SLOVENSKI STANDARD
SIST ISO 2720:2011

01-julij-2011

Fotografija - Univerzalni fotografski fotoelektrični svetlomeri - Navodilo za tehnični opis

Photography - General purpose photographic exposure meters (photoelectric type) - Guide to product specification

Photographie - Posemètres photographiques pour usage général (type photoélectrique) - Base de spécification

Ta slovenski standard je istoveten z: **ISO 2720:1974**

ICS:

37.040.10	Fotografska oprema. Projektorji	Photographic equipment. Projectors

SIST ISO 2720:2011 **en,fr**

INTERNATIONAL STANDARD 2720

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Photography — General purpose photographic exposure meters (photoelectric type) — Guide to product specification

Photographie — Posemètres photographiques pour usage général (type photoélectrique) — Base de spécification

First edition — 1974-08-15

UDC 771.376.35

Ref. No. ISO 2720-1974 (E)

Descriptors : photography, photographic equipment, photographic exposure meters, calibrating, testing conditions.

Price based on 7 pages

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 2720 was drawn up by Technical Committee ISO/TC 42, *Photography*, and circulated to the Member Bodies in July 1972.

It has been approved by the Member Bodies of the following countries :

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

No Member Body expressed disapproval of the document.

Printed in Switzerland

CONTENTS

This page intentionally left blank

Photography — General purpose photographic exposure meters (photoelectric type) — Guide to product specification

0 INTRODUCTION

This International Standard has been prepared in order to make information available for the development, manufacture and test of photoelectric exposure meters. It does not cover the automatic or semi-automatic control of exposure in cameras.

Photographic exposure is defined as the product of exposure time and image illuminance. Satisfactory exposure is achieved within the camera by control of the effective exposure time (shutter speed) and the relative aperture (*f*-number) and depends on the speed of the photo-sensitive material used and on the light incident upon it. In order to determine the exposure required, the luminance of, or illuminance falling upon, a given scene is measured by the exposure meter and a calculating mechanism is used to correlate the meter indication with the camera exposure settings for the photo-sensitive material used.

Exposure meters are calibrated by reference to a standard subject; reflected light meters by reference to an area of known uniform luminance which covers completely the whole field of view of the meter; incident light meters by reference to a point source of light of known luminous intensity located on the meter axis.

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies calibration levels and test conditions for general purpose photoelectric exposure meters which measure reflected light or incident light, or both, in determining photographic exposure for camera use.

It applies to meters containing a light sensitive element, an indicating electrical instrument calibrated in suitable units such as luminance, illuminance, or some factor of photographic exposure, a directional system and a calculator to correlate the meter indications with the camera exposure settings for the particular photographic film being used.

Quality of product is not covered.

2 REFERENCES

IEC Publication 68-2-6, *Basic environmental testing procedures — Test Fc : Vibration.*

IEC Publication 68-2-27, *Basic environmental testing procedures — Test Ea : Shock.*

3 GENERAL REQUIREMENTS

3.1 Meter and calculator markings

3.1.1 *Nomenclature*

The preferred exposure-parameter markings shown on the calculator or scale of the instrument shall be compatible with the symbols, abbreviations, and relationships given in clause 6.

3.1.2 *Relative aperture scale*

Numbered aperture markings shall be selected from the series of *f*-numbers given in table 2. The symbol used to indicate relative aperture shall be $1 : A$ or $f : A$ or f/A or $f\text{-}A$ where A is the *f*-number.

Intermediate scale divisions may be used and may be numbered.

3.1.3 *Effective exposure time scale (shutter speed)*

Effective exposure time scale markings shall be selected from the series of effective exposure times given in table 2.

Intermediate scale divisions may be used and may be numbered.

3.1.4 *Film speed markings*

Markings shall include the logarithmic and/or arithmetic film speeds (S° or S respectively) selected from the series of film speeds given in table 2. These film speeds may be designated as ISO if they are consistent with ISO proposals or International Standards.

3.1.5 *Exposure value scale*

Exposure values, when shown, shall be in numerical sequence determined from the equations given in clause 6 for any combination of relative aperture and effective exposure time. A change in meter reading of one exposure value unit, E_V, will require a change in exposure by a factor of 2. This unit is called a STEP.

3.1.6 *Light scale*

Because the light reading is used as a basis for setting the calculator, the light scale may be marked in light units or in any arbitrary units, or may not be marked at all, provided that transfer of the measured light value to the calculator can be made effectively.

3.2 Balance of movement

The moving coil system of the meter shall be statically balanced to permit accurate indication. Balance shall be tested with zero illuminance on the photo-sensitive element. A battery, if included, shall be switched off.

The pointer shall first be set to the zero mark on the scale when the meter is held so that the plane of movement of the pointer is horizontal. The device shall then be turned through 90° so that the plane of movement is vertical with the pointer : 1) horizontal, 2) vertical.

The deflection of the pointer from its initial position to that of maximum deflection after vibration to minimise friction, shall not exceed a prescribed percentage of the scale length.

3.3 Light sources for calibrating exposure meters

The light source used for calibrating meters shall operate at such a correlated colour temperature that it represents a reasonable compromise between the requirements of photography under tungsten and daylight lighting conditions, and shall closely match the relative spectral energy distribution of a black body at this temperature.

A possible correlated colour temperature for this purpose is 4 700 K. The chosen correlated colour temperature may be achieved by the use of a clear tungsten filament lamp operated at a specific correlated colour temperature used in conjunction with a suitable glass or liquid filter.

3.3.1 *Correlated colour temperature conversion filter*

Although other light sources and filters may be used, one reference lamp-filter combination to provide radiation at a correlated colour temperature of 4 700 K consists of a tungsten filament lamp operated at a correlated colour temperature of 2 855,6 K used in conjunction with a selectively absorbing liquid filter[1] made up as described below.

Two solutions shall be compounded according to the following formulae, the complete filter consisting of a 10 ± 0,05 mm 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 pentahydrate ($CuSO_4 \cdot 5H_2O$)	2,377	g
Mannitol [$C_6H_8(OH)_6$]	2,377	g
Pyridine (C_5H_5N)	30,0	ml
Water, distilled, to make	1 000,0	ml

Solution B

Ammonium cobalt(II) sulphate hexahydrate [$(NH_4)_2SO_4 \cdot CoSO_4 \cdot 6H_2O$]	21,045	g
Copper(II) sulphate pentahydrate ($CuSO_4 \cdot 5H_2O$)	15,642	g
Sulphuric acid (ρ = 1,84 g/ml at 20 °C)	10,0	ml
Water, distilled, to make	1 000,0	ml

The luminous transmittance τ_v of this filter to 2 855,6 K radiation is 0,259.

This combination filter may be used as a reference standard for calibration and when setting up test equipment using the selectively absorbing glass filters mentioned in this International Standard.

3.3.2 *Reflected light meters*

For calibrating reflected light meters a combination of a selectively absorbing blue glass filter, together with a diffusing screen designed to provide the required effective colour temperature of the source luminance, may be used, in conjunction with a clear tungsten filament lamp. The luminance of this extended source at any angle within 60° from the meter axis shall not be less than 85 % of the maximum luminance. The source shall be large enough to cause a change in the light indication of the meter, not greater than 1/12 step when the meter is rotated 5° in any direction from its test position.

3.3.3 *Incident light meters*

For calibrating incident light meters a selectively absorbing blue glass filter may be used, in conjunction with a clear tungsten filament lamp. The effective size of the luminous source shall be small enough to perform as a point source, so that the inverse square law of illumination may be obeyed.

NOTE – The minimum distance between the light source and the meter must exceed ten times the maximum dimension of the luminous source or of the receiver whichever is the greater.

3.4 Spectral sensitivity

3.4.1 *Requirements*

The spectral sensitivity of the meter shall be continuous over the wavelength range 400 to 700 nm but shall not extend appreciably beyond this range.

The effect of different spectral sensitivities of different light sensitive elements used in exposure meters shall be assessed by comparing the transmittance of the correlated colour temperature conversion filter mentioned in 3.3.1, when measured by :

1) the CIE Standard Photometric Observer, i.e. the luminous transmittance τ_v, and

2) the exposure meter, i.e. the meter transmittance τ_m.

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, U.S.A.

3.4.2 *Test*

The meter shall be mounted on a photometer bench and its distance from a constant tungsten source giving light at a correlated colour temperature of 2 855,6 K adjusted to d_1 to give a convenient indication on the meter. The filter specified in 3.3.1 shall then be interposed between source and meter and their distance apart re-adjusted to d_2 to give the same meter indication as previously.

The meter transmittance τ_m is given by

$$\tau_m = \left(\frac{d_2}{d_1}\right)^2$$

The luminous transmittance τ_v has been determined for this filter from the density wavelength relationship of the filter in conjunction with the standard visibility curve and Planck's radiation law, and is 0,259 at 2 855,6 K.

The spectral behaviour of the meter is assessed by the value of the ratio τ_m/τ_v.

It is permissible and convenient to connect a separate current indicating instrument to the photo-sensitive element circuit in place of the meter indicating instrument, provided that no mechanical change of the meter occurs which could modify the light receptor response characteristic.

3.5 Calibration constant

The calibration constant K (for reflected light meters) and C (for incident light meters) may be assigned a value within the limits given in 6.3.

The value of K or C, or both, may be marked on the nameplate of the exposure meter or given in the instruction manual furnished with the meter by the manufacturer. The allowable range in the value of the constants is not intended to permit increased calibration error. Its purpose is to allow the manufacturer to use and declare an optimum value of the constant within the stipulated limits to take into account design variations and prescribed methods of use.

3.6 Meter sensitivity

Meter sensitivity shall be expressed as the effective exposure time scale marking in seconds which corresponds to the lowest effective light mark on the light scale for a relative aperture of $f/8$ when the calculator is set to a film speed represented by

$$S = 100 \quad \text{or} \quad S^\circ = 21$$

3.7 Response time

The response time of an exposure meter shall be measured at two levels of light incident upon the meter.

3.7.1 *Normal light level*

The exposure meter shall be exposed suddenly to a constant luminance or illuminance sufficient to give pointer deflection to a convenient mid or upper scale mark. The response time of the meter is the time taken for the pointer to reach and remain within one-third of a step of its final value.

3.7.2 *Low light level*

The exposure meter shall be exposed for 2 min to a luminance or illuminance sufficient to give pointer deflection to a mark 2 steps above the lowest scale mark. The exposure shall then be terminated suddenly. The response time is the time taken for the pointer to coincide with the lowest scale mark.

3.8 Effect of temperature change

3.8.1 *Requirements*

The criteria for the effect of temperature change shall be as follows :

The change in indicated exposure at any temperature between 0 and + 40 °C from that at 20 °C, measured at any convenient mid-scale mark, and the change in indicated exposure after the meter has been subjected to temperatures of − 35 °C and + 50 °C, from that at 20 °C.

3.8.2 *Test*

The exposure meter shall be placed in air maintained constant within ± 2 °C at each prescribed temperature for at least 2 h before any readings are taken. It shall then be exposed to a tungsten light source having an effective correlated colour temperature between 2 650 K and 2 900 K, giving a luminance corresponding to a convenient mid-scale mark on the meter.

3.9 Fatigue of the photo-electric element

3.9.1 *Requirement*

The criterion for fatigue of the photo-electric element shall be determined by the test described in 3.9.2.

3.9.2 *Test*

The meter shall be kept unexposed to light for a period of not less than 1 h, and shall then be suddenly exposed to light of a luminance sufficient to give a deflection to a convenient mid-scale mark of the angular full scale deflection. The ratio of the luminance required after a protracted period to that required initially to maintain the same meter deflection, is the measure of fatigue.

The initial indication shall be that obtained after 5 s exposure; the protracted period shall be 3 min or any further period not exceeding 1 h provided that the fatigue measured is not thereby reduced.

Any incandescent lamp may be used for this test.

3.10 Shock resistance

3.10.1 *Requirement*

The change in indicated exposure to a constant light source, before and after the test described in 3.10.2, shall be the criterion for the assessment of shock resistance.