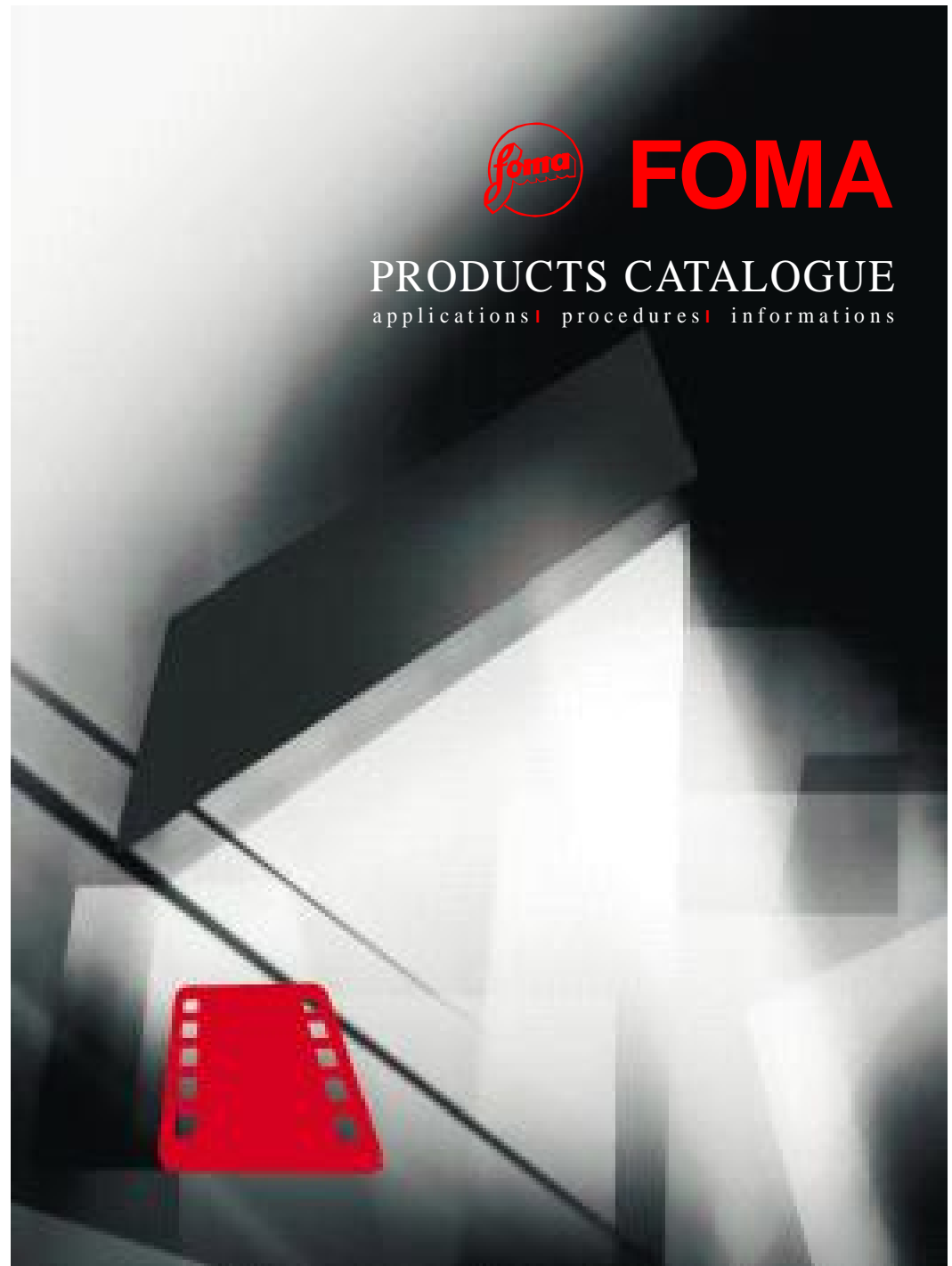


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FOMA BOHEMIA spol. s r.o., 501 04 Hradec Králové, Czech Republic
phone: +420 495 733 210, +420 495 733 111
fax: +420 495 733 376, +420 495 733 389
e-mail: foma@foma.cz
www.foma.cz





FOMA BOHEMIA spol. s r.o., Czech Republic

Present times and the history

FOMA Bohemia Ltd is a producer of photographic materials with long tradition. It has been founded in March 1995 through the privatization of the National Enterprise FOMA (FOTOHEMA before 1990) and it has become a part of the group of companies BOHEMIE Group producing chemical products.

FOMA Bohemia owns the filial companies FOTON JSC in Poland, FOMA Slovakia Ltd. in Slovakia, FOMA RUS Ltd. in the Russian Federation and FOMAMURES S.R.L. in Romania.

The firm's origin has dated from 1921 when a company named FOTOHEMA Ltd. in Hradec Králové has been founded. Its products were delivered with a brand name FOMA. At first only photographic plates and processing chemicals were produced. After a period of ten years the production of black-and-white papers and a year later the production of black-and-white roll films were opened.

In 1949 after the National Enterprise FOTOHEMA was established, the range of products has extended comprising X-ray films, black-and-white positive copy film, black-and-white papers for industrial use, black-and-white reversal film, colour paper, colour negative film and colour reversal film.

After 1990 essential changes were made and the production of black-and-white light sensitive materials has become the dominant production program of the company.

Since September 1997 when this has been confirmed with a certificate all activities of FOMA comply with the international standard ISO 9001.

High flexibility of FOMA and its willingness to fulfil even less usual requirements in orders of customers result in continuously increasing export. In 2003, FOMA materials were exported nearly to 50 countries, such as Germany, Russia, Latvia, Ukraine, Italy, UK, USA, Spain, France, India, Venezuela etc.



The actual offer of FOMA Bohemia Ltd comprises the following products:

for amateur and professional photographers

FOMAPAN black-and-white negative films, FOMASPEED black-and-white papers with fixed and variable contrast, FOMABROM black-and-white papers with fixed contrast, FOMATONE black-and-white papers with warm tone;

for medical use:

MEDIX X-ray films for medical use - for conventional and up-to-date diagnostic methods, in a wide choice of general and special types including dental X-ray films. The offer is completed with processors, negatoscopes, sensitometers, densitometers and also includes extensive service and consulting;

for industrial defectoscopy:

INDUX X-ray films for industrial use – for non-destructive testing (NDT), completed by an additional assortment of products, service and consulting;

for Graphic Arts:

photographic materials for exposing units, contact materials etc, service and consulting;

special materials:

papers and fotopapers for inkjet printers, films for dosimetry, black-and-white films for aerial photography, films for surveillance of indoor spaces and traffic, foil for use in criminal investigations, registration paper for tachographs of motorized rail vehicles;

processing chemicals for all kinds of delivered materials as liquid concentrates or in solid form, toning solutions and wetting agents;

instrumentation:

instruments and equipment for health sector and non-destructive tests;

In the world market, FOMA has successfully tried to introduce all products in the quality fully comparable with the corresponding competitive products, to ensure its own stable and long lasting position.

FOMA has its own research and development department and continues the 80 years of experience and tradition in the manufacturing of light-sensitive materials. All products are subject of continuous innovation process. As a middle size company, FOMA is able to react flexibly even to special demands of customers (there is a possibility to manufacture some products according to individual parameters' demands, in relatively small quantities, using atypical packaging, uncommon sizes etc. including the private label confectioning).



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1. BLACK-AND-WHITE FILMS

1.1. Application and specific features of films

Wide choice of negative, reversal and positive films of FOMA and their harmonically balanced sensitometric features (speed, granularity, resolving power etc.) offer plenty of possibilities to be applied in photography.

Application field	Film type		
	Fomapan 100 Classic	Fomapan 200 Creative	Fomapan 400 Action
General use	●	●	●
Portrait	●	●	●
Nude, still life	●	●	●
Landscape	●	●	
Architecture	●	●	
Reportage		●	●
Structure, macro and micrography	●	●	
Sport, movement, action – without flash			●
Reproduction	●	●	
Photography in experiments	●	●	●



List of available sizes of FOMA papers

Standard sizes black-and-white photopapers FOMA:

- 8.9x12.7 cm / 100 sh.
- 10.5x14.8 cm / 100 sh.
- 12.7x17.8 cm / 100 or 25 sh.
- 17.8x24 cm / 10 or 25 sh.
- 24x30.5 cm / 10 or 25 sh.
- 30.5x40.6 cm / 10 or 25 sh.
- 50.8x61 cm / 10 sh.

Unstandard sizes and version – can be supply through an agreement between the manufacturer and the buyer.



2.10. Usability time (storage life) and storage conditions for papers and baths.

Papers

FOMA photographic papers should be stored in the original packaging in dry and cool places (temperature up to 20 °C and relative humidity 50 – 60%), out of reach of harmful fumes, gasses and ionizing radiation

Liquid and powder chemicals for baths

Developers, stop bath (interrupter) and fixers both in liquid and in powder form should be stored in the original packaging in dry, well ventilated rooms at the temperature of 10 – 25 ° and relative humidity not exceeding 65 %. Protection against sudden temperature changes and against direct sunshine is important, too. If transport of liquid concentrates takes place at low outer temperature, precautions should be taken to prevent the solution temperature drop below the lower limit of the tolerated temperature range. If crystallization of any of the dissolved compounds appears at the temperature under the lower limit of the given range, the working solutions should preferably be prepared using water heated at 40 °C. Working solutions made from liquid concentrates or powder chemicals should be stored under the above given conditions, including limited air access (oxidation prevention). This condition is important especially for developers and presumed for the data of storage life given in the following table.

Type of FOMA bath	Packaging	Storage conditions	Storage life
Fomatol LQN	liquid concentrate	original package working solution (1+7)	24 months 2 days*
Fomatol P	powder	original package working solution	min. 24 months 2 dny*
Fomatol PW	powder	original package working solution (1+0) working solution (1+1) working solution (1+3)	24 months 2–3 days max. 2 days max. 24 hours
Fomatol H	powder	original package working solution	24 months 2 days
Universal developer	powder	original package working solution	24 months 24 days
Stop bath Fomacitro	liquid concentrate	original package working solution (1+19)	min. 24 months 1 month
Fixer type Fomafix	liquid concentrate	original package working solution (1+5)	24 months 6 months
Fomafix P Acid fixer	powder	original package working solution	min. 24 months min. 6 months

Note:

*The data are valid on condition that (in case of process interruption) the developer is stored in a covered tray for at least 12 hours; if oxidation is prevented better (by squeezing and recapping the bottle, by antioxidation gas etc.), the working life (usability) limit may be lengthened. In addition to the time of exposure to atmospheric oxygen, the deterioration (oxidation) rate may be influenced also by the contact area (e.g. by the size of the developing tray).

Another factors influencing the working life comprise amount, size and intensity of the dark parts of the developed images.

Specific features of black-and-white FOMA films

Characteristics	Fomapan 100 Classic	Fomapan 200 Geative	Fomapan 400 Action
High resolving power			
Very fine grain			
Fine grain			
High contour sharpness			
Wide exposure latitude			
Tolerance towards processing variations			

+

A

CMYK

+



+

+

1.2. Survey and characteristics of negative black-and-white films

FOMAPAN 100 Classic

is a black-and-white negative film designed for taking photographic pictures. The film meets high requirements for fine-granularity, very high resolution, excellent contour sharpness and a wide range of halftones. The nominal speed of ISO 100/21° C combined with wide exposure latitude gives very good results even with overexposures up to 1 EV (corresponding to ISO 50/18 °C) or underexposures up to 2 EV (corresponding to ISO 400/27° C) (exposure value), both without any change in processing. Rich and wide scale of halftones, even in highlighted areas, makes this film especially suitable for portrait photography and similar applications.

FOMAPAN 200 Creative

is a black-and-white negative film designed for taking photographic pictures. The film meets high requirements for fine-granularity, high resolution, good contour sharpness and a wide range of halftones. The film has a nominal speed of ISO 200/27° C; thanks to the wide exposure latitude, however, very good results can be achieved even with overexposures up to 1EV (corresponding to ISO 100/21° C) or underexposures up to 2 EV (corresponding to ISO 800/30° C), both without any change in processing. Rich and wide halftone reproduction, even in the highlighted areas, makes this film especially suitable for portrait photography and similar applications.

FOMAPAN 400 Action

is a black-and-white negative film suitable for taking pictures under unfavourable light conditions. High requirements for fine-granularity, good resolution and contour sharpness and a wide range of halftones are met with this film. Having the nominal speed of ISO 400/27° C combined with wide exposure latitude, Fomapan 400 yields very good results even with overexposures up to 1EV (corresponding to ISO 200/24° C) or under-exposures up to 2 EV (corresponding to ISO 1600/33° C), both without any change in processing.

LEADERFILM M

is a yellow-white matted film band designed for loading the film into a projector or a processing machine.

Schwarzschild effect

In the following table, the approximate values are given of prolonged exposure multiples and aperture number corrections for the basic series of FOMA films. They should be applied when exposure time exceeds 0.5 second and may thus cause the so called Schwarzschild effect.

Film type	Time (exp.meter)	Exposure correction	Aperture correction	Time (exp.meter)	Exposure correction	Aperture correction	Time (exp.meter)	Exposure correction	Aperture correction
Fomapan 100 Classic	1 s	2x	- 1	10 s	8x	-3	100 s	16x	-4
Fomapan 200 Creative	1 s	3x	- 1,5	10 s	9x	-3	100 s	18x	-4
Fomapan 400 Action	1 s	1,5x	-1	10 s	6x	-2,5	100 s	8x	-3

2.9. Capacity (yield) of paper processing baths

The efficiency of FOMA processing baths depends not only on the number of papers processed so far (see the table below), but also on storage conditions of working solutions (developer oxidation prevention etc.), not overrunning the working lives and expiration times, correct making up the working solutions (dilution with distilled water etc.).

FOMA bath type	Concentrate volume	Working solution volume	Yield (number of processed papers)	
			baryta base	RC base
liquid developer Fomatol LQN (1+7)	250 ml	1 l	1,5 m ²	3,0 m ²
Fomatol P (powder developer)	–	2,5 l 1 l	3,75 m ² 1,5 m ²	7,5 m ² 3,0 m ²
Fomatol PW (powder developer) 1+0, 1+1, 1+3	–	1 l	1,5 m ²	3,0 m ²
Fomatol H (1+0) (powder developer)	–	1 l	1,5 m ²	3 m ²
Universal developer (1+0) (powder developer)	–	1 l 5 l	1 m ² 5 m ²	2 m ² 10 m ²
<i>liquid fixer</i>				
Fomafix (1+5)	0,5 l	1 l	1,5 m ²	3 m ²
Fomafix P Acid fixer	–	1 l 5 l	1 m ² 5 m ²	2 m ² 10 m ²



2.8. Adjustment and finishing of photo papers

All black-and-white FOMA photographic papers can be further modified and adjusted. The author's intention as well as the overall picture impact can be varied by toning, colouring in, graphic techniques, virage, collage etc. Unavoidable part of photo papers finishing is retouching and reverse side legend. Fomagraphic photo paper is specially designed for descriptions or additional creative drawing on the emulsion side of the photograph. FOMA photographic papers are easily adjusted to any desired format, fastened by both-side adhesives, provided with a special lacquer, laminated, inserted into archiving or presentation foils, albums, mounts or frames.

Toning

FOMA photographic papers including Fomatone type papers can be toned by FOMA toners or similar baths of other manufacturers. The colour of new as well as older photographs may be successfully modified with a brown toner – Fomatoner Sepia or with a blue one - Fomatoner Indigo.

FOMATONER SEPIA

is a liquid concentrate of a two-bath sulphide-based toner designed for modifying the black-and-white photographs: tones ranging from yellow-brown up to purple-brown can be achieved, the resulting tone quality and intensity depends mainly on the second (toning) bath temperature. Other factors may add to the final tone, too, as e.g. the kind of paper to be toned, development time in enlargement process or the level of bleaching. Images on both RC and baryta papers can be toned.

Fomatoner Sepia is manufactured and supplied as a two-component concentrate in packaging of 2x220 ml.

FOMATONER INDIGO

is a liquid concentrate of a one-bath toner designed for toning black-and-white photographs to get a blue tone of the developed silver. Tone intensity depends on the temperature and time of toning, the decisive factor is, however, the dilution of the working (toning) solution. Even though baryta papers can be toned with good results, the best and standard tones are achieved with photographic papers on RC base.

Fomatoner Indigo is manufactured and supplied as a two-component concentrate in packaging of 2x220 ml.

Retouching

of FOMA photographic papers on a baryta or RC base and with any surface type can be performed by a conventional method, i.e. with brushes or felt-tipped pens, or by an "american retouch" – spraying method.



1.3. Survey and characteristics of film processing baths

FOMADON LQN

is a one-part liquid concentrate to make a fine-grain, normal-working phenidone-hydroquinone developer designed for all types of black-and-white negative films.

It is supplied in PE bottles of 0.25 l and diluted for use with water (1+10 or 1+14).

FOMADON LQR

is a one-part liquid concentrate to make a fine-grain, contrast-working phenidone-hydroquinone negative developer. It is designed for the manual processing of all types of black-and-white negative films.

It is supplied in PE bottles of 0.25 l and diluted for use with water (1+10 to 1+14).

FOMADON R 09

is a one-part liquid concentrate to make a fine-grain, normal-working p-aminophenol developer designed for all types of black-and-white negative films.

It is supplied in PE bottles of 0.25 l and diluted for use with water (1+20 to 1+100).

FOMADON P

is a two-component, powder form phenidone-hydroquinone developer, designed for manual processing of all types of black-and-white films. It produces images in neutral black tone. It is supplied in packaging to make up 1 litre of working solution.

FOMADON EXCEL

is a two-component, powder type of a slightly alkaline developer, based on the advanced formula with new developing substances. It is designed for manual processing of all types of black-and-white negative films and ensures high reproducibility, stability and tolerance to variations. It yields fine-grain negatives with excellent sharpness, enhanced resolving power and distinct drawing in lights as well as in shadows.

It is supplied in packaging to make 1 litre of working solution.

UNIVERSAL DEVELOPER

is a two-component, normal-working developer in powder form. The developer is designed for the manual and automatic processing of all sorts of black-and-white negative and positive photomaterials. It is supplied in packaging to make up 1 or 5 litres of working solution.

FOMAFIX

is a one-part liquid concentrate to make a rapid fixer designed for manual and machine processing of all types of black-and-white negative films and papers.

It is supplied in PE bottles of 0.5 l (larger packages can be supplied on demand) and diluted for use with water (1+5 for manual processing) and (1+4 for machine processing).

FOMAFIX P / ACID FIXER

is a two-component, powder type acid fixer, designed preferably for manual processing of all types of black-and-white negative films and papers.

It is supplied in packaging to make 750 ml of working solution.

FOMACITRO

is a liquid concentrate of a stop bath (interrupter), designed for general use in manual processing of all types of black-and-white negative films and papers.

It is supplied in PE bottles of 0.25 l and diluted for use with water (1+19).



1.4. Developing times of FOMAPAN films

The developing times given below for black-and-white negative FOMA films are valid for spiral tank processing on condition that agitation of the developer or tilting (turning over) of the tank is performed continuously for the first 30 seconds and then for 10 seconds at the beginning of every following minute

FOMA developer	Developing time (minutes) at 20 °C		
	Fomapan 100 Classic	Fomapan 200 Creative	Fomapan 400 Action
Fomadon LQN (1+10)	7 – 8	5 – 6	9 – 10
Fomadon LQN (1+14)	9 – 10	6,5 – 7	12 – 13
Fomadon LQR (1+10)	5 – 6	5 – 6	7 – 8
Fomadon LQR (1+14)	7 – 8	7 – 8	9 – 10
Fomadon R 09 (1+20)	3,5	4	5
Fomadon R 09 (1+40)	6 – 7	8 – 9	9 – 10
Fomadon R 09 (1+100)	20 – 22	26 – 28	30 – 32
Fomadon R 09 (1+200)	42 – 44	52 – 54	60 – 62
Fomadon P	7 – 8	5 – 6	10 – 11
Fomadon Excel	5 – 6	6 – 7	7
Universal developer	5	3,5	7,5

Note:

The lower value in the range corresponds to the lower gradient, the upper value of the developing times range is valid if higher gradient is desired.

Time corrections for temperatures differing from the recommended 20 °C
(valid for FOMA – as well as for other manufacturer's developers)

Temperature of the working solution should be checked before each film processing. If the bath temperature differs from the recommended value of 20 °C, it is necessary to multiply the recommended developing time by a corresponding factor as given in the table below. If developer temperature changes significantly during the (longer) development, the developing time should be changed accordingly, too.

temperature	16 °C	18 °C	20 °C	22 °C	24 °C	26 °C
factor	1,45	1,2	1,0	0,85	0,75	0,6

2.7. Washing and drying of papers

Washing of papers on a baryta base

As the baryta base can soak up considerable amounts of liquids, washing of this kind of photo papers after fixing lasts longer than the washing of papers on a resin coated (RC) base. Washing with running water at the temperature over 12 °C takes 30 minutes; at the temperature lower than 12 °C, washing for 45 minutes is necessary. Time of the washing procedure, or time for which photographs remain immersed in water, may be lengthened substantially without any danger of deterioration of their quality.

Washing of papers on RC base

Photo papers on RC base demand only 2 minutes of washing with circulating water at the temperature over 12 °C; below 12 °C, washing for 4 minutes is necessary.

Prolonged time of the washing procedure (over 12 minutes) causes swelling of paper edges which may result in prints edges curling during drying.

Before drying, it is advisable to submerge the processed and washed papers in a wetting agent (Fotonal) solution for 1 minute.

FOTONAL

is a liquid concentrate of a wetting agent containing surface active substances and additives for increasing the processed image stability. Application of the Fotonal containing final bath ensures even draining of water off the film surface, accelerates drying and prevents stains formation caused by inhomogenous drying.

Drying of baryta papers

Sufficiently washed photographic papers should drip and get carefully wiped with a soft viscous sponge or a special wiper to remove the surplus water off their surface. They are stretched in a usual way, at best onto a glass plate (emulsion side up).

This method is suitable both for matt and glossy surface: the glossy surface gains an interesting velvet appearance. Alternatively, baryta photo papers can be pressed.

The final appearance (tone fullness, contrast and/or brightness of prints) can be definitely evaluated only after complete drying.

Drying of RC papers

After wiping down the surplus water, papers on RC base are dried (but never glazed). They are stretched on a nylon rack, well absorbing clean pad (cotton cloth etc), or hanged loose. Drying takes 10-30 minutes at room temperature, warm air drying (max. up to 85 °C) is quicker.



2.5. Stop bath (paper processing interruption)

A more efficient method than rinsing a film with water is an interruption of the process in an acid bath. A 2% acetic acid solution or a stop bath, e.g. FOMACITRO is suitable, the treatment time should be 10 – 20 seconds. Stop bath makes the development more reproducible and lengthens the life of the fixer. Contamination of the fixer with remaining developing substances especially when interruption is inadequate may cause deterioration of the image by fogging and yellow-brown stains occurrence, i.e. phenomena induced by continuing silver reduction in the emulsion layer.

FOMACITRO

is a liquid concentrate of a stop bath (interrupter). It is used in manual processing of all types of black-and-white films and papers. Developing substances contained in the emulsion layer after development are neutralized by Fomacitro solution, their reduction effect is suppressed so that development process stops immediately.

Eventual exhaustion of the stop bath is indicated by a colour change from yellow-orange to blue-green; replacement with a fresh working solution is necessary as soon as possible. The stop bath temperature should not vary from that of the previous bath (devepper) by more than 5° C

2.6. Film fixing

Efficiency of the fixing process is strongly dependent on the actual exhaustion of the given working solution and on the fixing time, which is influenced by other factors, too, as the bath temperature or the fixing substance used, e.g. ammonium thiosulphate for rapid fixers (Fomafix). Unnecessary lengthening of fixing time brings no positive effect and may induce undesirable accumulation of colloid silver on print edges with consequent improper washing.

FOMAFIX

is a liquid concentrate of a rapid fixer with ammonium thiosulphate as the main constituent, designed both for manual and machine processing of papers and films.

In manual processing at 20° C with the fixer diluted with water (1+5), sufficient fixing time is 3 minutes for Extrabrom papers and 1.5 minutes for other FOMA papers on RC base. In machine processing, at the working solution temperature of 30° C and dilution 1+4, the fixing time is 25-35 seconds for Fomaspeed, Fomaspeed Variant III, Fomatone MG and Fomalux papers

FOMAFIX ACID FIXER

is a two-component, powder type acid fixer, designed preferably for manual processing of papers as well as films. It is dissolved to make up a total volume of 1 litre of working solution. Black-and-white Fomabrom papers are fixed for 5 minutes at 20° C, other papers on the FOMA RC base for 3 minutes.

Developing times of FOMAPAN films in other manufacturer's developers

Other (foreign made) developers	Developing time (minutes) at 20° C		
	Fomapan 100 Classic	Fomapan T200 Creativ	Fomapan 400 Action
Kodak XTOL	5-6 g=0,60-0,67	6-7 g=0,59-0,66	7 g=0,66
Kodak T-MAX (1+4)	5-6 g=0,62-0,67	5-6 g=0,63-0,68	7-8 g=0,63-0,68
Kodak HC 110 (1+31)	–	–	6,5 g=0,69
Kodak MICRODOL X - stock	8 g=0,66	–	–
Kodak MICRODOL (1+1)	9-10 g=0,65-0,68	8,5 g=0,66	–
Ilford ID11-stock/Kodak D76	6-7 g=0,63-0,70	5-6 g=0,59-0,68	7-8 g=0,61-0,66
Ilford ID 11(1+1)	8-10 g=0,57-0,63	8-9 g=0,63-0,68	12-13 g=0,64-0,68
Ilford ID 11 (1+3)	15-16 g=0,64-0,67	12-13 g=0,60-0,66	22-23 g=0,66-0,68
Ilford Microphen-stock	5-7 g=0,60-0,66	5-6 g=0,58-0,64	8-9 g=0,66-0,69
Ilford Microphen (1+1)	8-9 g=0,62-0,64	–	12-13 g=0,63-0,66
Ilford Microphen (1+3)	13-14 g=0,66-0,68	12-13 g=0,65-0,68	24-25 g=0,65-0,66
Ilford Perceptol-stock	8 g=0,67	6 g=0,64	9-10 g=0,62-0,67
Ilford Perceptol (1+1)	10-11 g=0,63-0,66	7,5 g=0,66	–
Ilford Perceptol (1+3)	14-15 g=0,63-0,66	12-13 g=0,63-0,68	–
Ilford Ilfosol S (1+9)	6-7 g=0,62-0,68	3,5 g=0,65	6 g=0,63
Ilford Ilfosol S (1+14)	7-8 g=0,63-0,68	5-6 g=0,57-0,65	11-12 g=0,66-0,69
Tetenal Emofin Liquid	4-5 g=0,58-0,64	4-5 g=0,60-0,66	6-7 g=0,63-0,68
Tetenal Emofin (prašková)	4-6 g=0,55-0,70	6-8 g=0,55-0,66	6-8 g=0,55-0,66
Tetenal Ultrafin SF (1+0)	5 g=0,67	5 g=0,68	7-8 g=0,63-0,68
Tetenal Ultrafin Plus (1+4)	5 g=0,64	5 g=0,64	7-8 g=0,64-0,68
Tetenal Ultrafin Plus (1+6)	7,5 g=0,62	7-8 g=0,60-0,66	11-12 g=0,64-0,67
Tetenal Ultrafin Liquid (1+20)	7,5 g=0,68	7,5 g=0,66	15 g=0,63

Developing times of FOMAPAN films in other (foreign made) manufacturer's developers

Other (foreign made developers)	Developing time (minutes) at 20 °C		
	Fomapan 100 Classic	Fomapan 200 Creativ	Fomapan 400 Action
Aculux 2 (1+9)	9-10 g=0,64-0,66	8-9 g=0,60-0,64	–
Acutol (1+9)	6-7 g=0,56-0,63	6-7 g=0,55-0,64	10-11 g=0,58-0,62

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A
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CMYK
+



Correction filters-application

After a decision what the desired contrast should be, a corresponding filter (or filter pair) is inserted in the filter drawer of the enlarger, i.e. between the light source and the condenser. It is necessary to adapt the FOMA Variant filter sizes to the given enlarger drawer. For different types of enlargers, FOMA Variant correction filters are manufactured and supplied in sizes 8.9x8.9 cm or 15.2x15.2 cm.

For various correction filters and their combinations, exposure times should be prolonged by a so called lengthening factor (see the following table):

FOMA Variant filter sign	Contrast grade to get	Exposure lengthening factors for FOMA papers	
		Fomaspeed Variant III	Fomatone MG
2xY	extra soft	1,4	2,0
Y	soft	1,4	1,5
no filter	*	–	–
M1	special	1,4	1,5
2xM1	normal	2,1	1,8
M2	hard	2,6	2,0
2xM2	ultra hard	4,6	3,0

* a value corresponding approximately to the "special" contrast grade

Development times for FOMA photo papers (at the temperature of 20 °C)

	Fomabrom Fomabrom	Fomaspeed Fomaspeed 412 Fomaspeed Variant Fomalux	Fomatone MG Fomatone MG Classic
Fomatol LQN (dilution 1+7)	90-120 s	60-90 s	1 – 3 min.
Fomatol P (working solution)	90-120 s	60-90 s	1 –3 min.
Fomatol PW – no dilution – dilution (1+1) – dilution (1+3)	– – –	– – –	2 – 3 min. 4 – 6 min. 8 – 12 min.
Fomatol H (dilution 1+0)	90-120 s	60-90 s	1– 3 min.
Universal developer (dilution 1+0)	90-120 s	60-90 s	1– 3 min.

Processing of variable-contrast FOMA papers

The main advantage of this group is the possibility to use just one kind of photo paper for achievement of various contrast grades. Changing the contrast during enlargement or printing helps to make quality photographs even from very uneven negative film originals.

FOMA manufactures and supplies following types of variable-contrast photo papers: Fomaspeed Variant III, Fomatone MG, Fomatone MG Classic.

Contrast grading of these materials can be controlled by use of:

- separate correction filter sets (Foma Variant Filters, Ilford Multigrade Filters etc.) with various number of filters - usually yellow or magenta coloured
- magenta and yellow filters in colour mixing heads
- special enlarging heads for variable-contrast papers
- programmable colour printers - with a programme for variable contrast paper
- black-and-white printers for variable-contrast papers

FOMA VARIANT – correction filters

Foma Variant correction filters are designed for the contrast control of variable-contrast (multigrade) black-and-white photo papers (e.g. Fomaspeed Variant III, Fomatone MG etc.) during their exposure. The filters are manufactured as a standard set of 6 pieces, containing 3 kinds of filters, i.e. pairs of yellow (Y), light magenta (M1) and deep magenta (M2) filters.

This set extends the resulting print contrast variability up to seven grades (including exposure without correction), from extra soft to ultra hard.



1.5. Development of films

For black-and-white negative FOMAPAN films, the recommended developing procedure can be at best performed either manually in a spiral tank or in a processing machine. The results of the development depend on a number of factors (e.g. the lighting and contrasts of the photographed scene, film type and its characteristics, developer type and concentration, developing time and temperature, developer agitation etc.). For reversal processing of the black-and-white reversal Fomapan R film, a special process R-100 is suitable.

Safelighting

All panchromatically sensitized FOMA films should be processed in total darkness or under infrared light. For a short time orientation during processing, an indirect safelight can be used, e.g. using an Agfa 108 or Ilford 908 filters with a 15W bulb at a minimal distance of minimum 75 cm

1.6. Stop bath (process interruption)

When development has been finished, it is essential to rinse the film immediately in running water (for at least 30 seconds).

A more efficient method uses interruption in an acid bath, e.g. Fomacitro or in a 2% acetic acid solution for at least 10 seconds. Stop bath lengthens the life of the fixer.

FOMACITRO

is a liquid concentrate of a stop bath (interrupter), designed for use in manual processing of all types of black-and-white films and papers. Developing substances contained in the emulsion layer after development are neutralized by Fomacitro solution, their reduction effect is removed and development process stops immediately. Eventual exhaustion of the stop bath is indicated by a colour change from yellow-orange to blue-green; then it should be replaced with a fresh working solution. The stop bath temperature should correspond to the previous bath (developer) temperature within the tolerance range of 5° C.

1.7. Film fixing

During the fixing process, the undeveloped silver halides are solubilized and prepared to be removed from the emulsion layer, where they otherwise might cause undesirable darkening due to light. Optimum results can be achieved when producer's recommendations are observed, and namely the fixing time and the amount of films processed in the given working solution. Once fixing has been completed, the film may be checked under normal illumination. According to a general rule, the fixation should be continued for twice the time of film clearing.

FOMAFIX

is a liquid concentrate of a rapid fixer with ammonium thiosulphate as the main constituent, designed both for manual and machine processing of films and papers.

Black-and-white Fomapan films are fixed for 3 minutes at the working solution temperature of 18 – 25 °C.

FOMAFIX P ACID FIXER

is a two-component, powder type acid fixer, designed preferably for manual processing of films and papers (see paragraph 1.3.). It is dissolved to make 750 ml of working solution.

Black-and-white Fomapan films are fixed for 10 minutes at the working solution temperature of 18 – 25 °C.

1.8. Washing and drying of films

A thorough final wash of the fixed material is highly recommendable to ensure good stability and steady quality at storage. Efficiency of the washing procedure depends on temperature, agitation and exchange of wash water.

Recommended washing methods:

1. Washing with running (filtered) water, input directly into the tank. In this case, the washing time is 30 minutes at wash water temperature under 15° C or 15 minutes at wash water temperature higher than 15° C.
2. Washing with distilled water.
The tank is filled with distilled evtl. demineralized water up to 2/3 of its volume, temperature should approximately equal to that of the previous fixing bath. Next steps follow:
1st step: the tank is turned over five times and used water poured out.
2nd step: the tank is filled again with the same amount of fresh water, turned over ten times and used water poured out.
3rd step: the tank is filled again in the same way, turned over twenty times.
4–5th step: for ensuring high stability of the film image, the 3rd step can be repeated once or twice.

When using a tank with a reel on a rotary core, it is needed to rotate the reel continually for one minute after each fresh water filling.

Processed and washed film is submerged in a final bath containing FOTONAL for 1 minute. In this way, even draining of water off the film surface makes drying quicker and prevents stains to be left on the negative.

FOTONAL

is a liquid concentrate of a wetting agent containing surface active substances and additives for increasing the processed image stability. To make a working solution, 5 ml concentrate is added to one litre water.

Drying

Before starting the drying process, the hanging film band may be carefully wiped: in addition to elimination of stains, drying time will be cut down. According to the recommendation, drying of films proceeds best in a drying cabinet at the temperature of 30–45° C or at room temperature in a clean and dust-free place.

Manual processing of papers on RC base

RC base, i.e. a paper laminated on both sides with polyethylene, is an up-to-date option for producing photo papers ideal for rapid and easy processing. Drying not only in hot air dryers, but even at the room temperature scarcely exceeds a few minutes. Papers on a resin coated base permit only drying, not glazing with conventional glazing presses or drums. Unlike baryta papers, RC papers practically do not get curled when properly processed (washed and dried).

Processing of FOMA papers on a baryta paper base

Processing of photo papers on a baryta paper base needs some more time, resulting however in guaranteed archiving stability, so that they are especially suitable for art photography and exhibits.

Processing of fixed-contrast FOMA papers

FOMA photo papers have been traditionally produced in a variety of fixed-contrast grades. To choose the most suitable contrast grade, certain aspects should be taken into consideration as e.g. contrast of the negative image, enlarger type and the author's creative intentions. For most applications, contrast grades N (normal) or Sp (special) are fully satisfactory. The resulting image contrast can be further modified by the developer type or its dilution.

Table of some criteria and recommendations for right contrast grade choice

Contrast of negative image	Enlarger with condenser (insufficiently diffused light)				Enlarger with diffusion (scattered) light			
	Contrast grade of photo paper				Contrast grade of photo paper			
	S	Sp	N	C	S	Sp	N	C
low				I				I
lower			I				I	(I)
medium		I	(I)				I	
higher	(I)	I				I		
high	I				I			

Coding of FOMA photographic papers

Numerical code with three digits

1 st digit = base type	2 nd digit = base whiteness	3 rd digit = surface type
1 – double-weight	1 – extra white	1 – glossy
2 – single-weight	2 – white	2 – matte
3 – resin-coated (RC)	3 – cream-coloured	3 – velvet
4 – resin-coated (RC) (110 g per sq.m)	4 – chamois	4 – lustre
5 – natural		5 – pyramid grain

Contrast grade

soft (S), special (Sp), normal (N), hard (C), variable (Variant, Fomatone MG)



FOMAFIX

is a one-part liquid concentrate to make a rapid fixer designed for manual processing of all types of black-and-white films and papers.

It is supplied in PE bottles of 0.5 litre (larger packages can be supplied on demand) and diluted for use with water (1+5).

FOMAFIX P, ACID FIXER

is a two-component, powder type acid fixer, designed preferably for manual processing of all types of black-and-white papers and also for films. (see paragraph 1.7).

It is supplied in packaging to make 1 litre of working solution (for papers).

FOMACITRO

is a liquid concentrate of a stop bath (interrupter), designed for general use in manual processing of all types of black-and-white negative films and papers.

It is supplied in PE bottles of 0.25 l and diluted for use with water (1+19).

2.4. Conditions, methods and procedures of paper processing

Darkroom safelights

For the right choice of darkroom safelighting, it is necessary to know first of all the spectral sensitivity of the respective photo papers. The wavelength of the light source (e.g. LED diode) or of the colour filter absorption are the decisive factors to be considered.

Safelighting for fixed-contrast FOMA papers

Photo papers from the fixed-contrast group as Fomabrom, Fomaspeed, Fomagrapic and Fomalux should be processed under the safe illumination conventionally used for black-and white papers, e.g. under yellow-green, red or orange diffusion safelight, using appropriate filter screens (e.g. Ilford 902, Osram Duka 50, Durst Sanat, Kodak OC, Agfa G7, Agfa Y7J) with 15W incandescent lamp. The period of action should not exceed 3 minutes at a minimum distance of 0.5m from the light source, or 10 min at the distance of 1 m.

Safelighting for FOMASPEED Variant III

The spectral sensitization of variable-contrast photo papers differs substantially from sensitization of the fixed contrast type, so that a different kind of safelighting should be used. Fomaspeed Variant III paper is preferably processed under safelight with a dark-red filter (designed for orthochromatic materials), as e.g. Kodak GBX-2, Ilford 906, Agfa R1, Osram Duka 50. An economical illumination device with LED diodes can be used alternatively, provided the wavelength is not less than 610nm. Taking in mind the high speed of Fomaspeed Variant III paper, handling time should be as short as possible.

Safelighting for FOMATONE MG

Fomatone MG and Fomatone MG Classic belong to the group of markedly low-speed photo papers, therefore, safelight commonly used for conventional fixed-contrast papers is fully sufficient, with e.g. yellow-green, orange or red filter.

1.9. Capacity (yield) of film processing baths.

The amount of films developed in individual FOMA developers, as given below, is valid only if proper storage conditions of working solutions had been kept as stated in paragraph 1.10. After the guaranteed working life, the exhausted solution should be replaced by a fresh one. Only in this way, high and standard quality of processing can be ensured. If development has been interrupted after processing of less than the allowed number of films, the working solution should be kept in darkness and prevented from oxidation, e.g. by squeezing the PE bottle before recapping.

FOMA bath type	Packaging		Working solution	
	Concentrate volume	Number of processed films	Working solution volume	Number of processed films
Fomadon LQN, Fomadon LQR (1+10) - sheet films (13x18 cm) - perforated or roll films	250 ml	min. 30 min. 12	1250 ml 660 ml	14 3
Fomadon P (powder developer) - sheet films (13x18 cm) - perforated or roll films	-	-	1000 ml	25 10
Fomadon Excel (powder developer) - sheet films (13x18 cm) - perforated or roll films	-	-	1000 ml	30 12
Universal developer (powder developer) - sheet films (13x18 cm) - perforated or roll films	-	-	400 ml	30 12
Fomafix (1+5) - sheet films (13x18 cm) - perforated or roll films	500 ml	min. 50	1000 ml	40 17
Fomafix P Acid Fixer (powder fixer) - sheet films (13x18 cm) - perforated or roll films	-	-	750 ml	35 15

Table of lengthening factors (for the developing time) for film processing

FOMA bath type	Film type		
	Fomaplan 100 Classic	Fomaplan 200 Creative	Fomaplan 400 Action
Fomadon LQN (1+10)	f = 1,5	f = 1,4	f = 1,7
Fomadon LQN (1+14)	f = 1,7	f = 1,7	f = 1,7
Fomadon LQR (1+10)	f = 1,4	f = 1,4	f = 1,4
Fomadon LQR (1+14)	f = 1,6	f = 1,6	f = 1,6

Note:

f = lengthening factor for the developing time – should be applied for each successive film exceeding the number of films recommended for the given solution



1.10. Usability time (storage life) and storage conditions for films and baths.

Films

As recommended, unexposed FOMA films should be stored in the original packaging in dry and cool places (temperature 5 – 20 °C and relative humidity 50– 60%), out of reach of harmful fumes, gasses and ionizing radiation. When stored in a refrigerator, film packages should be adapted to room temperature for approximately 2 hours before opening.

Exposed films should preferably be processed as soon as possible.

Liquid and powder processing baths.

FOMA processing chemicals should be stored in the original packaging in dry, well ventilated rooms at the temperature of 10 – 25 °C and relative humidity not exceeding 65 %. Protection against sudden temperature changes and direct sunshine is important as well. If transport of liquid concentrates proceeds under the conditions of low outer temperature, precautions should be taken to prevent the solution temperature drop below the lower limit of the tolerated temperature range. If crystallization of any of the dissolved compounds appears at the temperature under the lower limit of the given range, the working solutions should preferably be prepared using water heated at 40 °C. Working solutions made from liquid concentrates or powder chemicals should be stored under the above given conditions, including limited air access (oxidation prevention). This condition is essential especially for developers and presumed for the data of storage life in the following table.

Type of FOMA bath	Form of packaging	Storage conditions	Storage life (usability time)
Fomadon LQN	liquid concentrate	original package working solution (1+10), (1+14)	min. 12 months 2–3 hours
Fomadon LQR	liquid concentrate	original package working solution (1+10), (1+14)	min. 12 months 2–3 hours
Fomadon R09	liquid concentrate	original package working solution (1+20) working solution (1+40) working solution (1+100)	min. 24 months 2–3 days 6 hours 2–3 hours
Fomadon P	powder	original package working solution	min. 24 months 2 months
Fomadon Excel	powder	original package working solution	min. 24 months 12 months
Universal developer	powder	original package working solution	min. 24 months 6 hours
<i>Stop bath</i> Fomacitro	liquid concentrate	original package working solution (1+19)	min. 24 months 1 month
<i>Fixer type</i> Fomafix	liquid concentrate	original package working solution (1+5)	24 months 6 months
Fomafix P	powder	original package	min. 24 months min. 6 months

2.3. Survey and characteristics of baths for paper processing

Black-and-white FOMA developers suit well to all types of FOMA photo papers and/or to papers of other manufacturers. Processing of standard types of photographic papers (Fomabrom, Fomaspeed, and also Fomagrapic) in Fomatol LQN or Fomatol P developers produces neutral or slightly warm tone of the final silver image. The tone is slightly colder when contact Fomalux paper is used, whereas Fomatone MG paper gives brown-green prints.

Processing in a special Fomatol PW developer varies the tone of the above-given standard papers to slightly brown-green. More pronounced brown-green tone is achieved when this developer is combined with a Fomalux paper; papers of the Fomatone MG series give really warm brown tones.

Foma photo papers can also be processed in other standard developers (Kodak Polymax, Tetenal Eukobrom, Variospeed, Ilford PQ Universal, Ilford Multigrade, Agfa Neutol Liquid NE etc.), or in special developers (Agfa Neutol WA, Neutol Liquid WA, Tetenal Neutral type Liquid and others).

FOMATOLLQN

is a one-part liquid concentrate to make up a normal-working phenidone-hydroquinone developer, designed both for manual and machine processing of all types of black-and-white papers. It is supplied in bottles of 0.25 l and 0,5 litre or in canisters of 5 litre. They are diluted for use with water (1+7 for manual or 1+4 for machine processing).

FOMATOLP

is a two-component, powder form phenidone-hydroquinone developer, designed for manual processing of all types of black-and-white photo papers. It produces images in neutral black tone. It is supplied in packaging to make up 1 litre of working solution.

FOMATOLPW

is a powder type, glycine-hydroquinone developer supporting a warm image tone, designed for manual processing of Fomatone series of papers. It is supplied in packaging to make up 1 litre of working solution.

FOMATOLH

is a two-component, normal-working developer in powder form. The developer is designed for the manual processing of black-and-white positive photomaterials. It is supplied in packaging to make up 1 litre of working solution.

UNIVERSAL DEVELOPER

is a two-component, normal-working developer in powder form. The developer is designed for the manual and automatic processing of all sorts of black-and-white negative and positive photomaterials. It is supplied in packaging to make up 1 or 5 litres of working solution.



2.2. Survey and characteristics of photographic papers

FOMABROM

is a black-and-white photographic paper for general use, coated on a conventional double-weight baryta paper base. The paper features high exposure latitude and an outstanding image stability. Due to the built-in optical brightener, a brilliant print appearance is achieved. The paper is manufactured on a double-weight baryta paper base (280 g/sq.m.) in a glossy and matt surface and in four contrast grades: soft (S), special (Sp), normal (N) and hard (C).

FOMASPEED

is a black-and-white photographic paper for general use on PE-resin coated (RC) base. Emulsion layer containing optical brighteners and development accelerators gives a brilliant print appearance achieved even at shortened development times in rapid processing. It is manufactured in four contrast grades: soft (S), normal (N), special (Sp) and hard (C), and in two surfaces: glossy and matt.

FOMASPEED 412

is a black-and-white photographic paper for general use on a low weight (110g/m²) resin coated base. The paper yields especially rich halftone scale. Its high speed permits using objectives with high aperture number even when enlargement to big picture size is desired. Therefore, this paper is the best choice for exhibition and billboard purposes. It is available in normal contrast grade (N) and matt surface.

FOMASPEED VARIANT III

is a variable-contrast black-and-white enlarging paper on PE resin coated base, designed for commercial, art, industry, newspaper, air and police photography, among other applications. When special colour filters are used for contrast control, the contrast grades may range from very soft up to very hard, which helps to make quality photographs even from negatives with extremely low or extremely high gradient. Its high speed and developing substances contained also in the emulsion layer cut down exposure times substantially. This advantage is emphasized when exposure to higher contrast grade and/or enlargement to big size is demanded. The paper is available in glossy and matt surface.

FOMATONE MG

is a variable-contrast black-and-white photo paper with warm image tone, suited especially for portrait photography and retro-style works. It is manufactured in two sorts:

- FOMATONE MG - on PE (resin) coated base in surfaces: matt and fine velvet
- FOMATONE MG Classic*/ - on baryta paper base (double weight) in surfaces: glossy, matt and chamois.

FOMALUX */

is a black-and-white photo paper on resin coated base, designed for portrait photography and similar applications. It has a rich halftone scale, soft reproduction of lights and deep blacks. Low speed of its emulsion makes this paper very suitable for contact copying, though it can be used for enlargement, too.

*/ This product could be delivered only towards an order after an arrangement with the manufacturer.



1.11. Survey and characteristics of black-and-white reversal films

FOMAPAN R */

is a medium sensitive (ISO 100/21 °C), panchromatically sensitized black-and-white reversal film featuring very fine grain, high resolving power and contour sharpness, and higher contrast. The film provides excellent differentiation of grey tones both in highlighted areas and in shadows. Spectral sensitization of Fomapan R allows true transfer of colours to the grey scale, and in addition, enables full speed exploitation even at artificial lighting. The film is designed for work with cine-camera or for taking photographic pictures for slide presentation. Conventional processing is also possible. The film can be used for digitization

Packaging

Fomapan R is manufactured and supplied in the following sorts and sizes:

- 16 mm one-edge perforated / 30.5 m
- 2x8 mm (standard) / 10 m
- 2xSuper 8 mm (DS 8) / 10 m
- 35 mm double-edge perforated in 135-36 cartridge for exposures 24x36 mm or in bulk length

1.12. Reversal films processing

All sorts of black-and-white Fomapan R films can be processed by any convenient processing procedure designed for this type of films. For easier access, a specially designed FOMA R-100 process can be applied both for manual and for machine processing. Detailed description of the process is an implicate part of the Fomapan R technical sheet (provided on demand by the manufacturer).

*/ This product could be delivered only towards an order after an arrangement with the manufacturer.

List of sizes of manufactured black-and-white films

Films		FOMAPAN 100 Classic	FOMAPAN 200 Creative	FOMAPAN 400 Action
Perforated	135-36	•	•	•
	135-24	•	•	•
Roll-films	17, 30.5 and 50 m	•	•	•
	35 mm x 305 and 610 m	•	•	•
	120 – 6x9 cm	•	•	•
Sheet films	6.5 x 9 cm (2.5 x 3.5") / 50 sheets	•		
	8.3 x 10.8 cm (3.25 x 4.24") / 50 sheets	•		
	9 x 12 cm / 50 sheets	•		
	10 x 15 cm / 50 sheets	•		
	13 x 18 cm / 50 sheets	•		
	18 x 24 cm / 50 sheets	•		
	<i>and other sizes according to an agreement with manufacturer</i>			

2. BLACK-AND-WHITE PAPERS

2.1. Application and specific features of photographic papers

Wide choice of FOMA photographic papers offers extensive application possibilities. Photo papers on a resin coated base fulfil the demands for rapid and easy processing, those on a baryta paper base (Fomabrom and Fomatone MG Classic) show high stability and a specific appearance. They will find their way especially to the creative world of exhibitions and museums.

FOMA papers are manufactured as fixed contrast ("S, Sp, N, C") or as variablecontrast (Fomaspeed Variant III, Fomatone MG) types. High speed of most of the FOMA papers cuts down the necessary exposure time, while, on the contrary, low speed papers Fomatone MG and particularly Fomalux are preferably used for contact copying. Warm image tones are achieved with the papers on a cream tinted base – Fomatone MG; the resulting picture may be further modified using a special Fomatol PW developer.

Moreover, an exclusive kind of photo paper is represented in the offer of FOMA by Fomatone MG Classic 542 on a natural chamois colored base, and the list is completed by papers on and extra thin RC base (Fomaspeed 412).

Specific features of black-and-white FOMA photo papers

Characteristics	Paper type					
	Fomabrom	Fomaspeed	Fomaspeed 412	Fomaspeed Variant III	Fomatone MG	Fomalux
RC base						
RC base -thin (low weight)						
Baryta paper base						
Fixed contrast						
Variable contrast						
Low speed						
Extra low speed						
Warm tone of silver						
Warm tone of base						
Manual processing						
Machine processing						