Linhof

EXPOSURE CONTROL AT THE GROUND GLASS IMAGE

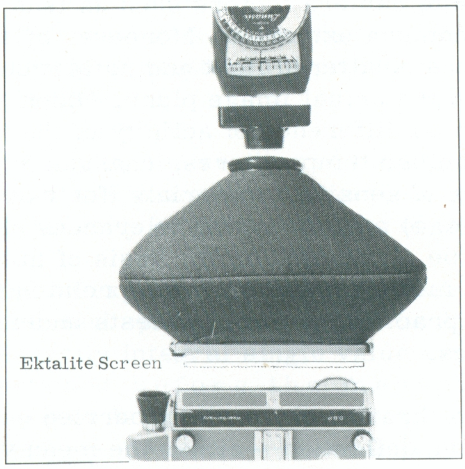

Fig. 1

Precise determination of exposure from the ground glass image demands a light-tight connection between the exposure meter and the focusing and light-measuring bellows. This is provided by adapters which are available for the LUNASIX and METRASTAR. The meter assembly is attached, without any diffuser, to the ground glass frame. The procedure in general is to set the lens to the working aperture and make the measurement at this aperture. The measurement range of the LUNASIX is from 1 to 45 DIN, 1 to 25 000 ASA with corresponding exposure times from 1/4000 th sec. to 8 hours. If the lighting conditions are very bad, either the measurement may be made at full aperture and the exposure calculated for the working aperture, or alternatively the exposure meter may be used on the subject in the ordinary way as a reflected light meter beside the camera. (For example for close-ups, if necessary using a grey card).

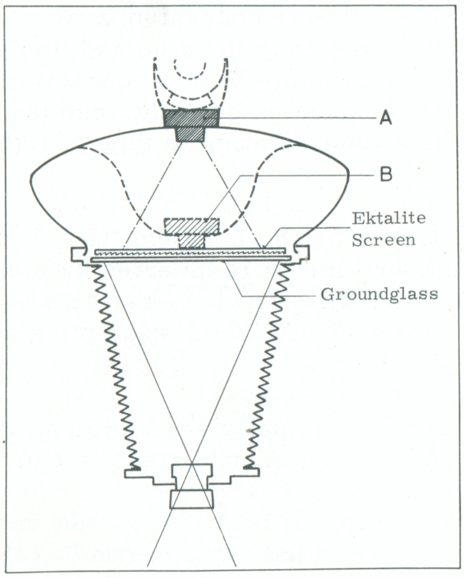

Fig. 2

An instructive experiment: if a uniformly illuminated surface is focused with a normal or short focus lens so as to fill the format, then - provided all extraneous light is excluded - the CdS exposure meter will give practically the same reading (A) with the bellows extended so that the meter collects light from the whole format through the Ektalite lens and (B) with the meter lying direct on the Fresnel lens. This shows that it is not only in the central area of the image that the light falling on and passing through the ground glass is effectively measured.

When wide-angle lenses are used, however, small differences may occur. To obviate this, it is recommended in these circumstances always to employ the selective method of measuring only a portion of the image. (See Fig. 3).

Linhof have developed an astonishingly simple system whereby the image brightness over the ground glass of 2 1/4 x 3 1/4 / 6 x 9 to 8 x 10 in. / 18 x 24 cm cameras can be systematically sampled with standard CdS exposure meters. The high sensitivity of this type of meter necessitates an absolutely light tight connection between photocell and camera back. This condition is fulfilled, by the LINHOF focusing and light measuring bellows available for the above formats. Moreover the flexibility of this device, in conjunction with the built-in 2 1/2 x magnifier, enables the image to be selectively tested over small areas, as well as measured as a whole by using the bellows at full extension.

It must be expressly pointed out that for precise determination of exposure at the ground glass image the use of a combination of ground glass and Ektalite (Fresnel) lens is just as essential as the adapter for LUNASIX and METRASTAR exposure meters. The special effect of the Ektalite lens is shown in the accompanying diagram.

What is the particular merit of this exposure determination system?

For a clear understanding of this it is necessary to consider certain basic principles.

The exposure control systems available on the market today fall into two fundamentally different categories.

First there is the selective highlight and shadow method, whereby relatively small areas at the two ends of the brightness scale are separately measured and the mean is taken as the correct exposure. As a means merely of determining exposure this method would seem somewhat laborious, but it does have the advantage of determining the brightness contrast range.

The second method, which incidentally necessitates the use of a special camera back, integrates the entire image brightness as a basis of exposure determination. In itself a quick and simple method, this results in a single reading, which however with subjects of very uneven brightness distribution does not represent a true mean value, and it must therefore be considered inferior to a selective technique.

The method based on the Linhof cameras is a flexible one which within certain limits combines the advantages of both systems (see Fig. 3).

To come back to the advantages of what has recently become known as the TTL (through the lens) system of exposure determination, we may briefly summarize:

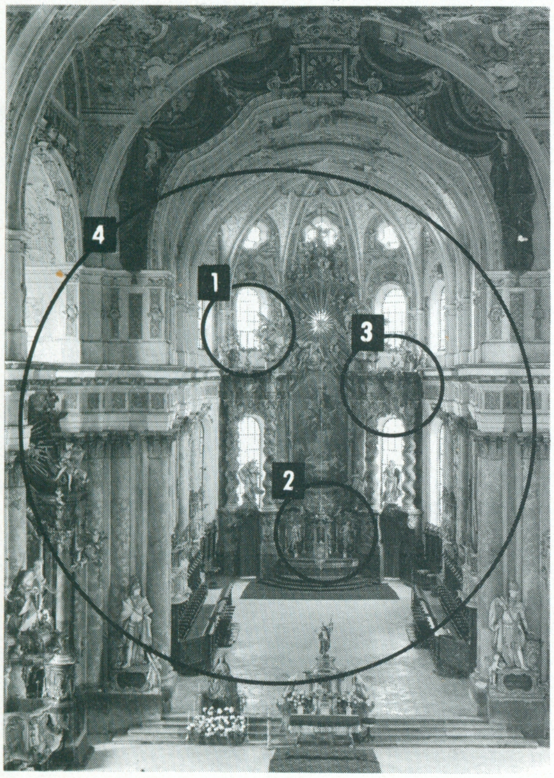

Fig. 3

Either method may, as circumstances dictate, be used with the focusing and light measuring bellows: Using the selective method, either the highlights (Circle 1) or the shadows (Circle 2) may be given predominance, or the two-measurement technique may be used. It is also possible, of course, to select an area of the image which integrates to an average value (Circle 3). The overall integral measurement (Circle 4) collects light from highlights and shadows alike throughout the image and at the same time compensates for the unbalanced spectral response of the CdS photo resistance. In the normal circumstances of uniform brightness distribution this method is to be preferred. (With the exception of wide angle shots, see Fig. 2).

The LINHOF image-wise measurement is based on the brightness of the subject (1/3 stop on the LUNASIX or METRASTAR scale corresponds to a log intensity difference of 0.1) and automatically takes into account variable camera factors such as lens stop, filters and camera extension. Moreover by this method the effects of scattered light and reflections can be assessed in the actual image plane. Other factors, too, such as difference of actinity of the light at different colour temperatures, changes in sensitivity and use of sensitive materials (for example the effects of storage) manufacturing tolerances of the meter, etc., can be eliminated on the basis of initial tests. All picture measurements are then related to the ideal basis of practical calibration tests under optimum conditions.

This initial test calibration exposure is carried out as follows: The pointer deflection - either the mean value or the direct reading on the 'LUNASIX' - obtained at the working stop is transferred in the usual way to the yellow setting ring - in the case of the 'METRASTAR' only the triangular index mark is set - and the speed of the sensitive material used for the test exposure (continuous tone material, black-and-white or colour) is set to the DIN or ASA value. The exposure time which is then read off against f/1 is then used as basis for a series of exposures at a range of stops above and below the initial value, but all at the same exposure time.

On the basis of the best result from this exposure series the DIN or ASA value is corrected in accordance with the disparity in stop value and this new speed noted on the sensitive material packet. It is interesting to note in this connection that the speed values given for black-and-white films are always based on daylight, and the use of artificial light demands a correction of about 3 DIN. Such data relating to type of lighting are accordingly also noted on the packet.

Here may be mentioned also a remarkable method of lens stop control from the ground glass image. The LUNASIX or METRASTAR exposure meter is inserted by means of the adapter in the focusing and light measuring bellows and at the full lens aperture directed on an area of the ground glass image which on the LUNASIX for example gives a pointer deflection of 11.

If now the stop is closed down, the pointer deflection of the meter - actually adjustable as it is to 1/6th stop - will record the change in brightness at that point of the ground glass image.

If the initial f/number of the lens is not a whole number, for example if it is f/4, 5, this intermediate value (between f/4 and f/5, 5) must be taken into account as a half stop in reading the pointer deflection.

If at full aperture the meter cannot, by adjusting the lighting or target selection on the image, be adjusted to read either 11 or 19, possible inaccuracy of reading due to the scale divisions can be obviated in the following manner: First of all the exposure meter is sighted, at full aperture, on the brightest possible part of the subject and, for example, the effect is observed of stopping down within the range of 15 2/3 to 13 2/3 (but not below 13). The last attainable stop value is noted, and further stop determination is based on a darker area of the image proceeding from the corresponding pointer deflection - e.g. 10 1/3 - step by step to the desired stop. Thus it is easy to avoid the critical range of diminished reading accuracy, in our example between 10 1/3 and 13 2/3.

Any discrepancies which may occur as against the stop scale are most likely attributable to the effects of scattered light or manufacturing tolerances between different lenses and shutters (stop scale).

For the rest, the reading of the stop value when the meter is used for measurement in the image plane is anyway illusory, in as much as it is based on the particular conditions and light intensity attending the use of the working stop used.

Where an exposure is to be made at a specified exposure time after setting the ascertained speed value in DIN or ASA the pointer deflection of the exposure meter for a necessarily integral single value exposure measurement on the ground glass image can be ascertained before the measurement is made. It can be accurately set by adjusting the stop or lamp distance.

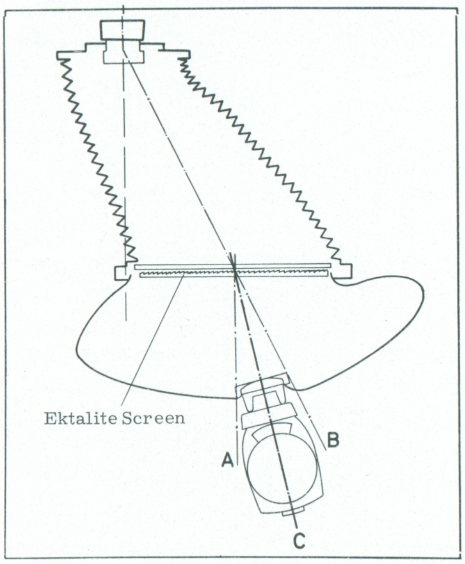

Fig. 4

Even when using extreme wide angle lenses the exposure meter should be used nearly vertically even for measurements close to the edge of the field, thanks to the light collecting function of the Ektalite lens. If, on the other hand, as a result of the use of camera movements the lens is displaced or tilted relative to the camera back, the CdS exposure meter - while always aimed at the area of the ground glass image which is to be measured - is tilted towards the lens. This is basically true of all focal lengths. The required tilt (C) can be taken as approximately the mean between the perpendicular (A) from the area under measurement and the production of the line (B) joining this area and the lens. Final adjustment of the tilt is controlled by observing the position of maximum deflection of the meter pointer.

To adapt the method to the case where the camera lens is decentred relative to the camera back, the exposure meter is given an oblique tilt in the direction of the lens. Here again the Ektalite lens is very advantageous, and by its property of concentrating the light reduces the degree of tilt required. The criterion for correct inclination is always the attainment of maximum deflection for the area under measurement. The effect of encroachment into the field of the area under measurement which occasionally constitutes a source of error when the meter is tilted in this manner is practically negligible in the case of selective integral measurements (see Fig. 3, circle 3).

It is a well known fact that with increasing exposure time the effect of reciprocity failure is to cause under-exposure. Since the reciprocity failure factor may vary from emulsion to emulsion, and is subject to certain modifications as a result of ageing of the material, film manufacturers will on request furnish special data on its effect both on exposure and, in the case of colour material, on the colour distortion which is bound up with it. These factors can then simply be included as corrections in the calculations as is done with filters etc., or better still can be practically eliminated for future work by a test exposure made under the extreme conditions obtaining. (Same pointer deflection = same exposure time).

The same system of exposure determination at the ground glass image can in modified form be applied to document materials and line film. Since the speed is based on grey values whereas such materials do not record continuous tone greys, a setting of 18 DIN, 50 ASA is consistently used, and ignoring the printed or diagrammatic subject matter - for example by covering it over with a sheet of paper of a tone to match that of the original to be copied - the pointer deflection of the CdS exposure meter corresponding to the intensity in the centre of the ground glass is noted.

After setting this value on the disc (as described for continuous tone material) the basic value for the test exposure is read off not against 1 but against 8. The setting thus remains constant in this case, but under some circumstances - depending upon the result of the test exposure - the reading index may vary, for example to f/5, 5 or some intermediate value. On the packet, accordingly, a note will be made: artificial light f/5 6 1/3. But enough with theory: better try it out for yourself. If a suitable CdS meter is not already available it is worth while to acquire one for between ourselves you will have plenty of use for it outside the camera, for it is not possible always and everywhere to employ ground glass exposure determination. Needless to say, the method will be capable of adaptation to future new types and modifications of the CdS exposure meter.

And when one day you have collected, as we have, hundreds of colour photographs on reversal film, etc., some of them at extreme magnification calling for up to 3000 x exposure increase factor (eliminated by using a constant pointer deflection of the exposure meter - controlled by adjusting the distance of the light source - and consequently constant exposure time) without any perceptible difference in the exposure level of the results, then you will be in a position to judge of the value of exposure determination at the ground glass image.

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