



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 39648-2020

**Textiles - Tests for colour fastness - Determination of colour
fastness grades by digital imaging techniques**

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1 Scope

This Standard specifies the methods for evaluating the discoloration grade of the specimen (according to Annex A) and the evaluation of the staining grade of the standard backing fabric (according to Annex B) by digital imaging techniques in the color fastness test. It also specifies the requirements of digital imaging system.

This Standard does not apply to the grading of light fastness tests of textiles.

NOTE: In the color fastness test of textiles described in the ISO 105B series of standards, the gray sample card is not used for the discoloration assessment of the specimen.

This Standard describes the apparatus, equipment settings and calibration methods for assessing discoloration and staining.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 6151, Textiles - Tests for colour fastness - General principles of testing (GB/T 6151-2016, ISO 105-A01:2010, MOD)

CIE S 012/E, Standard method of assessing the spectral quality of daylight simulators for appraisal and measurement of colour CIE 13.3,1995, Method of measuring and specifying the colour rendering properties of light sources, 2nd edition

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 system grey

The color of the interior surface of the light source box and other instrument parts visible in the captured image.

NOTE: This grey is roughly between N5 and N7 on the Munsell color chart. Under D65 light source and CIE1964 standard chromaticity observation conditions, the CIELAB chromaticity value does not exceed 2.5 in any hue direction; the CIELAB luminance value is within 50/70+/-2.

3.2 verification chart

A chart containing a series of patches of known chromaticity values.

3.3 system software

A software capable of controlling and operating a digital camera for inspection.

3.4 white tile

A plate that its color is certified and traceable to a national standard.

3.5 operator-selected area

During discoloration or staining gradings, the system software operator manually selects the location and size of the test area in the reference and specimen.

3.6 automatic grading

The system software automatically grades the test area on the reference specimen and test specimen during discoloration or staining grading.

4.1 General

There is a calibrated digital camera in the test setup (4.2). It is installed in the appropriate position of the light source box (4.3). The light source box provides a controlled and continuous lighting environment. Specimens can be individually placed in the light source box for grading. A group of specimens can also be graded simultaneously by test type. The operator shall manually select the test area. An example of the instrument structure diagram is shown in Figure 1.

If it is consistent with the operator's manual selection of the test area (3.5), the automatic

grading (3.6) method can be used.

The test instrument shall be maintained and calibrated in accordance with the manufacturer's instructions and actual conditions.

operations. It shall have a storage function. Also, it can set the operating conditions of different grading requirements.

4.2.2 Camera installation

The camera shall be installed on the top of the light source box (4.3), directly above the specimen. The camera installation shall be capable of adjusting the position of the camera lens so that the specimen grading area is parallel to the lens.

The installation height of the camera shall be such that an image of the entire grading area can be obtained by properly adjusting the focal length of the camera.

4.2.3.1 General

The verification of the camera is to determine the accuracy of the CIEXYZ value of each pixel in the output image of the camera. The verification result will be stored in the system software. Images acquired during testing are graded accordingly. The verification of the camera is based on the verification chart specified in Annex C.

4.2.3.2 Verification interval

The following shall be verified:

- After the digital imaging system is activated;
- After the camera's settings are changed;
- After the manufacturer's recommended calibration interval has been reached.

4.2.3.3 Verification time

The system software shall record the time and date of the current camera calibration and make it available for review. When the verification time expires, the system software shall automatically remind the user to perform the calibration.

4.2.3.4 Verification performance

Verification performance is expressed in terms of repeatability and accuracy of image data. The verification result is expressed as the median and maximum value of CIEDE2000 color difference. CIEDE2000 color difference is the difference between the known value and the measured value of the digital verification chart. The system software guides these verification tests.

The system software shall be able to store the current verification performance parameters of the camera, so that the user can restore the current settings of the camera.

4.2.3.5 Accuracy test

The digital camera (4.2) shall be verified within the time period specified by the manufacturer or within 8h intervals, whichever is the shorter time interval between the two.

For each color block in the calibration color card, the CIEDE2000 color difference value is tested by digital image method and spectrophotometric method, respectively.

The spectrophotometer shall be calibrated by means of the white tile (3.4). The chromaticity value of this white tile (3.4) can be traced back to national standards.

The median and maximum values of CIEDE2000 chromatic aberration shall be recorded for accuracy.

Accuracy shall meet the following requirements at the same time:

- The maximum value of CIEDE2000 is less than 5.0;
- The median value of CIEDE2000 is less than 1.0.

4.2.3.6 Repeatability test

The repeatability test shall be performed within the time period specified by the manufacturer.

Make 10 consecutive measurements on the verification chart that meets the requirements of Annex C. The digital imaging system shall measure and record all color blocks used in the calibration.

Calculate the arithmetic mean of CIELAB^{*}, a^{*}, b^{*}, c^{*} and h for each color block.

Calculate the difference between the CIEDE2000 average and the individual measurements for each block.

Calculate the median value of the CIEDE2000 color difference for each color block.

The median and maximum values of CIEDE2000 color difference shall be recorded to indicate repeatability.

Repeatability shall meet the following requirements at the same time:

- The maximum value of CIEDE2000 is less than 1.0;
- The median value of CIEDE2000 is less than 0.4.

4.3.1 General

The box shall meet the following requirements: