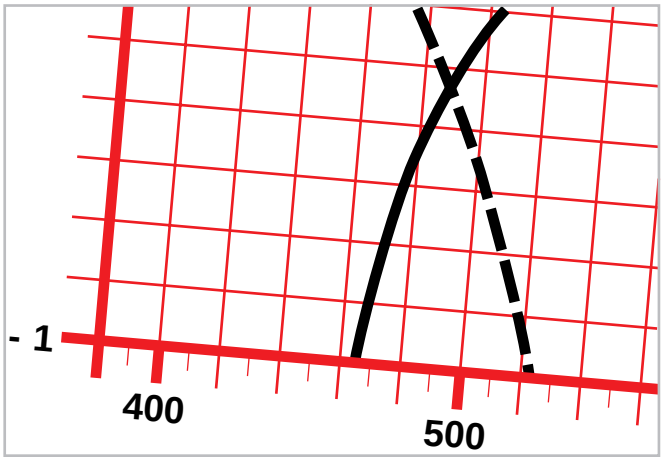
TECHNICAL DATA



AGFA RANGE OF FILMS

Amateur colour films

This brochure contains information on the quality and features of Agfa amateur colour films. More specific data, figures and charts are given in the Appendix.

Agfa colour films are high-grade products for all applications in amateur photography. The speed ratings available range from the standard sensitivity, for normal and very bright conditions, up to high sensitivity for bad to critical lighting conditions or fast-moving subjects. The optimum material is therefore available for any situation which may arise in normal practice.

Colour negative films: This type of film is suitable for prints. The standard sizes are 9 x 13 cm and 10 x 15 cm. However, larger formats are still of excellent print quality.

Colour reversal films: Reversal films are slide films. They produce transparent originals for projection purposes. Slide films also allow the production of high-quality prints. Made with a system such as Agfa DPS (Digital Print System), they are comparable to the best prints from negatives.

AGFA

The ISO 9002 quality certificate

Since 1992 the photo-chemical production department of Agfa-Gevaert AG has possessed the ISO 9002 certificate for its quality management system, as awarded by Lloyd's Register for Quality Assurance Ltd. (LRQA), London.

The ISO 9002 standard defines the principles of quality assurance, including concepts and criteria for customer-based quality planning, specifications for each stage of production, and also systems for error prevention and for the continuous enhancement of production techniques.

Comprehensive documentation of all the tests and their regular monitoring by internal and external auditors ensures that the product quality is consistently based on objectively defined criteria, and conforms at all times to a reproducible standard.

What are the most important quality features of colour films?

The following four fundamental factors decide the quality of a film.

Colour rendition

Colours must be rendered faithfully, i.e. their intensity, tone and brightness must correspond to the original subject. A film must therefore have the three qualities given below.

- **High colour saturation**, i.e. brilliance and intensity.
- **Precise colour tone separation**, i.e. differentiation of colours that are similar in tone. The finer the shades which are distinguished by the film, the crisper the general impression of the print.
- **Neutral grey balance**, a particularly strict requirement for a colour film. It means that all the achromatic "colours" (i.e. all the shades ranging from white through grey to black) must be neutral. This is the only way to ensure that all the other colours (i.e. blue, green and red) are accurate, and without colour casts.

Sharpness

The reproduction of a subject on a photographic film base can lead to loss of detail. The greater the sharpness of a photograph, the better the effect of depth.

Granularity

The grain is the smallest element of a developed film. The smaller (and therefore finer) the grain, the calmer the effect. Coarse grain creates rough surfaces.

Film speed

The film speed is generally quoted in ISO values. The AGFACOLOR HDC 100 plus, for example, has ISO 100/21°. The higher the value, the higher the film's sensitivity to light and thus its speed. Given the same exposure time to produce good photographs, high-speed films need less light than low-speed films.

The quality of a colour film is therefore determined by these four factors – the colour rendition, sharpness, granularity and speed. Although a change in one of these affects all the others, it does not influence the overall quality. Consider the film speed as an example. An increase in speed leads to a decrease in the levels of colour rendition, sharpness and granularity (though this does not apply in the same way to special films). However the change is not proportional. Owing to today's sophisticated technology, the differences are so small in a normal-sized photograph that they can hardly be perceived with the naked eye.

Directions for use

Film speed

Today's ISO values are a combination of the former ASA and DIN values. The following table illustrates this point.

ISO	ASA	DIN	In comparison to ISO 100/21°
100/21°	100	21°	
200/24°	200	24°	twice as fast
400/27°	400	27°	four times as fast

In principle, all these speeds are for all photographic situations that might occur under normal circumstances (e.g. people, portraits, landscapes, groups, buildings, holidays, animals, plants, flowers, documentation etc.). Nevertheless, it is still worthwhile observing a number of simple rules in the choice of the film speed.

	ISO 100/21°	ISO 200/24°	ISO 400/27°
Lighting			
– Bright, e. g. cloudless	×	×	
– Medium, e. g. overcast		×	×
– Weak, e. g. rainy			×
Moving subject*			
– Almost motionless	×	×	
– Medium-fast		×	
– Fast			×
Lens*			
– High speed	×	×	
– Low speed		×	×
Flash (medium light output)			
– Small rooms	×	×	
– Large rooms			×

* Depending on the lighting

In practice, the ISO 200/24° speed rating is becoming more and more popular. Because of their high exposure latitude, the AGFACOLOR HDC 200 plus and AGFACOLOR FUTURA 200 ensure excellent print quality, whether the light is extremely bright or critical.

Camera setting

Modern cameras adjust themselves automatically to the film speed (by reading the DX code). Cameras without automatic lighting control must be set manually to the film speed stated on the pack.

Exposure latitude

Most cameras have automatic exposure control, which sets the most favourable ratio of exposure time and aperture. Nevertheless, many photographs are not correctly exposed, because the automatic control of some cameras cannot cope with unusual or critical lighting conditions. Backlit shots are a typical example. Without lighting adjustment, the negative or slide may well end up being under-exposed by one or two f-stops. Depending on the film type, Agfa films tolerate exposure

errors up to 5 f-stops (under-exposure up to 2, over-exposure up to 3 f-stops) without noticeable reductions in quality (for exact figures see "Characteristic values and curves of various films" from page 5).

Exposure notes

When in doubt, it is good to err on the generous side in the exposure of colour negatives (i.e. stop up = lower f-number), but to be more cautious with slide films (i.e. stop down slightly = higher f-number). In this way you are always on the safe side: over-exposing a negative film and slightly under-exposing a slide film produces an increase in colour saturation.

Daylight

Daylight is not just daylight. In the morning and in late afternoon the sun is at an angle. As a result, the light is warmer and contains more red. At noon, on the other hand, when the sun is shining vertically, the light is colder and contains more blue. This quality of the light, which is known as the colour temperature, is measured in Kelvin.

All AGFACOLOR and AGFACHROME films are suitable for use in medium daylight, at a colour temperature of 5 500 Kelvin. If the light is too cold, it can be adjusted with a red filter (e.g. R 1.5 or R 3), and if it is too warm, with a blue filter (e.g. B 1.5 or B 3). These corrections should only be used with slide films.

Flash

Electronic flash-guns and flash bulbs are suitable for medium daylight. The guide number of the flash depends on the film speed. Tip: if a subject is dark or far away, you can achieve better flash photos by stopping up one step.

Artificial light

Artificial light, i.e. light from sources such as photographic lamps, electric bulbs or fluorescent tubes, has its own characteristics. Photographic lamps have a colour temperature of 3 400 K, electric bulbs 3 200 K.

AGFACOLOR negative films and AGFACHROME slide films are ideal for artificial light. For best results a certain type of filter is required, depending on the light source. However as each filter reduces the intensity of the light, this must be compensated as follows.

Type of lamp	Filter	Adjustment
Photographic lamp	80 B	+ 1 $^{2}/_{3}$ f-stops
Electric bulbs	80 A	+ 2 f-stops

With fluorescent tubes, on the other hand, there is no uniform method of measurement, as their light spectrum differs considerably depending on the type, age and manufacturer.

UV blocking filters

Each AGFACOLOR or AGFACHROME film contains an integrated UV protection filter which absorbs any invisible UV radiation contained in daylight. It is therefore not necessary to use a UV blocking filter, though it is useful for a physical protection of the lens.

Polarizing filters

This type of filter is used either for the reduction of reflections, e.g. on glass and water (though not metal), or for the production of certain effects (e.g. a more intensive blue sky). Depending on the filter type, the exposure time needs to be increased by a certain factor (see the instructions for your camera or filter).

Colour filters

Colour filters are intended for black-and-white photography. They are not suitable for colour, as they produce considerable colour shifts.

Long and short-term effects

Extremely long or short exposure times can affect the speed and colour balance of the film. This is known as the reciprocity effect.

The reciprocity effect of AGFACOLOR and AGFACHROME films is excellent. If the exposure time is within 1-1/10 000th and 1 second, the colours and speed remain the same. However if the exposure is any longer or shorter, then it may be necessary to make exposure or colour adjustments (for details see the tables on page 5).

X-ray checks

X-ray checks, which are inevitable before a flight, can sometimes cause problems. We have found that if an X-ray machine is marked “Film Safe“ and the checks do not exceed the usual number, then they do not normally affect a film. Nonetheless films should never be checked in with the normal luggage, but kept with your hand luggage. Visual checks are always safer.

This applies in particular to high-speed films, because the sensitivity of a film to X-rays is proportional to its sensitivity to visible light.

Storage

Remember never to store films under moist or humid conditions. Neither should films be exposed to heat.

Unexposed films: The cooler an unexposed film is stored, the longer it will last. Furthermore, we recommend keeping the film in the original pack, which is moisture-proof (i.e. water-tight), so that the photographic qualities remain stable. Films that have been stored in a refrigerator should be kept at room temperature for about two hours before use, as the atmospheric humidity might otherwise produce condensation on the cold film. A car glove compartment is not suitable for storing films. If the sun is hot, they can easily develop temperatures of up to 80°C/175°F. Fumes, such as formaldehyde, can also be harmful. They are released by furniture, cosmetics, adhesives and varnish. The camera itself only provides inadequate protection. Instead, put your camera in a polyethylene bag if necessary.

Exposed films: Once exposed, a film should be developed as soon as possible. The "latent" image (i.e. the pre-development exposure) may otherwise deteriorate as a result of long-term storage or unfavourable weather conditions, and this disturbs the colour balance.

Developed films: The same safety precautions apply to developed films, i.e. they must be kept in a cool and dry place and protected from harmful fumes and direct light.

Processing

Film development processes are standardized throughout the world. Agfa films are “process-compatible” and are developed in the following processes:

AGFACOLOR negative films	AP 70/C-41
AGFACHROME slide films	AP 44/E-6

From production to the finished picture – Agfa quality assurance

Modern production methods and strict inspections ensure that no films are shipped unless they are within Agfa’s extremely narrow tolerance limits. To ensure that this high quality standard reaches the end user, Agfa has incorporated a number of features to enhance the stability of its products.

- **High storage stability,** which largely prevents any changes to the qualities of the film during storage, by the retailer or by the customer.
- Extremely **wide exposure latitude**, which largely compensates for any exposure errors that might occur in practice (e.g. with backlit photographs or a weak flash).
- **High resistance to processing fluctuations** during development – fluctuations which can never be totally avoided, even if process monitoring is very thorough.

Specific product details

The charts and figures shown on page 6 to 8 are briefly explained below, and the conditions of measurement are also described.

All the figures are averages of various production runs. For some emulsion batches they may vary slightly from each other, in spite of the very tightly main-tained tolerances.

Spectral sensitivity

Chart to define the colour sensitivity of an unprocessed film.

References

- Equi-energy spectrum
- Measured density: 1.0 above minimum density

Absorption of emulsion dyes

Chart to define the relative effect of a processed film on incident light. With colour negative films, it measures the spectral sensitization of the subsequent print material, with colour slide films it measures the viewer’s perception under certain defined standard lighting conditions.

References

- Neutral object of medium brightness
- Minimum density

Colour density curves

Chart to define the density of dyes in a processed film, depending on the lighting.

References

- Exposure: daylight 1/100th sec.
- Process: AP 70/C-41 or AP 44/E-6
- Densitometry: Status A or Status M

Sharpness

International name of the chart: MTF (Modulation Transfer Function) which defines the sharpness of the image. The higher the transfer factor in %, the lower the loss during transmission of the light.

References

- Exposure: daylight
- Densitometry: visual filter (V_λ)

Granularity

Granularity is the irregular density of an exposed and processed film surface. The numeric value is based on the RMS (root mean square) method of measurement. The smaller the value, the finer the grain of the film.

References

- Exposure: daylight
- Densitometry: visual filter (V_λ)
- Reading: diffused density 1.0
48 µm scanning aperture

Resolution

Numeric value which defines the resolution limit for the rendition of the finest adjacent detail (e.g. lines in a grid). Resolution is a purely visual criterion, affected significantly by the contrast range.

References

- Lines per mm with a contrast range of either 1.6:1 or 1.000:1

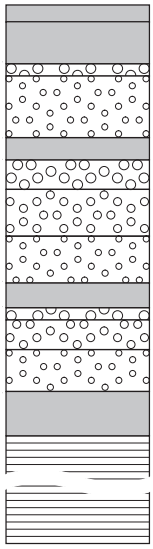
Function of the chromogeneous colour process

All films with a chromogeneous colour process are based on the principle of subtractive colour mixture. They contain three light-sensitive “emulsion packages“, each of which is sensitive to one of the three spectral areas blue, green and red. The packages consist of either two emulsions (with high and low sensitivity) or three (with high, medium and low sensitivity). Furthermore, each emulsion has colour couplers incorporated into it, so that it cannot cross over to other (neighbouring) emulsions.

These colour couplers “couple“ – i.e. combine – with the oxidation products of the colour developer to form dyes. In the blue-sensitive emulsion layers they produce yellow, in the green-sensitive emulsion layers magenta, and in the red-sensitive layers cyan.

Each type of film requires an individual emulsion design. The schematic diagram below shows the AGFACOLOR HDC 100 plus

Emulsion design of the HDC 100 plus



Total layer thickness (without base): **16 µm**
(Other films: see pages 6 - 8.)

Emulsion base

The film base consists of acetyl cellulose and has a thickness of 120 µm in 35mm films and 110 µm in pocket films. The base of the films in the Advanced Photo System is made of PEN (polyethylene napthalate), and is 90 µm thick.

The Agfa standard film range

AGFACOLOR negative films

Films	AGFACOLOR HDC 100 plus ISO 100/21°	AGFACOLOR HDC 200 plus ISO 200/24°	AGFACOLOR HDC 400 plus ISO 400/27°
System code / no. frames			
135-36	×	×	×
135-24+3	×	×	×
135-12+3	×	×	×
110-24		×	
110-12		×	
126-24		×	

AGFACOLOR negative films for the Advanced Photo System

Films	AGFACOLOR FUTURA 100 ISO 100/21°	AGFACOLOR FUTURA 200 ISO 200/24°	AGFACOLOR FUTURA 400 ISO 400/27°
System code / no. frames			
240-40	×	×	×
240-25	×	×	×
240-15	×	×	×

AGFACHROME slide films

Films	AGFACHROME CTprecisa 100 ISO 100/21°	AGFACHROME CTprecisa 200 ISO 200/24°
System code / no. frames		
135-36	×	×

Characteristic values and curves of the various films

Reciprocity effect

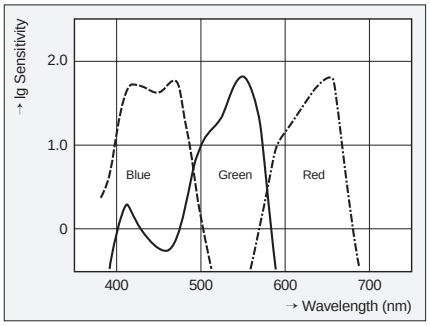
AGFACOLOR negative films	AGFACOLOR HDC 100 plus		AGFACOLOR HDC 200 plus		AGFACOLOR HDC 400 plus	
Exposure reading (seconds)	1/10 000 – 1	10	1/10 000 – 1	10	1/10 000 – 1	10
Exposure adjustment (f-stops)	0	+ ½	0	+ 1	0	+ 1

AGFACOLOR negative films for the Advanced Photo System	AGFACOLOR FUTURA 100		AGFACOLOR FUTURA 200		AGFACOLOR FUTURA 400	
Exposure reading (seconds)	1/10 000 – 1	10	1/10 000 – 1	10	1/10 000 – 1	10
Exposure adjustment (f-stops)	0	+ 1	0	+ 1	0	+ 1

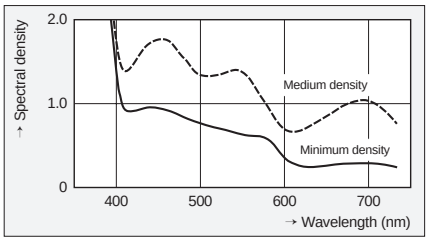
AGFACHROME slide films	AGFACHROME CTprecisa 100		AGFACHROME CTprecisa 200	
Exposure reading (seconds)	1/10 000 – 1	10	1/10 000 – 1	10
Exposure adjustment (f-stops)	0	+ ½	0	+ 1
Filtration (CC filter)	0	05 Y	0	10Y 05C

AGFACOLOR HDC 100 plus

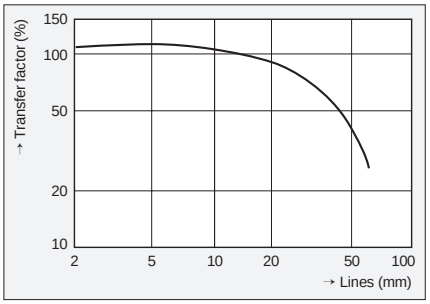
Spectral sensitivity



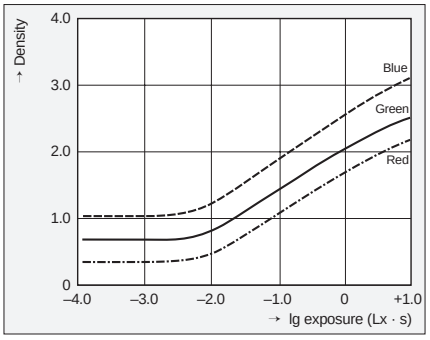
Spectral density



Sharpness



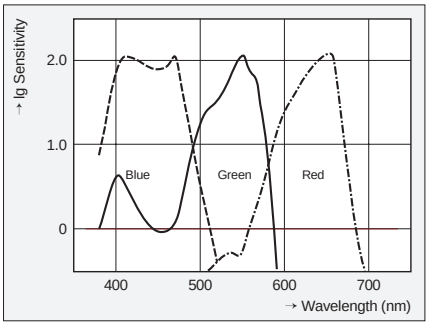
Colour density curves



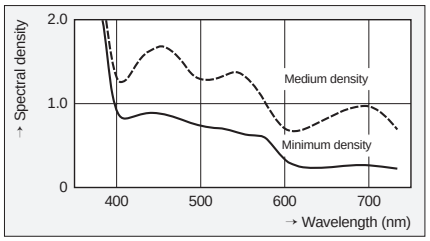
Speed:	**ISO 100/21°**
Granularity (x 1000):	**RMS 4.0**
Resolving power:	
Contrast 1000 : 1	**130 lines/mm**
Contrast 1.6 : 1	**50 lines/mm**
Exposure latitude:	**–2 to +3 f-stops**
Layer thickness:	16 µm

AGFACOLOR HDC 200 plus

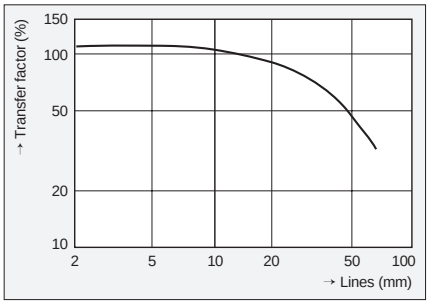
Spectral sensitivity



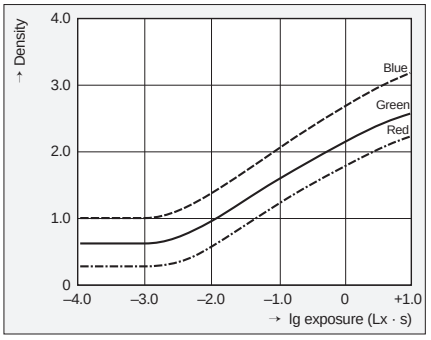
Spectral density



Sharpness



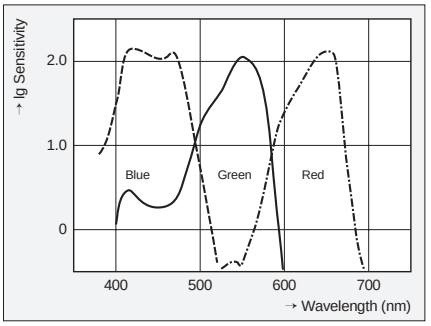
Colour density curves



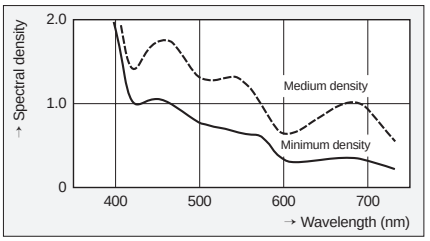
Speed:	**ISO 200/24°**
Granularity (x 1000):	**RMS 4.5**
Resolving power:	
Contrast 1000 : 1	**130 lines/mm**
Contrast 1.6 : 1	**50 lines/mm**
Exposure latitude:	**–1½ to +3 f-stops**
Layer thickness:	18 µm

AGFACOLOR HDC 400 plus

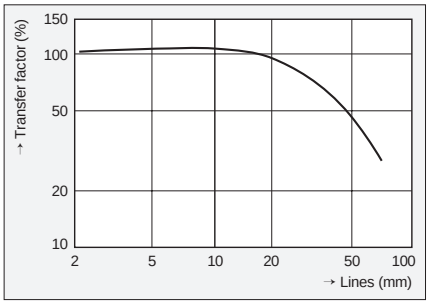
Spectral sensitivity



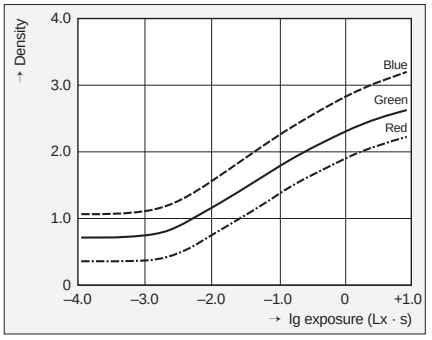
Spectral density



Sharpness



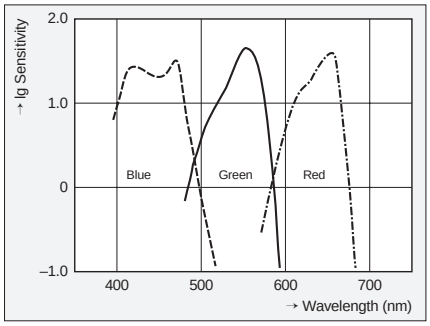
Colour density curves



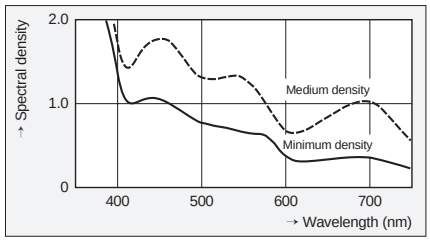
Speed:	**ISO 400/27°**
Granularity (x 1000):	**RMS 4.5**
Resolving power:	
Contrast 1000 : 1	**130 lines/mm**
Contrast 1.6 : 1	**50 lines/mm**
Exposure latitude:	**–1 to +3 f-stops**
Layer thickness:	19 µm

AGFACOLOR FUTURA 100

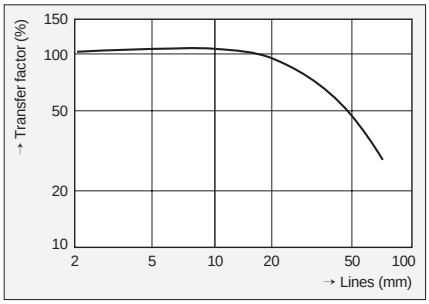
Spectral sensitivity



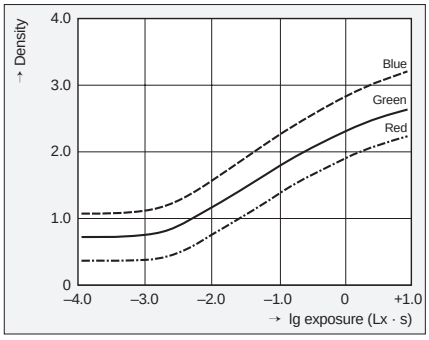
Spectral density



Sharpness



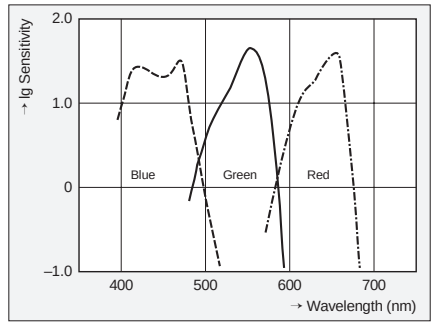
Colour density curves



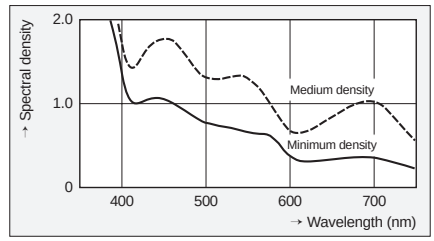
Speed:	**ISO 100/21°**
Granularity (x 1000):	**RMS 4.0**
Resolving power:	
Contrast 1000 : 1	**130 lines/mm**
Contrast 1.6 : 1	**50 lines/mm**
Exposure latitude:	**–2 to +3 f-stops**
Layer thickness:	16 µm

AGFACOLOR FUTURA 200

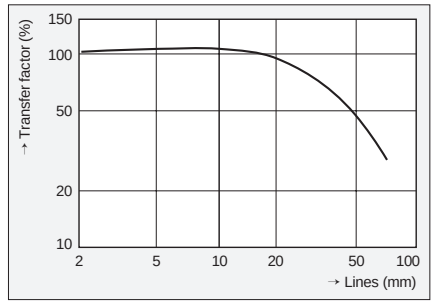
Spectral sensitivity



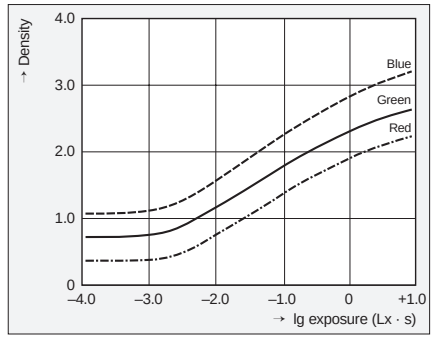
Spectral density



Sharpness



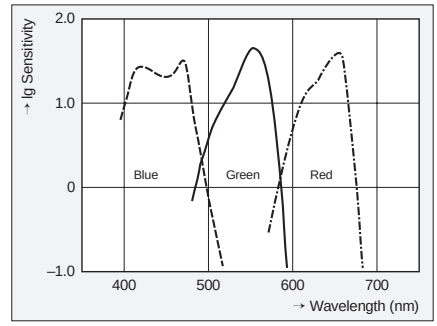
Colour density curves



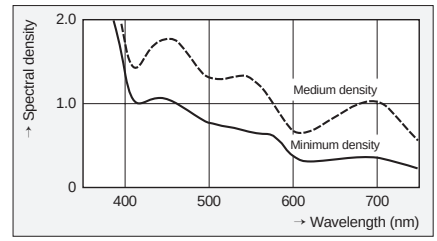
Speed:	**ISO 200/24°**
Granularity (x 1000):	**RMS 4.3**
Resolving power:	
Contrast 1000 : 1	**130 lines/mm**
Contrast 1.6 : 1	**50 lines/mm**
Exposure latitude:	**–2 to +3 f-stops**
Layer thickness:	19 µm

AGFACOLOR Futura 400

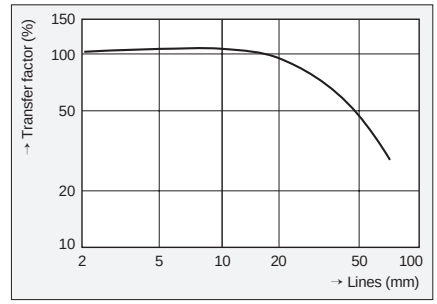
Spectral sensitivity



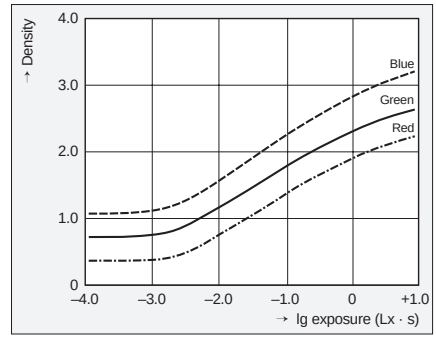
Spectral density



Sharpness



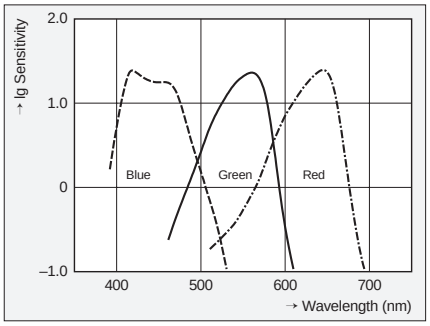
Colour density curves



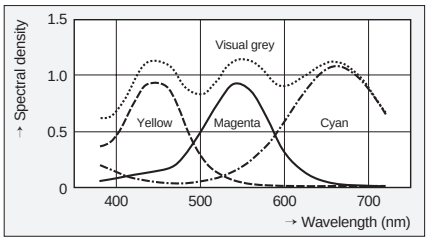
Speed:	**ISO 400/27°**
Granularity (x 1000):	**RMS 4.5**
Resolving power:	
Contrast 1000 : 1	**130 lines/mm**
Contrast 1.6 : 1	**50 lines/mm**
Exposure latitude:	**–1 to +3 f-stops**
Layer thickness:	19 µm

AGFACHROME CTprecisa 100

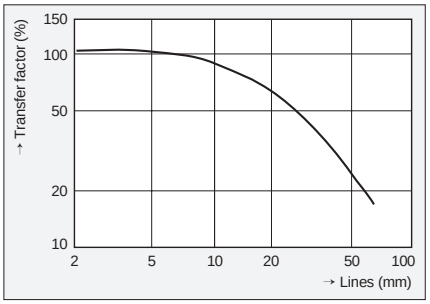
Spectral sensitivity



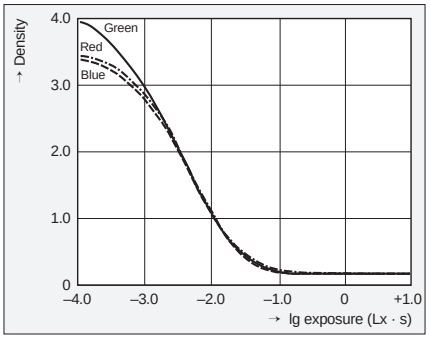
Spectral density



Sharpness



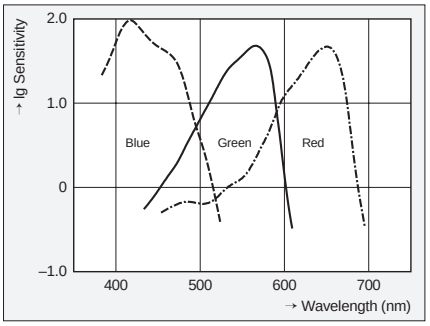
Colour density curves



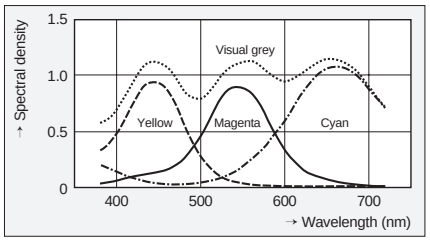
Speed:	**ISO 100/21°**
Granularity (x 1000):	**RMS 10.0**
Resolving power:	
Contrast 1000 : 1	**130 lines/mm**
Contrast 1.6 : 1	**50 lines/mm**
Exposure latitude:	**–½ to +½ f-stops**
Layer thickness:	25 µm

AGFACHROME CTprecisa 200

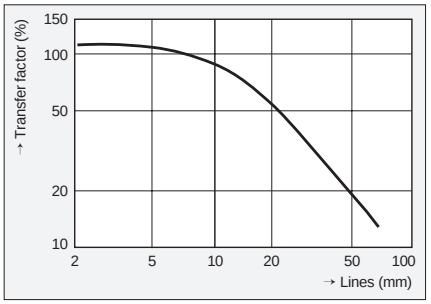
Spectral sensitivity



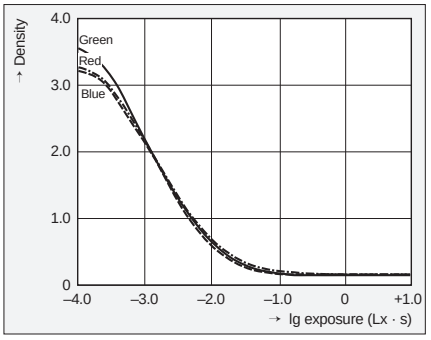
Spectral density



Sharpness



Colour density curves



Speed:	**ISO 200/24°**
Granularity (x 1000):	**RMS 12.0**
Resolving power:	
Contrast 1000 : 1	**120 lines/mm**
Contrast 1.6 : 1	**50 lines/mm**
Exposure latitude:	**–½ to +½ f-stops**
Layer thickness:	27 µm

The Agfa professional range

This range covers a broad spectrum of colour negative, colour slide and black-and-white negative films. Depending on the section of the range, the available speeds range from ISO 15/25° to ISO 400/27° in the systems/formats 135, 120, 220, sheet film and bulk film.

Agfa professional films have qualities that are geared entirely towards the requirements of professional photographers. They are produced within extremely narrow tolerances, to ensure the maximum consistency as required by professionals.

Further details are given in the Professional Film technical data brochure (PF).

Note

The information given here is based on the evaluation of typical products at the time of printing. Slight deviations are possible through production tolerances. Agfa-Gevaert is constantly endeavouring to improve the quality of the products, and therefore reserves the right to alter the product specifications without notice.

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