); 71
35 mm films with 1 litre replenisher

Yield without replenisher:

10 – 12 35 mm films 135-36 or
roll films 120 per litre.

50 – 69 sheet films 9 x 12 cm per litre
(= 0.5 – 0.65 m²).

For details on replenishment: see page 51.

Developing times at different temperatures

Processing in tanks

The optimum developing time is dependent on the printing process used, the processing temperature and the desired gradation. The times should be determined individually, depending on the film type and the above criteria.

The following developing times are guides:

(21).

General instructions when mixing powder developers:

The use of partial quantities is not recommended, as the chemicals may have separated due to vibration during transport.

Replenishment of BW developers

Continuous replenishment of ATOMAL FF and REFINAL developers ensures consistent results over long periods of processing. This means a good, reproducible utilization of speed together with consistent gradations. Theoretically, the developers can be replenished indefinitely.

Replacement is practically only necessary if the tank solution has been contaminated by glue residues, gelatine or sludge.

(21)	Temperature	Time
	18°C	7-9 min
	20°C	5-7 min
	22°C	4-5 min
	24°C	3-4 min

Level replenishment in tanks

The replenishment rate corresponds to the amount of solution carried over by the films. The tank solution is filled up with replenisher as required, then stirred. Any suspended particles should be allowed to settle.

Automatic replenishment

The effective replenishment rate depends on the throughput. In comparison, higher throughput has a lower rate of replenishment than small throughput or if there are long idle times between batches.

The following replenishment rates are guides:

- ▶ per sqm of film = 250 ml
- ▶ per 35 mm film 135-36 = 14 ml
- ▶ per roll film 120 = 17 ml
- ▶ per sheet film 9 x 12 cm = 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 too high density, despite correct exposure, developing time and temperature. In the case of over-replenishment (developer activity too high), fill up with developer tank solution until the fresh state is reached.

Please note: the replenisher should never be diluted with fresh solution or with water! In the case of under-replenishment (= developer activity too low), a higher replenishment rate is necessary or part of the tank solution should be replaced with replenisher. Corrections of this type can be done several times.

The Agfa paper developers

General instructions

Positive developers have been optimized for the full development of photo papers. They are much faster than negative film developers. The developing times should be set so that the papers are fully developed in the given time.

The draining times should not be forgotten here. Longer developing times are relatively unproblematic and only minimally influence the final result. Slight deviations in the bath temperature do not affect the quality and should be balanced simply by alterations in times.

Short product descriptions

AGFA MULTICONTRAST DEVELOPER

This developer is suitable for the processing of variable contrast black & white papers. Ideally balanced to AGFA MULTICONTRAST PREMIUM or AGFA MULTICONTRAST CLASSIC.

The very good storage life and yield are demonstrated when processing without replenishment. This developer is characterized by the following factors:

- ▶ neutral image tone
- ▶ exceedingly active, thereby ensuring rapid response and good use of speed and contrast differentiation with variable-contrast papers
- ▶ very good maximum density of both Multi-contrast papers:
MULTICONTRAST PREMIUM and
MULTICONTRAST CLASSIC
- ▶ above-average storage life, processing stability and yield
- ▶ low replenishment rate, so less waste
- ▶ new anti-calcifier system with biodegradable complexing agents, so more environment-friendly

NEUTOL plus

This developer has no hydroquinone. It has been optimized for high-yield processing in trays, drums and roller transport machines without replenishment.

- ▶ excellent activity, resulting in rapid response of the density
- ▶ good use of speed ensures short exposure times
- ▶ very good maximum blacks offer brilliant reproduction

- ▶ the very low fog level leads to clear image results

NEUTOL plus/LOR

This developer without hydroquinone is especially designed for mechanical processing. It achieves particularly good developing results with Agfa Multicontrast Premium RC/PE paper in combination with laser exposure. Further product qualities to be noted are:

- ▶ extremely low replenishment rate of 100 ml/m²
- ▶ no silver sludge and therefore no soiling of machine and prints
- ▶ high activity enables processing at low temperatures or with shorter processing times

NEUTOL, NEUTOL LIQUID NE and NEUTOL LIQUID WA

This group of high-quality developer concentrates are ready for use immediately after dilution with water. They are suitable for processing in trays, drums and roller transport machines without replenishment but with very high yield. The image shows rapid response and the print tone is neutral to warm black. The good use of speed and good fog security are further special quality features of these developers. A special calcium stabilizer stops the clouding which otherwise occurs in liquid developers, even with a high output.

AGETOL LIQUID

A developer with optimum processing consistency. Very good storage life and economical in use for continuous processors and roller transport machines (e.g. AGFA PRO).

NEUTOL NE

This powder developer influences the print tone and is used for tray, drum and roller transport machine processing without replenishment. It shows extremely high yield, a very consistent print tone, and also outstanding calcium stabilization together with constant low clouding.

METINOL

Due to its slow and steady print formation, METINOL is extremely suitable for tray processing. METINOL is marked by its high throughput and the processing of large formats (also when the sponge technique is used).

(22)	Developer	Silver bromide paper: BROVIRA-SPEED	Silver chlorbromide papers: MULTICONTRAST PREMIUM, MULTICONTRAST CLASSIC
	MULTICONTRAST DEVELOPER	Neutral black print tone	Neutral to warm black print tone
	NEUTOL Plus	Neutral black print tone	Neutral to warm black print tone
	NEUTOL Plus/LOR	Neutral black print tone	Neutral to warm black print tone
	NEUTOL LIQUID NE	Neutral black print tone	Neutral to warm black print tone
	NEUTOL NE	Neutral black print tone	Neutral to warm black print tone
	AGETOL LIQUID	Neutral black print tone	Neutral to warm black print tone
	NEUTOL	Neutral to warm black print tone	Warm black print tone
	NEUTOL LIQUID WA	Neutral to warm black print tone	Warm black print tone
	METINOL	Neutral to warm black print tone	Warm black print tone

Technical Data and processing instructions

Image tone control

The print tone of black & white photo papers is determined above all by the emulsion.

However, the print tone can be marginally influenced by the choice of developer.

The following table shows the effect of Agfa positive developers on the print tone of silver bromide and silver chlorbromide emulsions.

(22)

Other standard black & white developers and fixers are also suitable, bearing in mind their special characteristics.

Note for warm tone development: To ensure perfect processing of warm tone papers, care must be taken to avoid contamination of developer with fixer. In addition, there should be a stop bath (2% acetic acid solution) between developer and fixer.

(23)	Concentrate	Standard dilution 1+4	Economy dilution 1+6
	500 ml	2.5 litres	3.5 litres
	1 litre	5 litres	7 litres
	5 litres	25 litres	35 litres
	20 litres	100 litres	140 litres

**Processing in machines
with replenishment* and manual
processing in trays and drums
(Dilution 1+4)**

(24)	Paper type	Developing times* in sec. at			Yield per litre
		20°C	25°C	30°C	
	PE	50±10 s	30±10 s	15-20 s	200 sheets 17.8x24 cm (= approx. 8.5 m ²)
	Fibre base	90±10 s	70±10 s	50±10 s	depends on solution absorption

* Replenishment rate: 150 ml/qm (normal dilution 1+4)

**Processing in trays and drums
without replenishment
(Dilution 1+6)**

(25)	Paper type	Developing times* in sec. at			Yield per litre
		20°C	25°C	30°C	
	PE	75±15 s	50±10 s	30±5 s	150 sheets 17.8x24 cm (= approx. 6.5 m ²)
	Fibre base	110±10 s	90±10 s	70±10 s	depends on solution absorption

* The precise time depends on the type of paper and the processing conditions, and should be determined individually. Longer developing times are relatively uncritical. In the AGFA PRO processor, the developing time is approx. 30 seconds (at 25°C/77°F). In the Ilfospeed 2050-RC or 2150-RC processors, the developing time is between 10 and 20 seconds. The developer temperature is 35°C and cannot be adjusted. Standard results are produced with the MC developer at the dilution 1+4.

The concentration of developer solutions in use

MULTICONTRAST DEVELOPER

Mixing

The concentrate is topped up with water to the end volume required and well mixed. The normal 1 + 4 dilution can be used both as tank solution and replenisher. (23) (24) (25)

Storage life

The storage life of the concentrate in the unopened original pack is at least 12 months. Mixed developer should be kept in airtight closed bottles or in tanks with floating lids.

The storage life with a 1 + 4 dilution is:

- ▶ In brimful, airtight closed glass bottles = 6 weeks
- ▶ In half-full glass bottles = 3 weeks
- ▶ In tanks with floating lids = 4 weeks
- ▶ In open tanks without floating lids = 2 weeks

Storage life is reduced by 20% with a dilution of 1 + 6.

NEUTOL plus

Mixing

The concentrate is topped up with water to the end volume required and stirred well. (26)

Standard dilution (1 + 4): This dilution is recommended if the developer is to be kept for a longer period of time with relatively low daily throughput. The storage life of this dilution lies at around one week. (27)

Economy dilution (1 + 9): Economy dilution is particularly effective if there is a high daily throughput and the tray contents are exhausted fast. The economy dilution permits an even better utilization of yield. To maintain good consistency, the developer carry-over should be topped up several times daily with the same amount of fresh solution. The storage life of the economy solution lies at around 2 days. (28)

Economy dilution	(26)	Concentrate		Standard dilution	Economy dilution
		1+4	1+9		
	1 litre	5 litres	10 litres		

Processing in trays, drums and roller transport machines (Standard dilution 1+4)

(27)	Paper type	Developing times* in sec. at			Yield per litre
		20°C	25°C	30°C	
	PE	50±10 s	30±10 s	15-20 s	117 sheets 17.8x24 cm (= approx. 5 m ²)
	Fibre base	90±10 s	70±10 s	50±10 s	depends on solution absorption

Economy dilution 1+9

(28)	Paper type	Developing times* in sec. at			Yield per litre
		20°C	25°C	30°C	
	PE	70±10 s	50±10 s	30±5 s	94 sheets 17.8x24 cm (= approx. 4 m ²)
	Fibre base	100±10 s	80±10 s	60±10 s	depends on solution absorption

* The precise developing time depends on the type of paper and the processing conditions, and should be determined individually. Longer developing times are relatively uncritical.

NEUTOL plus/LOR

Mixing

The concentrate is topped up with water up to the end volume and diluted (tank filling = replenisher). (29)

Replenishment rate: 100 ml/m² at standard utilization (one tank volume turnover within two weeks). At lower utilization it is advisable to increase the replenishment rate (possibly double). At very high utilization the replenishment rate can be reduced to 80 ml/m² (for instance, for finishing leader belt machines).

(30)

(29)	Concentrate	Standard dilution 1+4
	1 litre	5 litres

Processing in machines with replenishment

(30)	Paper type	Developing times** in sec. at			Replenishment rate/qm
		20°C	25°C	30°C	
	PE	30±5 s	20±5 s	18 s**	100 ml
	Fibre base	30±5 s	70±5 s	30±5 s	100 ml

* The precise developing time depends on the type of paper and the processing conditions and should be determined individually. Longer developing times are relatively uncritical.

** A processing time of less than 18 sec. cannot be recommended, as this could lead to streaking due to uneven development.

NEUTOL, NEUTOL LIQUID NE, NEUTOL LIQUID WA

Mixing

The developer concentrate is topped up with water at about 30°C to the required end volume and stirred well. The developer is ready for use after cooling to room temperature. The concentrate should not be stored in the plastic bottle after the removal of partial quantities.

Stock solution (1 + 3): If the complete quantity is not completely used or different dilutions have to be produced, it is advisable to mix a concentrated stock solution (= 1 part concentrate + 3 parts water). This solution can also be used undiluted as a particularly powerful developer (see dilution table). (31)

Standard dilution (1 + 7): This solution (1 part stock solution + 1 part water) is recommended if the developer is to be used over a longer period of time with a lower daily throughput. Topping up with the same solution is only necessary when the tray level falls too low. The storage life at normal dilution lies at about one week. (31)(32)

Economy dilution (1 + 11): Economy dilution (1 part stock solution + 2 parts water) is particularly cost-effective. It is to be recommended if there is a high daily throughput and the tray contents are exhausted fast. The economy solution cannot be stored as long (no longer than one day), but makes higher yield possible and therefore costs are especially low. To maintain a good consistency, the developer carry-over should be topped up several times a day with the same amount of fresh solution. (33)

Storage life

- ▶ Concentrate in the original packaging = 2 years
- ▶ Stock solution 1 + 3 in tightly closed glass bottles = 6 months
- ▶ Normal and economy dilution: see mixing instructions

If crystals have formed in the concentrate due to too cold storage, they must be completely dissolved in the amount of water specified for mixing. Storage temperature above 30°C should be avoided.

Dilutions

(31)	Version	Concentrated dilution 1+3	Standard dilution 1+7	Economy dilution 1+11
	1.25 litres (for 10-15 litres)	5 litres	10 litres	15 litres
	5 litres (for 40-60 litres)	20 litres	40 litres	60 litres

Processing in trays, drums and roller transport machines*

(Standard dilution 1+7)

(32)	Paper type	Developing times in sec. at			Yield per litre
		20°C	25°C	30°C	
	PE	60±10 s	45±10 s	30±10 s	117 sheets 17.8x24 cm (= approx. 5 m ²)
	Fibre base	90±10 s	60±10 s	45±10 s	depends on solution absorption

* Replenishment in roller transport machines:
approx. 350 ml/qm fresh solution, 1+7 dilution

Processing in trays and drums

(Economy dilution 1+11)

(33)	Paper type	Developing times in sec. at			Yield per litre
		20°C	25°C	30°C	
	PE	90±10 s	60±10 s	45±10 s	94 sheets 17.8x24 cm (= approx. 4 m ²)
	Fibre base	120±10 s	90±10 s	60±10 s	depends on solution absorption

AGETOL LIQUID

Mixing

To mix both tank solution and replenisher, the concentrates are diluted at the ratio of 1 + 7 (= 1 part concentrate + 7 parts water) with water of about 30°C. The solutions are ready for use after cooling to working temperature.

(34) (35)

**Processing PE paper
with replenishment in continuous
and roller transport machines.**

AGETOL LIQUID 1+7

(34)	Replenisher	Developing times in sec. at				Replenishment rate (ml/qm)
		20°C	25°C	30°C	35°C	
	AGETOL LIQUID	60±10 s	45±10 s	30±10 s	20±5 s	300±20

**Processing
without replenishment in drums,
tanks and other processors.**

AGETOL LIQUID 1+7

(35)	Paper type	Developing times in sec. at				Yield per litre
		20°C	25°C	30°C	35°C	
	PE	60±10 s	45±10 s	30±10 s	20±5 s	117 sheets 17.8x24 cm (= approx. 5 m ²)
	Fibre base	90±10 s	60±10 s	45±10 s	30±5 s	depends on solution absorption



Powder developers in use

NEUTOL NE

Mixing

To make ready-to-use solution, Part A is dissolved in at least half of the final volume of water at about 40°C. Part B is then stirred in. After the chemicals have been completely dissolved, mixing should be completed by topping up the water to the final volume. The developer is ready to use after cooling to working temperature.

Stock solution: If the developer is to be used over a longer period of time, it is advisable to mix a concentrated stock solution. Part A is dissolved – depending on the package size used – in either 2 or 8 litres of water at about 40°C, and then Part B is stirred in. The chemicals should be completely dissolved. Please see the dilution table for mixing working solutions from the stock solution. (36)

Standard dilution: (1 part stock solution + 1 part water) This dilution is to be recommended if the developer is to be used over a longer period of time with a low daily throughput. Filling up with the same solution is only necessary if the tray level falls too low.

Dilutions

(36)	Versions	Concentrated stock solution	Standard dilution 1+1*	Economy dilution 1+2*
	5 litres (for 5-7,5 litres)	2,5 litres	5 litres	7,5 litres
	20 litres (for 20-30 litres)	10 litres	20 litres	30 litres

* When mixed with stock solution

Processing in trays, drums and machines without replenishment (Standard dilution 1+1*)

(37)	Paper type	Developing times in sec. at			Yield per litre
		20°C	25°C	30°C	
	PE	60±10 s	45±10 s	30±10 s	117 sheets 17.8x24 cm (= approx. 5 m ²)
	Fibre base	90±10 s	60±10 s	45±10 s	depends on solution absorption

* When mixed with stock solution

Storage life at normal dilution lies at about one week. (37)

Economy dilution: (1 part stock solution + 2 parts water) The dilution is particularly effective with a high daily throughput. The economy dilution may be stored for less time (no more than one day), but it permits better utilization of yield and therefore the costs are low.

To maintain good consistency, the developer carry-over should be topped up several times a day with the same amount of fresh solution.

(38)



Alexander Basta/Germany

**Processing in trays, drums and machines
without replenishment
(Economy dilution 1+2*)**

(38)	Paper type	Developing times in sec. at			Yield per litre
		20°C	25°C	30°C	
	PE	90±10 s	60±10 s	45±10 s	94 sheets 17.8 x 24 cm (= approx. 4 m ²)
	Fibre base	110±10 s	90±10 s	60±10 s	depends on solution absorption

* When mixed with stock solution

**Storage life
(at room temperature)**

- ▶ Developer in the original packaging = at least 2 years
- ▶ In brimful, tightly closed glass bottles = 6 months
- ▶ At normal and economy dilution, see mixing instructions.

METINOL

Mixing

For mixing ready-to-use solution, stir Part A in about 80% of the final volume of water at about 40°C. Then Part B is stirred in. After the chemicals have been completely dissolved, top up with water to the final volume. The developer is ready for use after cooling to working temperature. It is not possible to mix a concentrated stock solution with this developer. The economy dilution (= 1 part working solution + 1 part water) only has a short storage life due to its tendency to oxidize.

(39) (40)

Storage life

(at room temperature):

- ▶ Developer in the original packaging = at least 2 years
- ▶ Working solution in brimful, tightly closed glass bottles = 6 months
- ▶ Economy dilution = 1 day

Processing in trays, drums and roller transport machines

(Dilution: Ready solution)

(39)	Paper type	Developing times in sec. at			Yield per litre
		20°C	25°C	30°C	
	PE	60±10 s	45±10 s	30±10 s	117 sheets 17.8x24 cm (= approx. 5 m ²)
	Fibre base	90±10 s	60±10 s	45±10 s	depends on solution absorption

Processing in trays, drums and roller transport machines

(Normal dilution 1+1*)

(40)	Paper type	Developing times in sec. at			Yield per litre
		20°C	25°C	30°C	
	PE	90±10 s	60±10 s	45±10 s	70 sheets 17.8x24 cm (= approx. 3 m ²)
	Fibre base	120±10 s	90±10 s	60±10 s	depends on solution absorption

* The economy dilution (1 part ready solution + 1 part water) will only keep for one day, and is intended as a one-shot developer for high throughput.

Technical Data and instructions for the posttreatment of films and papers

The stop bath (interrupter)

To prevent alkaline developer from being carried over into the fixer, a stop bath should be used between developer and fixer. Fibre base papers should not lie in this bath for too long (about half a minute). Too strong a mixture (and thereby a stop bath that is too acidic) is not advisable as too much acid would be carried over into the fixer. On the one hand, it is then difficult to wash the fixing salt out of the soft paper and on the other, the danger of sulphur separation exists.

Processing data for film processing

(41)	Stop bath tank solution	Time in sec. at 20-25°C	Replenishment rate
	2% acetic acid	10-30 s	910 ml/m ² Film 50 ml/135-36 60 ml/rollfilm 120 9.8 ml/sheet film 9 x 12 cm 50 ml/film 135-36

If correctly used, the stop bath has the following advantages:

- ▶ It stops post-development
- ▶ It prevents or impedes the alkaline developer from being carried over into the fixer and therefore the formation of dichroitic fog, yellow fog and deviation of the print tone is prevented
- ▶ It permits the use of a neutral fixer (e.g. FX-UNIVERSAL)
- ▶ It permits warm tone development with NEUTOL LIQUID WA (no deviation in print tone through post-development in the fixer).
- ▶ It lengthens the storage life of the fixer.

The fixer is mixed as follows:

- ▶ 1 part acetic acid (60%) + 30 parts water. Length of treatment in the 2% acetic acid stop bath: 20 – 30 s* (at 20 – 25°C). Longer treatment (more than 1 minute) would make washing more difficult and reduces the storage lives of prints.

The stop bath can be replenished with a 5% acetic acid bath with mechanical processing:

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

(41)

Processing data for paper processing

Replenishment rate: 200 ± 50 ml/m².

Important: In processors for PE papers which do not include a stop bath, the acid AGEFIX or ACIDOFIX fixers should be used.

The use of fixers

Photographic emulsion layers contain non-developed, light-sensitive silver complex on the unexposed areas after development. For the long-term stabilization of the print, these silver complexes must be removed at all costs. This takes place through fixing which transforms the hard to dissolve silver complexes into soluble compounds and the wash ensures their complete removal from the emulsion.

Correct fixing times

The fixing times required can be found in the corresponding tables. As a guideline for films, the following should be noted: the time it takes the cloudy, milky inking on the film to disappear should be doubled. Too long fixing times can have a negative effect.

AGEFIX

Highly concentrated liquid fixer on ammonium thiosulphate basis with optimum composition for yield and storage life. Depending on the dilution, AGEFIX can be used either as a standard or a rapid fixer.

Processing data AGEFIX for film processing.

Replenisher: AGEFIX 1+6

(42)	Tank solution AGEFIX	Time in min. at 20-25°C	Replenishment rate
	Standard fixer 1+7	6-8 min	910 ml/m ² film 50 ml/135-36 60 ml/rollfilm 120 9.8 ml/sheet film 9 x 12 cm 50 ml/film 135-36

Processing data AGEFIX for film processing.

Replenisher: AGEFIX 1+4

(43)	Tank solution AGEFIX	Time in min. at 20-25°C	Replenishment rate
	Rapid fixer 1+5	3-5 min	910 ml/m ² film 50 ml/135-36 60 ml/rollfilm 120 9.8 ml/sheet film 9 x 12 cm 50 ml/film 135-36

Mixing for film processing

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

- ▶ Standard fixer:
1 part concentrate + 7 parts water (42)
- ▶ Rapid fixer:
1 part concentrate + 5 parts water (43)

Yield without replenishment
(per litre):

- ▶ Approx. 1 m² of film
- ▶ 15 – 30 35 mm films 135-36
- ▶ 15 – 30 roll films 120
- ▶ 100 sheet films 9 x 12 cm

**Processing (PE papers) with replenishment
in continuous transport and roller transport
machines (AGFA-PRO)**

(44)	Tank solution AGEFIX	Fixing times in sec. at 20-30°C	Reple- nisher	Replenishment rate (ml/m ²)
	Rapid fixer 1+5	30±10 s	AGEFIX 1+3	200±20
	Standard fixer 1+7	45±10 s	AGEFIX 1+5	300±20

**Processing without replenishment in trays,
drums, tanks and other processors
(Dilution: Standard fixer 1+9)**

(45)	Paper type	Fixing times in sec. at 20-35°C	Yield per litre
	PE	75±15 s	60 sheets 17.8x24 cm (= approx. 2.5 m ²)
	Fibre base	240±60 s	35 sheets 17.8x24 cm (= approx. 1.5 m ²)

**Processing without replenishment in trays,
drums, tanks and other processors
(Dilution: Rapid fixer 1+7)**

(46)	Paper type	Fixing times in sec. at 20-35°C	Yield per litre
	PE	45±15 s	60 sheets 17.8x24 cm (= approx. 2.5 m ²)
	Fibre base	120±60 s	35 sheets 17.8x24 cm (= approx. 1.5 m ²)

**Mixing for
paper processing**

The concentrate is diluted with the amount of water required. The fixer is ready for use after stirring. (44)

- ▶ Standard fixer:
1 part concentrate + 9 parts water (45)
- ▶ Rapid fixer:
1 part concentrate + 7 parts water (46)

The composition of the fixer changes during use. To achieve perfect results, the fixer should therefore be checked regularly and replaced with fresh solution in good time. Continuous replenishment over a longer period of time, and therefore longer storage life of the fixer ensures consistent results with mechanical processing.

**Storage life
(at room temperature)**

- ▶ Concentrate in unopened original pack =
2 years
- ▶ Ready solution and opened packs
= max. 3 months

ACIDOFIX

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

Mixing

The contents of the pack are stirred into the appropriate quantity of water at approx. 40°C. The fixer is ready for use after cooling to the working temperature. The fixer times depend on the film or paper type (emulsion, silver halide coverage), temperature, agitation and condition of the fixer. The shorter times are applicable for freshly mixed fixers. Used fixers require longer fixer times. (47) (48)

Storage life

- ▶ In the unopened original pack = 2 years
- ▶ Ready solution = max. 3 months

Processing data ACIDOFIX for film processing

(47)	Tank solution	Time in min. at 20-25°C	Yield per litre
	ACIDOFIX	2-3 min	approx. 1 m ² 15-30 film 135-36 15-30 rollfilm 120 100 sheet film 9x12 cm 50 ml/film 135-36

Processing data ACIDOFIX for paper processing

(48)	Paper type	Fixing times in sec. at 20-35°C	Yield per litre
	PE	60±10 s	60 sheets 17.8 x 24 cm (approx. 2.5 m ²)
	Fibre base	150±30 s	35 sheets 17.8 x 24 cm (approx. 1.5 m ²)

**Processing (PE papers) with replenishment
in continuous transport and roller transport
machines (AGFA-PRO)**

(49)	Dilution as	Fixing times in sec. at 20-35°C	Replenisher	Replenishment rate (ml/m ²)
	Rapid fixer 1+4	20±5 s*	MC FIXER 1+4	200±20

* At fixing times of 10±5 s, the replenishment rate must be doubled to 400±20 ml/m².

**Processing without replenishment in trays,
drums, tanks and other processors
(Standard fixer 1+7)**

(50)	Paper type	Fixing times in sec. at 20-35°C	Yield per litre
	PE	40±15 s	60 sheets 17.8x24 cm (= approx. 2.5 m ²)
	Fibre base	120±30 s	35 sheets 17.8x24 cm (= approx. 1.5 m ²)

**Processing without replenishment in trays,
drums, tanks and other processors
(Rapid fixer 1+4)**

(51)	Paper type	Fixing times in sec. at 20-35°C	Yield per litre
	PE	20±10 s	60 sheets 17.8x24 cm (= approx. 2.5 m ²)
	Fibre base	60±20 s	35 sheets 17.8x24 cm (= approx. 1.5 m ²)

MC-Fixer

The liquid fixer concentrate on ammonium thiosulphate basis is perfectly matched to the AGFA MULTICONTRAST papers PREMIUM and CLASSIC. This fixer is also most suitable for all other B&W papers with fixed or varied gradation.

Mixing

The concentrate is diluted with the appropriate quantity of water. The fixer is ready for use after stirring.

- ▶ Tank solution/Standard fixer:
1 part concentrate + 7 parts water (50)
- ▶ Replenisher (tank solution) – Rapid fixer:
1 part concentrate + 4 parts water (49)(51)

Storage life (at room temperature)

- ▶ Concentrate in unopened original pack =
2 years
- ▶ Ready solution and opened packs
= max. 3 months

Fixer monitoring

The rising silver content, dilution due to carry-over and the subsequent change in acid content reduce the effectiveness of the fixer. For this reason, the pH value, density and silver content – particularly when processing without replenishment – should be continuously monitored.

The chemical trade supplies acid test paper to monitor the pH value: for instance, Lyphan Paper L 669, Fa. Klotz, Berlin. The paper strip is dipped into the solution and the change in colour compared with a test chart. These indicator papers are accurate enough to determine the pH value.

The density is measured with a hydrometer (areometer). The fixer is poured into a graduated cylinder and the hydrometer is then dipped in, to swim on its own. The density value can then be read on the hydrometer scale at the highest point of the solution. The tester's eye should be on the same level as the surface of the solution. The higher the density is, the less the hydrometer sinks into the solution.

To test the silver content of used fixers, a 5 cm long strip of standard silver test paper is dipped into the solution to be monitored and after a few seconds, the test strip is compared with the colour chart.

The following values in used condition should be achieved for problematic work:

- ▶ Acid content between pH 4 and pH 8
- ▶ Density value not under the value of fresh solution
- ▶ Silver content not over 4 g/litre
(The silver content does not exceed this value in correctly replenished processors).

If the figures obtained during monitoring vary to any great degree from those given above, it is advisable to mix fresh fixer to maintain the quality of the results.

Silver recovery

Electrolytic silver recovery is possible from fixers which can contain up to 4 g silver per litre. If the quantities of fixer are large enough, it may be worthwhile using a silver recovery unit. Smaller quantities should be handed over to a fixer-disposal company.

Fixer recycling

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

Final wash

The final wash ensures that the fixer salt complexes are washed out of the emulsion of the photo materials.

A thorough final wash is most important for the storage lives of black & white negatives or papers, as the silver complexes reduce the stability of photo materials.

Depending on temperature, agitation, input and output of the washing water, the following washing times are necessary for all films:

- ▶ 15 ± 5 minutes at 20 – 25°C
- ▶ 20 ± 5 minutes at 15 – 20°C

The following washing times are necessary for papers:

- ▶ for PE papers: 2 – 4 min.
- ▶ for fibre base papers: 20 – 40 min.
- ▶ for fibre base papers after a soda interim bath: 15 – 30 min.

Note for RC papers: Much longer washing times may cause the prints to curl.

Soda interim bath for fibre base papers

For processing black & white fibre base papers, a soda bath (= 1% sodium carbonate solution) can be inserted between fixer and final wash. This enables the fixer to be washed better and faster out of the soft paper. This not only redu-

ces the final wash by about 30% but also improves the storage lives of the prints. The treatment lasts about 2 – 3 minutes.

AGEPON

This wetting agent is used as the final bath after the last wash. It ensures even draining of the water without leaving drops, stains or streaks on the paper or film surface. The AGEPON final bath reduces the drying times and improves high gloss on papers.

Mixing

AGEPON is diluted with water at the ratio of 1 + 200 (= one capful to 1 litre water). Higher concentrations do not improve results. The papers/films are agitated for 1/2 to 1 minute in the wetting agent and then dried without rinsing.

Yield

Around 100 to 200 films can be put through 1 litre of AGEPON bath. The AGEPON bath must be replaced when the liquid does not drain evenly off the surface of the material.

Storage life

The concentrate will keep virtually indefinitely in the closed bottle. The storage life of ready solution depends on the type of water used.

The diluted AGEPON solution should not be used for longer than 2 weeks.

ALGEZID II

This powerful, chlorine-free biocide is used to prevent fungus and algae forming in the water tanks and in wash water and silver recovery units. When used correctly, ALGEZID II has no detrimental effects on photographic materials. It should not be added to the processing solutions.

Use

After shut-down, 2 ml ALGEZID II (per 10 litres) are added to the water tank. The water need not be drained off before the next development batch.

Storage life

The concentrate will keep virtually indefinitely in closed bottles.

Stabilizing with SISTAN

SISTAN protects photo materials from changes in print silver caused by environmental effects, without changing the print tone. These changes appear initially as yellowish brown to reddish highlight discoloration and can later destroy the whole film or paper material by the silver being converted into a colloidal form.

More information on the theory of this subject is to be found on Page 31 of this brochure. The practical use only is dealt with here.

Mixing

For use, SISTAN is diluted with water: 50 ml SISTAN + 950 ml water. The correctly processed and washed prints are agitated for 1 minute in the SISTAN solution after the final wash.

A further wash should not be done afterwards!

Note: Too high a concentration of SISTAN can lead to stains which take some time to appear – particularly if prints are in close contact (store stacked).

Care should therefore be taken that both the fronts and backs of prints are wiped before drying to avoid partial over-concentration caused by dried spots of SISTAN. The pinch and transport rollers of mechanical processors and continuous dryers should be carefully wiped clean to stop the SISTAN solution crystallizing on them.

Yield

Up to 2 m² of film (equivalent to approx. 30 – 40 35 mm or roll films) or 2 m² of black & white paper (equivalent to approx. 45 sheets 17.8 x 24 cm) per litre ready solution. The solution can be used down to the last drop.



Ryuichu Sato/Japan

Print not toned. Neutral black image tone



Direct VIRADON brown toning

The image tone chosen can intensify expression

Storage life

The concentrate will keep virtually indefinitely in closed bottles. The ready solution should not be kept in open trays but rather in closed bottles.

Toning with VIRADON

The metallic (black) image silver can be converted into a different coloured tone by toning

processes. VIRADON can produce a brown image tone without changing the contrast. Toning can either be direct or indirect. Direct toning converts the silver image into a different silver compound in one operation. With indirect toning, the prints should be bleached first. A new image is formed in a second bath, but with a different coloured silver compound. Both direct and indirect toning are possible with VIRADON. Only prints that have been correctly exposed, developed according to specification and fixed in really fresh fixer are suitable for toning. (52) (53)

Only photos which have been developed as instructed and fixed in as fresh a fixer as possible are suitable for toning. A good final wash is equally important to quality. In principle, all black & white papers can be toned.

However, warm tone papers are the most suitable. The direct toning process should be chosen if archival stability (image silver stability) is of the utmost importance. The image tone here rarely changes. Indirect toning produces much warmer print tones (yellow-red). BROVIRA SPEED 310 is less suitable for indirect toning, since this method may result in a matter gloss in the dark to black areas than in the lighter areas.

Note! To avoid staining, each print should be placed individually and then well agitated. It

is also necessary for prints intended for toning to be treated with fixer which is as fresh as possible and to have been thoroughly washed.

Yield

2 – 3 m² photo paper can be toned in 1 litre ready solution (equivalent to approx. 45 – 70 sheets 17.8 x 24 cm).

Storage life

The concentrate will keep virtually indefinitely in closed bottles. Ready solution cannot be re-used.

(52)	Direct toning with VIRADON*	Time
	AGFA VIRADON 1+24 (1 part VIRADON + 24 parts water)	1-10 min (depending on intensity needed)
	Stop bath (10% sodium sulphite solution) (only necessary if after-toning in the wash is to be prevented)	1 min
	Final wash (as indicated for PE and fibre-base papers)	
* Processing temperature: 20°C		

(53)	Indirect toning with 44 BL bleach*	Time
	Bleaching with 44 BL bleach* (1+3) (1 part 44 BL concentrate + 3 parts water) *Process AP 44 (bleach for colour reversal film processing)	2-5 min
	or bleach (Agfa 501 formula): 500 ml 10% potassium ferricyanide solution 100 ml 10% potassium bromide solution 400 ml water	5 min 5 min
	Wash (running water)	5 min
	AGFA VIRADON 1+50 (possible stop bath as for direct toning)	3 min
	Final wash (as indicated for PE and fibre-base papers)	
* Processing temperature: 20°C		

General information

Environmental protection and disposal

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

If these regulations do not permit used photographic solutions to be discarded into the public sewage system, they must be disposed of as special waste.

Agfa photo chemical packaging conforms to the regulations of safety (transport, storage, handling) and of recycling. Photo chemical packaging should not contain any harmful impurities if it takes part in collection and recycling systems. The packs must therefore be absolutely empty, this means 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 purpose.

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.

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 crystallize in liquid concentrates, which could result in wrong bath mixtures, if this is not taken into consideration. The effects of direct heat should also be avoided. High temperatures can trigger a premature chemical reaction in concentrates that are prone to oxidization, and this in turn can lead to the decomposition of a bath.

Safety aspects when working with photochemicals

Certain precautions (e.g. avoiding contact with food and drink) and safety measures must be taken when working with photographic processing chemicals. These include adequate ventilation at the working place and, if necessary, the use of protective gloves and glasses.

Observing all the safety precautions ensures a high degree of safety at work. Nevertheless, with particularly sensitive persons, irritation of the skin and mucous membranes, and, in isolated cases, allergic skin reactions cannot be excluded.



Special regulations concerning transport and handling of dangerous substances apply to certain photochemicals and these are shown on the packs of all products subject to such labelling. Extra safety recommendations are to be found in the instructions enclosed with the products or on the labels of the packs.

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

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