INTERNATIONAL STANDARD ISO 2242

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Photography — Light sources for use in sensitometric exposure — Simulation of the spectral distribution of photoflood illumination

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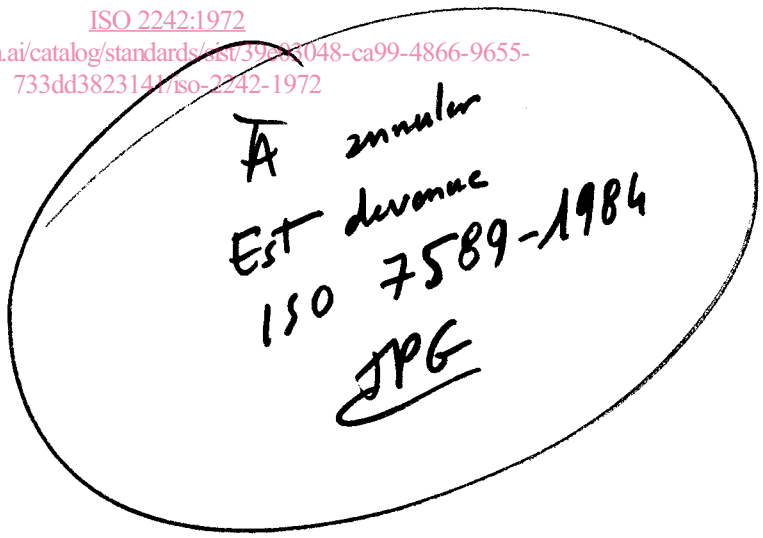

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up 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.

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.

International Standard ISO 2242 was drawn up by Technical Committee ISO/TC 42, *Photography*.

It was approved in September 1971 by the Member Bodies of the following countries :

Belgium	Japan	Thailand
Czechoslovakia	New Zealand	United Kingdom
Egypt, Arab Rep. of	Romania	U.S.A.
France	South Africa, Rep. of	U.S.S.R.
Germany	Spain	
Italy	Switzerland	

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Photography — Light sources for use in sensitometric exposure — Simulation of the spectral distribution of photoflood illumination

0 INTRODUCTION

Colour films at present available for photography with artificial light are of two types. One type is balanced for exposure to incandescent tungsten sources operated at a colour temperature of 3 200 K; the other is balanced for incandescent tungsten sources operated at 3 400 K. The sensitometric illuminant described in this International Standard is intended for use with the latter (3 400 K).

In this International Standard the specifications of the spectral energy distribution for the sensitometric illuminant are derived from the spectral energy distribution of a black body having a colour temperature of 3 400 K modified by the spectral transmittance values for a representative camera lens as given in Table 3. Although further study is required to establish with certainty the spectral transmittance which best characterizes a representative camera lens, the values given in Table 3 are considered reasonable and adequate for the intended purpose of this International Standard.

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies requirements for light sources appropriate for use in the sensitometric exposure of photographic materials, both monochrome and colour. The spectral quality of the exposing radiant energy closely matches the spectral energy distribution of average photoflood illumination modified by the spectral transmittance of a representative camera lens (see Table 3), exclusive of the infrared.

2 LIGHT SOURCE

2.1 General requirements

The light source shall be a lamp operated at a condition such that, with an absorbing filter if necessary, the energy incident on the exposure plane of the sensitometer will have, within the limits shown in Table 1, the spectral distribution shown for standard sensitometric photoflood (SSP) (see Table 2).

2.2 Specific requirements

An illuminant meeting the requirements of this International Standard shall provide in each spectral interval the same portion of its total energy as is provided in the corresponding spectral interval by standard sensitometric photoflood (SSP) (within the limits shown in Table 1).

An example of a suitable illuminant is given in the Annex.

TABLE 1 – **Requirements for relative spectral energy distribution**

Spectral interval nm	Relative energy of SSP	Energy/Total energy		
		SSP	Illuminant	
			Lower limits	Upper limits
360 to 400	57,7	0,020	0,015	0,025
410 to 450	177,1	0,062	0,057	0,067
460 to 500	302,9	0,106	0,101	0,111
510 to 550	429,0	0,149	0,144	0,154
560 to 600	543,9	0,189	0,184	0,194
610 to 650	642,1	0,224	0,219	0,229
660 to 700	718,7	0,250	0,245	0,255
Total	2 871,4	1,000		

The calculations of energy/total energy for each spectral interval of standard sensitometric photoflood are indicated in Table 2.

TABLE 2 – **Relative spectral energy distribution of standard sensitometric photoflood**[1)]

Wavelength nm	Relative energy	Interval sum	Energy/Total energy
360	2,7		
370	6,7		
380	11,3		
390	16,0		
400	21,0	57,7	58/2 871 = 0,020
410	25,7		
420	30,5		
430	35,4		
440	40,4		
450	45,1	177,1	177/2 871 = 0,062
460	50,1		
470	55,4		
480	60,7		
490	65,6		
500	71,1	302,9	303/2 871 = 0,106
510	76,1		
520	81,0		
530	85,8		
540	90,7		
550	95,4	429,0	429/2 871 = 0,149
560	100,0		
570	104,5		
580	108,9		
590	113,2		
600	117,3	543,9	544/2 871 = 0,189
610	121,2		
620	125,0		
630	128,6		
640	132,0		
650	135,3	642,1	642/2 871 = 0,224
660	138,3		
670	141,2		
680	143,9		
690	146,5		
700	148,8	718,7	719/2 871 = 0,250
Total	2 871,4	Total	1,000

1) 3 400 K calculated from Planck equation using C_2 = 1,438 79 and incorporating the transmittance of a representative camera lens (see Table 3).

TABLE 3 – **Spectral transmittance of representative camera lens and of liquid filter**

Wavelength	Spectral transmittance	
nm	Camera lens	Liquid filter
360	0,20	0,606
370	0,41	0,678
380	0,58	0,739
390	0,71	0,785
400	0,80	0,817
410	0,86	0,837
420	0,90	0,846
430	0,93	0,843
440	0,95	0,828
450	0,96	0,803
460	0,97	0,776
470	0,98	0,752
480	0,99	0,730
490	0,99	0,705
500	1,00	0,672
510	1,00	0,639
520	1,00	0,613
530	1,00	0,599
540	1,00	0,590
550	1,00	0,579
560	1,00	0,566
570	1,00	0,549
580	1,00	0,532
590	1,00	0,515
600	1,00	0,501
610	1,00	0,491
620	1,00	0,483
630	1,00	0,475
640	1,00	0,468
650	1,00	0,463
660	1,00	0,456
670	1,00	0,449
680	1,00	0,440
690	1,00	0,429
700	1,00	0,418

ANNEX

EXAMPLE OF A SUITABLE ILLUMINANT

A.1 LIGHT SOURCE

Although other light sources and filters may be used, one light source which meets the specific requirements of 2.2 consists of an incandescent tungsten filament lamp operated at a colour temperature of 2 850 K together with a selectively absorbing filter[1] having spectral transmittance values which conform to those in Table 3 and made up as described in section A.2.

A.2 FILTER

Two solutions shall be compounded according to the following formulae, the complete filter consisting of a 1 ± 0,005 cm layer of each solution contained in a double cell made by using three pieces of borosilicate crown glass (refractive index, $n = 1{,}51$) each 2,5 ± 0,05 mm thick. The working temperature of the filter shall be 20 ± 5 °C.

Solution A

Copper (II) sulphate ($CuSO_4.5H_2O$)	0,928	g
Mannitol [$C_6H_8(OH)_6$]	0,928	g
Pyridine (C_5H_5N)	30,0	ml
Water (distilled) to make	1 000,0	ml

Solution B

Ammonium cobalt (II) sulphate hexahydrate [$(NH_4)_2SO_4.CoSO_4.6H_2O$]	7,796	g
Copper (II) sulphate ($CuSO_4.5H_2O$)	6,455	g
Sulphuric acid ($\rho = 1{,}84$ g/ml)	10,0	ml
Water (distilled) to make	1 000,0	ml

The luminous transmittance of this filter to 2 850 K radiation is 0,548.

1) Detailed consideration of the make-up of colour-correcting filters is given in NBS Miscellaneous Publication No. 114, duplicate copies of which may be purchased upon application from Photoduplication Section, Library of Congress, Washington, D.C. 20540, USA.