

# JIS

**JAPANESE INDUSTRIAL STANDARD**

**Determination of ISO Colour  
Contribution Index (ISO/CCI)  
of Camera Lenses**

**JIS B 7097—1986**

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## JAPANESE INDUSTRIAL STANDARD

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Determination of ISO Colour Contribution  
Index (ISO/CCI) of Camera Lenses

B 7097-1986

1. Scope

This standard specifies a method for determining the colour contribution of camera lenses, hereinafter referred to as the "lens", according to the ISO Colour Contribution Index (ISO/CCI).

2. Definitions

For the purpose of this standard, the terms defined in JIS Z 8105, JIS Z 8113, JIS Z 8120 and JIS Z 8720, and the following apply.

- (1) colour contribution index Index for the estimation of the degree to which a lens will change the overall colour of a colour photograph relative to that obtained with no lens in the system. This is indicated by a set of three numbers corresponding to three colours; blue, green and red.
- (2) ISO colour contribution index Colour contribution index calculated according to the method specified in this standard.

Symbol: ISO/CCI

- (3) photographic response The response of a photographic film to radiant flux transmitted by the lens, represented by the following formula:

$$R = \int_{\lambda_1}^{\lambda_2} S_{\lambda}(\lambda) \tau(\lambda) s(\lambda) d\lambda$$

where  $R$  : photographic response

$S_{\lambda}(\lambda)$  : spectral distribution of the radiant flux

$\tau(\lambda)$  : axial spectral transmittance of the lens

$s(\lambda)$  : spectral sensitivity of the film

$\lambda$  : wavelength

$\lambda_1$  to  $\lambda_2$  : wavelength region over which the film is sensitive

Applicable Standards and Corresponding International Standard: See page 12.

- (4) ISO standard camera lens Imaginary camera lens whose relative spectral transmittance is determined by the International Organization for Standardization (ISO) [symbol:  $\tau(\lambda)$ ](see Attached Table 1).
- (5) average colour film (for the calculation of ISO colour contribution index) Imaginary colour film whose relative spectral sensitivity is the average relative spectral sensitivity of several daylight type colour films (see Attached Table 2).
- (6) photographic daylight Daylight corresponding to a correlated colour temperature of about 5500 K. This corresponds to the spectral distribution of daylight when the sun is approx. 40° above the horizon (average solar altitude in temperate zone during the daylight hours recommended for colour photography) (See Attached Table 3).

Symbol:  $D_{55}$

- (7) spectral sensitivity of film Sensitivity of the film to monochromatic radiation. This is represented by the reciprocal of the amount of radiant energy at each wavelength required to produce a specified photographic density in the photographic image processed by a specified development.
- (8) weighted spectral sensitivity (for the calculation of ISO colour contribution index) Equalized spectral sensitivity values derived from the photographic responses to the photographic daylight of the blue sensitive layers, which are sensitive mainly to blue light, of the green sensitive layers, which are sensitive mainly to green light, and of the red sensitive layers, which are sensitive mainly to red light; the values are used when calculating the ISO colour contribution index (ISO/CCI) (See Attached Table 4).

### 3. Determination of ISO Colour Contribution Index

**3.1 Principle** The ISO colour contribution index of a lens shall be determined by multiplying the photographic responses to photographic daylight of the blue, green and red sensitive layers of the average colour film, by the spectral transmittance of the lens.

**3.2 Spectral Transmittance of the Lens** The spectral transmittance of the lens shall be determined according to the method specified in the Annex.

**3.3 Procedure of Calculation** The procedure of calculation of the ISO colour contribution index shall be as follows:

- (1) Calculate the photographic response of the blue sensitive layers of the average colour film according to the following formula (2):

$$R_B = \int_{\lambda_1}^{\lambda_2} K_B D_{55}(\lambda) \tau(\lambda) \bar{s}_B(\lambda) d\lambda \quad \dots\dots\dots (1)$$

$$= \int_{\lambda_1}^{\lambda_2} W_B(\lambda) \tau(\lambda) d\lambda \quad \dots\dots\dots (2)$$

where,  $W_B(\lambda) = K_B D_{55}(\lambda) \bar{s}_B(\lambda)$

and  $K_B$  : a constant to make  $R_B = 100$  when  $\tau(\lambda) \equiv 1$  <sup>(1)</sup>

Note (1) This means that there is no lens in the photographic system.

$D_{55}(\lambda)$  : spectral distribution of photographic daylight

$\tau(\lambda)$  : axial spectral transmittance<sup>(2)</sup> of the lens whose ISO colour contribution index is to be determined.

Note (2) Relative values may be used.

$S_B(\lambda)$  : relative spectral sensitivity of the blue sensitive layers of the average colour film

$W_B(\lambda)$  : weighted spectral sensitivity of the blue sensitive layers of the average colour film

$\lambda_1 \sim \lambda_2$  : wavelength region in which the blue sensitive layers of the average colour film is sensitive.

Concerning the actual calculation, calculate  $R_B$  using discrete values of  $W_B(\lambda)$  and  $\tau(\lambda)$  at 10 nm wavelength interval according to the following formula:

$$R_B = \sum W_B(\lambda) \tau(\lambda) \dots\dots\dots (3)$$

- (2) Likewise, calculate the photographic responses of the green sensitive layers  $R_G$  and red sensitive layers  $R_R$  of the average colour film.
- (3) Determine the common logarithms of  $R_B$ ,  $R_G$  and  $R_R$  to two decimal places.
- (4) Subtract the minimum value,  $(\log_{10} R_i)_{\min}$ , of  $\log_{10} R_i$  ( $R_i$  designates either of  $R_B$ ,  $R_G$  or  $R_R$ ) from each value of  $\log_{10} R_B$ ,  $\log_{10} R_G$  and  $\log_{10} R_R$  to make the minimum to zero.
- (5) Multiply by 100  $[\log_{10} R_B - (\log_{10} R_i)_{\min}]$ ,  $[\log_{10} R_G - (\log_{10} R_i)_{\min}]$  and  $[\log_{10} R_R - (\log_{10} R_i)_{\min}]$  values.
- (6) Let the values calculated in (5) be B, G and R, and then the ISO colour contribution index is represented by the following form.

ISO/CCI B/G/R

Remarks 1. Example of the calculation for the ISO Standard Camera Lens is shown in Attached Table 5.

2. For the ISO Colour Contribution Index, the recommended values, tolerances and acceptance criteria are illustrated in a trilinear graph. The method of plotting the ISO/CCI in the trilinear graph is shown in the Reference.