TECHNICAL INFORMATION

CONTRAST CONTROL

CONTRAST CONTROL FOR ILFORD MULTIGRADE VARIABLE CONTRAST PAPERS

Contrast control with ILFORD MULTIGRADE papers can be achieved in several ways. These include the ILFORD MULTIGRADE hand filters and the ILFORD MULTIGRADE 600 equipment. Contrast can also be controlled with other variable contrast enlarger heads and with colour enlargers.

CONTRAST RANGE

This section describes how MULTIGRADE papers give different contrast levels. For practical information on selecting contrast levels turn to the next pages.

All chloro-bromide (black and white) emulsions are blue sensitive with a slight sensitivity to green light. To make an emulsion sensitive to colours in addition to blue, sensitising dyes need to be added.

MULTIGRADE papers are coated with an emulsion which is a mixture of three separate emulsions. Each emulsion is a basic blue sensitive emulsion to which is added different amounts of green sensitising dye. Thus, part of the mixed emulsion is sensitive mainly to blue light, part to blue light with some sensitivity to green light and part to both blue and green light.

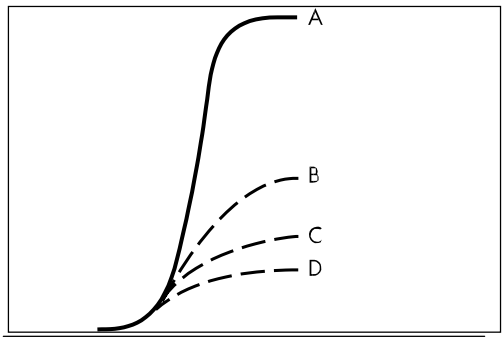
All parts of the emulsion have the same contrast. They also all have the same speed to blue light, but naturally, the part of the emulsion with only a small amount of green sensitising dye has a low speed (that is, is less sensitive) to green light.

When the paper is exposed to blue light, all parts of the emulsion react and contribute equally to the final image. This image is of high contrast because of the additive effect produced by three emulsions with the same speed and contrast. The resultant curve has a narrow exposure range and is thus of high contrast.

When the paper is exposed to green light, only the parts of the emulsion with the larger amounts of green sensitising dye react initially. This is because the three emulsions have very different sensitivities to green light. This image is of low contrast because of the additive effect produced by three emulsions with different speeds to green light, but with the same inherent contrast. The resultant curve has a very much wider exposure range and is thus of low contrast.

By varying the proportion of blue to green light, a contrast range between these two extremes can be obtained. The simplest way of controlling the colour of the light reaching the emulsion during exposure is by the use of filters: a magenta filter absorbs green light and transmits blue; a yellow filter absorbs blue light and transmits green. In this way, high and low contrast images can be made.

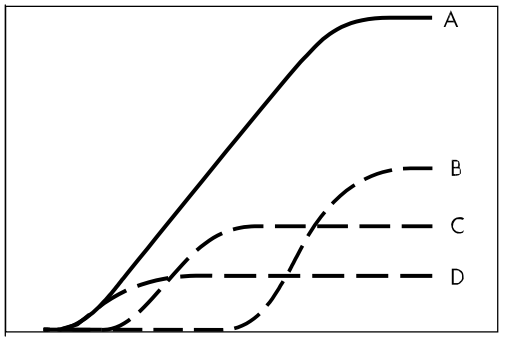
Exposure to blue light



Relative log exposure

A combined curve
B dyed emulsion I
C dyed emulsion II
D dyed emulsion III

Exposure to green light



Relative log exposure

A combined curve
B dyed emulsion I
C dyed emulsion II
D dyed emulsion III

MULTIGRADE FILTERS

The twelve MULTIGRADE filters are numbered 00–5 in 1/2 steps, with the lowest filter number corresponding to the softest contrast.

Filters are available in sets of filters 8·9x8·9cm (3 1/2x3 1/2 inches) and 15·2x15·2cm (6x6 inches). They can be used above or below the lens and can be cut to fit the enlarger filter drawer. Filter sizes 30x30cm (11·8x11·8 inches) are available to special order.

A filter kit is available for below the lens use. The kit comprises 12 mounted contrast filters, a mounted safelight filter and a filter holder.

MULTIGRADE filters are very easy to use: no complicated calculations are needed when changing from one filter to another. The exposure time for filters 00–3 1/2 is the same; that for filters 4–5 is double.

MULTIGRADE 600 EQUIPMENT

The MULTIGRADE 600 professional exposing system is a very convenient means of exposing MULTIGRADE papers over a wide contrast range of 00 to 5.

It works on the closed loop system, with a single pre-warmed lamp, to give repeatable results, even at high contrasts.

The light output is precisely controlled by the motorised shutter. The motorised filters give contrast control in 1/10 grade steps over grades 0 to 5. The head has five programmable paper channels (four pre-set for ILFORD MULTIGRADE papers). It also gives true white light for composition, focusing and exposure.

Once calibrated, the exposure probe automatically calculates the exposure and contrast needed for each negative. It can be used under normal safelight conditions.

The MULTIGRADE 600 system can also be used with most automatic roll easels.

The MULTIGRADE 600H enlarger head replaces the standard lamphouse on the most popular professional enlargers. The control unit, power supply and probe complete the system.

There are two versions of the MULTIGRADE 600H enlarger head. The medium format version is suitable for the Durst M805 enlarger. The standard format version is suitable for other enlargers including the Durst L1200, DeVere 504, Omega D and Beseler 45. The enlarger head fits directly in place on the Durst M805 and Durst L1200 enlargers. An adaptor kit is needed with other enlargers.

MULTIGRADE 600 – medium format

	MULTIGRADE 600 (for negatives up to 6x9cm(
Enlarger head	MULTIGRADE 600H
Power supply	MULTIGRADE 600S
Control unit	MULTIGRADE 600C
Exposure probe	MULTIGRADE 600P
Light mixing boxes*	35mm 6x6cm 6x9cm
Optional equipment Footswitch	MULTIGRADE 600F

*At least one light mixing box is needed for a complete system.

MULTIGRADE 600 – standard format

	MULTIGRADE 600 (for negatives up to 4x5inches)
Enlarger head	MULTIGRADE 600H
Power supply	MULTIGRADE 600S
Control unit	MULTIGRADE 600C
Exposure probe	MULTIGRADE 600P
Light mixing boxes*	35mm 6x7cm 4x5inches
Optional equipment Footswitch	MULTIGRADE 600F

*At least one light mixing box is needed for a complete system.

OTHER VARIABLE CONTRAST ENLARGER HEADS

The contrast of MULTIGRADE papers can be controlled with the range of variable contrast enlarger heads that are currently available. Some of these are easier to use than others, and several give excellent results.

Many manufacturers make variable contrast heads for their enlargers which are specially designed for use with MULTIGRADE papers. Enlarger heads that have been designed in conjunction with ILFORD include those from De Vere, Dunco, Kaiser, Leitz, LPL and Meopta.

For use with MULTIGRADE papers, follow the instructions provided by the enlarger manufacturer.

USE OF COLOUR HEADS

By adjusting the yellow and magenta filtration on colour heads, it is possible to obtain a wide contrast range with MULTIGRADE papers. However, the maximum contrast will be slightly lower as the filters used in colour heads are optimised for use with colour paper and not with variable contrast paper. The suggested filtration in the following tables can only be a guide, because individual enlargers vary. The actual filtration for a particular enlarger must be determined by trial.

Filtration types used in colour enlargers

From the table below, select the type of filtration needed according to the enlarger type.

Durst	Kodak	Meopta
Dunco	Advena	Meopta
Durst	Beseler	
Kaiser	Chromega	
Kienzle	De Vere	
Leitz	Fujimoto	
Lupo	IFF	
	Jobo	
	LPL	
	Omega	
	Paterson	
	Simmard	
	Vivitar	

Single colour filter settings

From the table below, read off the approximate filtration needed for each contrast step. However, as the yellow and magenta filters have not been arranged to equalise exposures, new exposure times will have to be recalculated when the contrast is changed.

If you are using a Durst enlarger, or one that uses Durst filtration values, choose the suggested settings depending on whether the maximum magenta setting on your enlarger is 170M or 130M.

MULTIGRADE filter	Durst (max 170M)	Durst (max 130M)	Kodak	Meopta
00	150Y	120Y	199Y	150Y
0	90Y	70Y	90Y	90Y
1/2	70Y	50Y	70Y	70Y
1	55Y	40Y	50Y	55Y
1 1/2	30Y	25Y	30Y	30Y
2	0	0	0	0
2 1/2	20M	10M	5M	20M
3	45M	30M	25M	40M
3 1/2	65M	50M	50M	65M
4	100M	75M	80M	85M
4 1/2	140M	120M	140M	200M
5	170M*	130M	199M	–

*Some enlargers in this group have a maximum magenta setting higher or lower than 170M. For these enlargers, set the highest possible magenta value as an approximate equivalent to filter 5.

Dual colour filter settings

From the table below, read off the approximate filtration needed for each contrast step. Dual filtration values usually need longer exposure times than single filtration values, but should need less adjustment to exposure times when changing contrast.

MULTIGRADE filter	Durst (max 170M)	Durst (max 130M)	Kodak	Leitz Focomat V35
00	115Y/0M	120Y/0M	162Y/0M	135Y/6M
0	100Y/5M	88Y/6M	90Y/0M	105Y/12M
1/2	88Y/7M	78Y/8M	78Y/5M	77Y/11M
1	75Y/10M	64Y/12M	68Y/10M	67Y/17M
1 1/2	65Y/15M	53Y/17M	49Y/23M	52Y/28M
2	52Y/20M	45Y/24M	41Y/32M	39Y/43M
2 1/2	42Y/28M	35Y/31M	32Y/42M	32Y/51M
3	34Y/45M	24Y/42M	23Y/56M	23Y/62M
3 1/2	27Y/60M	17Y/53M	15Y/75M	14Y/79M
4	17Y/76M	10Y/69M	6Y/102M	10Y/95M
4 1/2	10Y/105M	6Y/89M	0Y/150M	15Y/154M
5	0Y/170M	0Y/130M	–	0Y/200M

EXPOSING LIGHT SOURCES

MULTIGRADE papers are designed for use with most enlargers and printers, that is, those fitted with either a tungsten or tungsten halogen light source. They are also suitable for use with cold cathode (cold light) light sources designed for variable contrast papers.

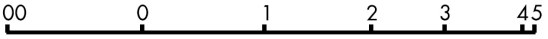
Cold cathode enlarger heads

Enlargers fitted with a cold cathode (cold light) head which has been designed for use with variable contrast papers can give a full contrast range on MULTIGRADE papers.

However, although a full contrast range may be available, it might not be evenly spaced. Also, in some cases, a full contrast range may not be available – it depends on the cold cathode lamp used.

The following chart gives a guide to the contrast range of MULTIGRADE papers when exposed using MULTIGRADE filters with a conventional tungsten enlarger head and with an Aristo head fitted with an Aristo W45 cold cathode lamp. With the Aristo W45 lamp, extra yellow filtration was also added – CC40Y – as recommended by Aristo. It can be seen that a full contrast range can be achieved, but the grade intervals are bunched towards the hard contrast end.

Aristo W45 cold cathode lamp + 40Y with MULTIGRADE filters



Conventional tungsten enlarger head with MULTIGRADE filters

Exposure factors for an Aristo head fitted with the Aristo W45 lamp + 40Y filter

MULTIGRADE filters

from / to	00	0	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5
00	1·00	1·07	1·10	1·15	1·17	1·26	1·38	1·70	1·62	0·98	1·00	1·12
0	0·93	1·00	1·02	1·07	1·10	1·18	1·29	1·59	1·51	0·96	0·93	1·05
1/2	0·91	0·98	1·00	1·05	1·07	1·15	1·26	1·55	1·48	0·93	0·91	1·02
1	0·87	0·93	0·96	1·00	1·02	1·10	1·20	1·48	1·41	0·89	0·87	0·98
1 1/2	0·85	0·91	0·93	0·98	1·00	1·07	1·18	1·45	1·38	0·87	0·85	0·96
2	0·79	0·85	0·87	0·91	0·93	1·00	1·10	1·35	1·29	0·81	0·79	0·89
2 1/2	0·72	0·78	0·79	0·83	0·85	0·91	1·00	1·23	1·18	0·74	0·73	0·81
3	0·59	0·63	0·65	0·68	0·69	0·74	0·81	1·00	0·96	0·60	0·59	0·66
3 1/2	0·62	0·66	0·68	0·71	0·72	0·78	0·85	1·05	1·00	0·63	0·62	0·69
4	0·98	1·05	1·07	1·12	1·15	1·23	1·35	1·66	1·58	1·00	0·98	1·10
4 1/2	1·00	1·07	1·10	1·15	1·18	1·26	1·38	1·70	1·62	1·02	1·00	1·12
5	0·89	0·96	0·98	1·02	1·05	1·12	1·23	1·51	1·45	0·91	0·89	1·00

When changing contrast with an Aristo head fitted with the Aristo W45 lamp + 40Y filtration, the exposure has to be recalculated. This is because the MULTIGRADE filters (and other manufacturers' filters) are designed for use with tungsten enlarger heads. The table gives the exposure factors for MULTIGRADE IV RC DeLuxe paper. It can also be used as a guide for other MULTIGRADE papers. For example, if a print of correct density has been made using filter 2 but it is decided that the contrast of filter 3 is needed, multiply the exposure given for filter 2 by 0·74.

Cold cathode (cold light) heads not designed for variable contrast papers and pulsed xenon light sources may give a reduced contrast range. The MULTIGRADE 00 filter is particularly useful with these light sources as it significantly extends the contrast range available. Alternatively, some additional yellow filtration, up to 70Y, may help. The contrast range will depend on the spectral characteristics of the light source used. The only way to determine the contrast range available with each model of enlarger is to carry out a practical test.

DIFFUSER v CONDENSER ENLARGERS

MULTIGRADE papers are designed for use with both diffuser and condenser enlargers. However, because of the different types of illumination there can be a contrast difference between the two types. In practical terms with most negatives, condenser enlargers give about an extra grade of contrast compared with a diffuser enlarger. This contrast difference, though, depends on the amount of silver left in the negative. Thus there is little change of contrast between the enlarger types for very pale, flat negatives and also for the dye image of ILFORD XP2 SUPER negatives.

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

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