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NATIONAL METROLOGY TECHNICAL SPECIFICATION
OF THE PEOPLE'S REPUBLIC OF CHINA

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**Calibration Specification of Transmittance Measuring
Equipment for Ophthalmic Products**

眼镜产品透射比测量装置校准规范

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Calibration Specification of Transmittance Measuring Equipment for Ophthalmic Products

1 Scope

This Specification is applicable to the calibration of different principles and categories of transmittance measuring equipment for ophthalmic products (including spectrophotometer-type equipment).

2 References

ISO 13666:1998 Ophthalmic Optics - Spectacle Lenses - Vocabulary

ISO 14889:2003 Ophthalmic Optics - Spectacle Lenses - Fundamental Requirements for Uncut Finished Lenses

ISO 8980.3:2003 Ophthalmic Optics - Uncut Finished Spectacle Lenses - Part 3: Transmittance Specifications and Test Methods

ISO 8599:1994 Optics and Optical Instruments - Contact Lenses - Determination of the Spectral and Luminous Transmittance

EN 1836:1997 Personal Eye Protection - Sunglass and Sunlare Filters for General Use

ISO/CIE 10526:1991 CIE Standard Colorimetric Illuminants

ISO/CIE 10527:1991 CIE Standard Colorimetric Observers

When using this Specification, pay attention to adopt the currently valid versions of the above cited documents.

3 Terms and Units of Measurement

3.1 Ophthalmic Products

Ophthalmic products include spectacle lenses, assembled glasses (including prescription spectacle lenses), sunglasses and contact lenses, etc.

3.2 Visible Radiation

Visible radiation refers to all optical radiation that can directly cause visual induction,

Type 3 (hereinafter referred to as fast measuring equipment) uses specific light sources and filters to obtain a measurement beam in the ultraviolet waveband of (280 ~ 380) nm. After irradiating the sample being tested, it directly measure the energy level of the transmitted beam and can quickly determine whether the transmittance of the sample in this waveband is zero.

5 Metrological Characteristics

5.1 Measurement Requirements

Measurement requirements are applicable to the standard equipment for special purposes and the spectrophotometer-type equipment.

5.1.1 Wavelength range

At least shall include (280 ~ 780) nm, and shall be divided in accordance with the following wavebands:

UV-B: (280 ~ 315) nm medium-wave ultraviolet;

UV-A: (315 ~ 380) nm long-wave ultraviolet;

V: (380 ~ 780) nm visible light,

5.1.2 Transmittance measurement repeatability

The transmittance measurement repeatability of measuring equipment used to issue fair data (such as: product measurement and quality inspection) to the public shall be not greater than 1.5%.

The transmittance measurement repeatability of measuring equipment used for commercial purposes shall be not greater than 2%.

5.1.3 Transmittance indication error

The absolute value of the transmittance indication error of measuring equipment used to issue fair data (such as: product measurement and quality inspection) to the public shall be not greater than 2%.

The absolute value of the transmittance indication error of measuring equipment used for commercial purposes shall be not greater than 3%.

5.1.4 Indication error of relative visual attenuation factor Q

The absolute value of the indication error of relative visual attenuation factor Q of measuring equipment used to issue fair data (such as: product measurement and quality inspection) to the public shall be not greater than 0.02.

lenses. Each of the two colorless lenses has three standard values of transmittance (τ_V , τ_{SUA} and τ_{SUB}); each of the two colored lenses has four standard values of relative visual attenuation factor (Q_R , Q_Y , Q_G and Q_B).

6.2.3 Standard lenses for fast measuring equipment

Standard lenses for fast measuring equipment are only applicable to the calibration of the fast measuring equipment.

Standard lenses for fast measuring equipment are composed of two colorless lenses whose diopter is $(0 \pm 2) \text{ m}^{-1}$. The transmittance in the UV-B waveband is smaller than 1%; the transmittance in the UV-A waveband is respectively 4% and smaller than 1%.

7 Calibration Items and Calibration Methods

7.1 Standard Equipment for Special Purposes and Spectrophotometer-type Equipment

7.1.1 Wavelength range

In accordance with the requirements of 5.1.1, operate the calibrated equipment to perform transmittance measurement once; check whether the wavelength range provided by the measurement result includes three wavebands: UV-B, UV-A and visible light.

7.1.2 Transmittance measurement repeatability

7.1.2.1 Standard equipment for special purposes: in accordance with the requirements of 5.1.2, select six colorless lenses in 6.2.1; continuously measure each one for at least 3 times to respectively obtain the measured values of transmittance. Take the range of the lens with the largest range among the three measured values of transmittance as the transmittance measurement repeatability of the equipment.

7.1.2.2 Spectrophotometer-type equipment: in accordance with the requirements of 5.1.2, select two standard lenses (flat plain lenses and spherical plain lenses) in 6.2.1 or 6.2.2; continuously measure each one for at least 3 times; use the measured spectral transmittance to obtain the transmittance value through manual or programmed calculation. Take the range of the lens with the largest range among the three measured values of transmittance as the transmittance measurement repeatability of the equipment.

7.1.3 Transmittance indication error

7.1.3.1 Standard equipment for special purposes: in accordance with the requirements of 5.1.3, select six colorless lenses in 6.2.1; continuously measure each one for at least 3 times to respectively obtain the measured values of transmittance. Calculate the

laboratory);

- d) Unique identification (for example, serial No.) of the certificate or report, and identification of each page and the total number of pages;
- e) Name and address of organization, to which, calibration is submitted;
- f) Description and clear identification of object being calibrated;
- g) Date of calibration: if it is related to the validity and application of calibration results, the date of receipt of the calibrated object shall be stated;
- h) If it is related to the validity and application of calibration results, the sampling procedure shall be explained;
- i) Identification of the technical specification, on which, calibration is based, including the name and code;
- j) Traceability and validity description of the measurement standards used in this calibration;
- k) Description of the calibration environment;
- l) Description of calibration results and measurement uncertainty;
- m) The calibration certificate shall indicate whether each index meets the metrological performance requirements or general technical requirements;
- n) The calibration certificate shall indicate the measurement object and measurement range limitation of the calibrated equipment, for example, "this equipment can only be used for the measurement of plain glass samples";
- o) Signature, post or equivalent identification of the issuer of the calibration certificate or calibration report, as well as the date of issuance;
- p) A statement that the calibration results are only valid for the current calibration of the object being calibrated;
- q) A statement that the certificate or report must not be partially copied without written approval of the laboratory.

Generally speaking, the evaluation and expression of uncertainty in measurement shall comply with the requirements of JJF 1059-1999 *Evaluation and Expression of Uncertainty in Measurement*, including the source of uncertainty and its classification, the formula and expression form of uncertainty combination, etc. (Appendix C provides an example of uncertainty analysis).

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