

INTERNATIONAL STANDARD

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1229**

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Photography — Expendable photoflash lamps — Determination of light output

*Photographie — Lampes à éclair à combustion — Détermination de l'émission
lumineuse*



Reference number
ISO 1229 : 1989 (E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 1229 was prepared by Technical Committee ISO/TC 42, *Photography*.

This second edition cancels and replaces the first edition (ISO 1229 : 1972), of which it constitutes a technical revision.

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International Organization for Standardization

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Photography — Expendable photoflash lamps — Determination of light output

1 Scope

This International Standard specifies methods for determining the light output of expendable non-reflected photoflash lamps. The test apparatus described makes it possible to obtain

- a) a recording of the light versus time curve;
- b) total light output in lumen seconds (lm·s), determined from the curve, a) above, by integration, or directly by a suitable integrating circuit for the photoelectric current.

The test procedures apply to expendable non-reflected photoflash lamps in which the light is produced by an electrically initiated combustion within a transparent envelope. The procedures enable the luminous flux versus time to be determined.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

CIE¹⁾ publication 25 (TC-1.2.) : 1973, *Procedures for the measurement of luminous flux of discharge lamps and for their calibration as working standards*.

3 Test apparatus

3.1 Cathode-ray oscilloscope, or equivalent apparatus, having a beam intensity modulation and a single sweep circuit with sweep times of approximately 20 ms to 100 ms.

3.2 Oscillator, capable of supplying calibrated output frequencies of 0,4 kHz to 2 kHz, for connection to the beam intensity modulation terminals of the oscilloscope.

3.3 Integrating sphere, of the type generally used for the measurement of the lumen output of incandescent lamps.

The inside diameter of the sphere shall be at least 4,5 times the largest dimensions of the largest photoflash lamp to be measured. Other conditions shall conform to CIE publication 25 (TC-1.2.).

3.4 Detection system, comprising a vacuum phototube and filter combination, or other suitable detector/filter combination, having a spectral response approximately that of a CIE standard photometric observer.

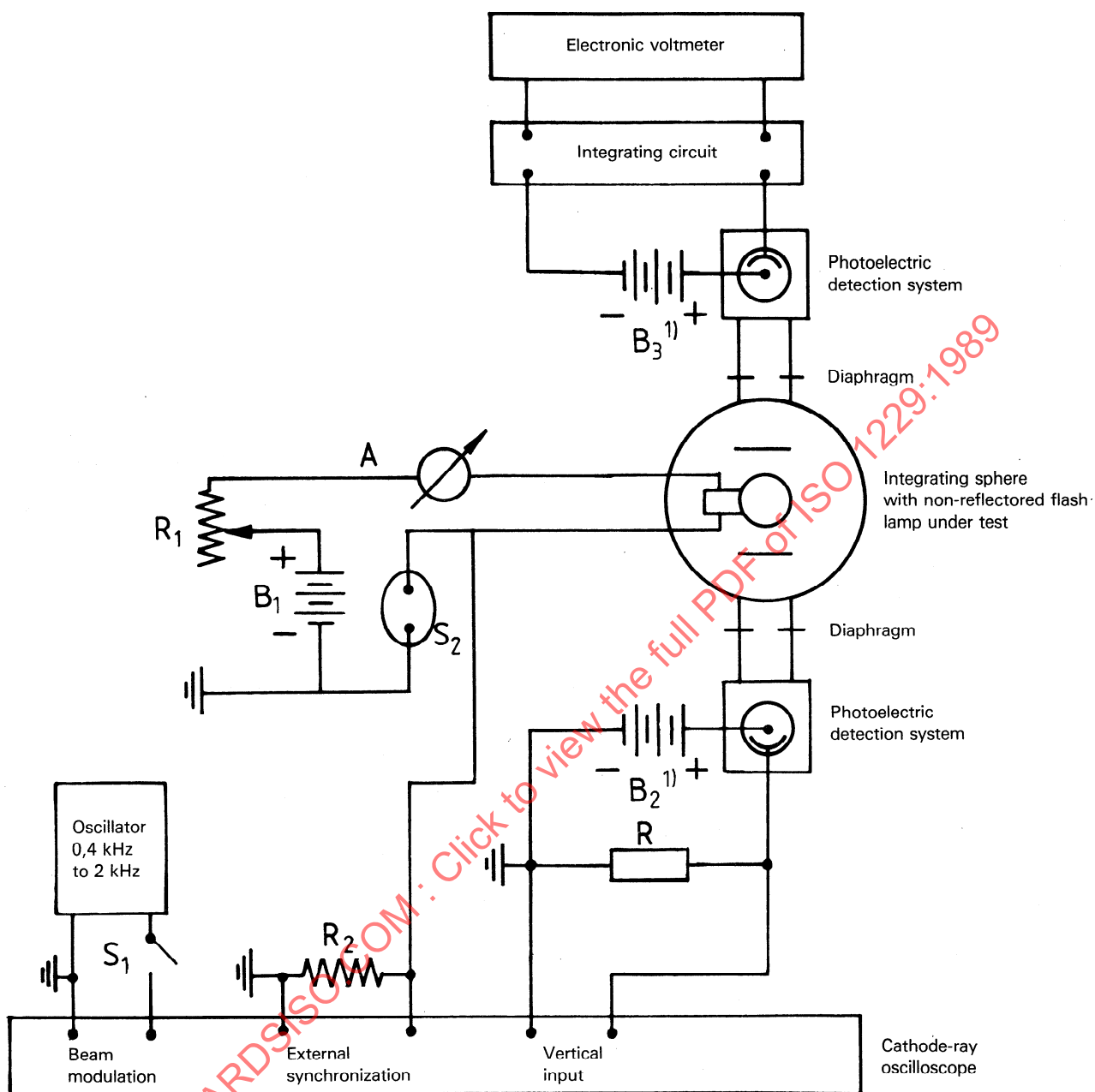
3.5 Integrating circuit, for the measurement of the light output in lumen seconds.

3.6 Direct current supply, of $3,0 \text{ V} \pm 0,1 \text{ V}$, and series resistance such that a current of 3,0 A can be obtained.

3.7 Camera, or other suitable means of providing a permanent record of the light output-time response of the flashing lamp.

3.8 Photodetector circuit, connected to the vertical deflection circuit of the cathode-ray tube in the oscilloscope, and triggering circuit with resistor R_2 as depicted in figure 1.

1) Commission internationale de l'éclairage (International Commission on Illumination).



- A Ammeter
R Resistor
 R_1 Variable resistor
 R_2 Fixed resistor (depends on type of oscilloscope and lamp supply circuit)
 S_1 Manual switch
 S_2 Mercury switch
 B_1 Direct current source, 3 V
 B_2 Direct current source, 90 V to 450 V¹⁾
 B_3 Direct current source, 90 V to 450 V¹⁾

Figure 1 — Test circuit for determining the light output of non-reflected photoflash lamps

1) Actual voltage within this range shall be no greater than the manufacturer's recommended value for the photoelectric tube used.

4 Photometric tests

The photometric tests on non-reflectored photoflash lamps are carried out in an integrating sphere equipped with a suitable detection system. The required light versus time data shall be recorded from the oscilloscope by photographing the traces, through the use of long persistence screens, or by other suitable means such as computerized data acquisition.

5 Calibration of apparatus

A calibrated incandescent standard lamp of luminous flux of at least 8 klm is used to calibrate the Y or lumen axis. The resistor R in the circuit diagram of the lower part of figure 1 will govern the deflection in the Y axis direction. For the measurement of photoflash lamps, this resistor shall be chosen in such a way that with a suitable gain setting of the oscilloscope amplifier the flash curve covers about two-thirds of the total available screen-height.

During calibration with an incandescent standard lamp, the resistor R will have to be replaced by a resistor chosen in such a way that the resulting resistance of the resistor and the input impedance of the Y axis terminals will, with the same gain setting, give a deflection of the same order as with the flash lamp under test.

In addition, in order to obtain deflection of the same order of magnitude with flash lamps having widely different peak lumen outputs, a set of diaphragms of known transmission shall be available for use in the sphere window when photoflash lamps are measured. The calibration of the ordinates of the luminous flux versus time curves obtained is given by the following equation

$$\text{lumens} = \frac{F}{r} \times \frac{d}{D} \times \frac{R_c}{R_t}$$

where

F is the luminous flux, in lumens, of the incandescent standard lamp;

d is the deflection or relative response, in volts, of the cathode-ray beam during testing of the photoflash lamp;

D is the deflection or relative response, in volts, of the cathode-ray beam during calibration with the standard lamp operated at specified voltage and without a diaphragm in the sphere window;

r is the transmission factor of the diaphragm used with the photoflash lamp under test;

R_c is the effective photocell load resistance, in ohms, used in calibration;

R_t is the effective photocell load resistance, in ohms, used during testing.

6 Time calibration

Time calibration shall be carried out by means of the marker pulses introduced by the beam intensity modulation (see 3.1 and 3.2).

7 Procedure

7.1 Using the direct current supply specified in 3.6 (see note 1), insert a shorting plug in the photoflash lamp socket, close the mercury switch S_2 (see note 2 and figure 1), and adjust the variable resistor R_1 , until the ammeter reads 3 A.

NOTES

1 To obtain significant ratings, measurements should be made at definite reproducible input values which conform to actual practice. Peak time ratings of photoflash lamps are therefore measured using a 3 V source and a 3 A short-circuit current because this approximates to most field applications.

2 Instead of the mercury switch a suitable electronic switching circuit may be used.

7.2 Open the mercury switch and remove the shorting plug. Adjust the single sweep control of the oscilloscope until it triggers with the operation of the mercury switch S_2 . A 1Ω resistance across the test lamp socket is necessary when making this adjustment. With the photoflash lamp under test in its socket and the oscillator operating, close switch S_1 , open the camera shutter, and close the mercury switch S_2 .

7.3 Set the intensity adjustment of the oscilloscope so that the trace is faint but visible until with modulation it alternates between complete blanking out and strong intensification.

7.4 An example of a luminous flux versus time curve made with this apparatus is shown in figure 2. The zero line is obtained by operating the mercury switch, S_2 , with the photoflash lamp in the sphere replaced by a 1Ω resistor or shorting plug.

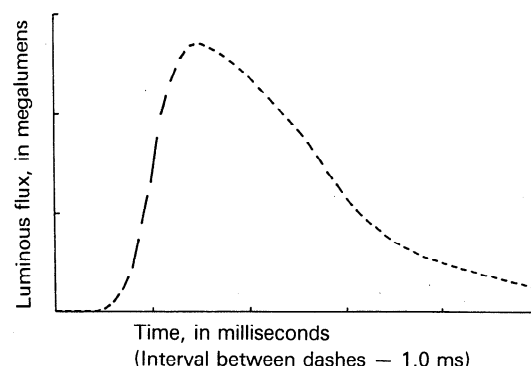


Figure 2 — Luminous flux versus time curve

8 Method for determining the quantity of light (lumen seconds)

The method of directly measuring the quantity of light from photoflash lamps is based on the use of a suitable integrating circuit for the photoelectric current. This circuit is indicated in the upper portion of figure 1.

The integrating apparatus is calibrated using an incandescent standard lamp of known luminous flux in the integrating

sphere. The photoelectric current is integrated during an accurately known time period. This time period is determined by an electronic gate which starts and stops the integration.

The luminous flux of the above standard lamp shall be at least 5 klm; the time period shall be chosen in such a way that the quantity of light during calibration is of the same order of magnitude as that of the photoflash lamps to be tested.

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