
**General methods of test for pigments
and extenders —**

Part 15:
**Comparison of resistance to light of
coloured pigments of similar types**

iTeh STANDARD PREVIEW
*Méthodes générales d'essai des pigments et matières de charge —
Partie 15: Comparaison de la résistance à la lumière des pigments
colorés de types semblables*
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html. (standards.iteh.ai)

This document was prepared by Technical Committee ISO/TC 256, *Pigments, dyestuffs and extenders*.

This second edition cancels and replaces the first edition (ISO 787-15:1986), of which it constitutes a minor revision. The changes compared to the previous edition are as follows:

- [Clause 3](#) on “Terms and definitions”, with a general reference to ISO 18451-1, has been added;
- a bibliography has been added;
- the text has been editorially revised.

A list of all parts in the ISO 787 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The terms “resistance to light” and “light fastness (or colour fastness)” describe the resistance of a material to change in its appearance as a result of exposure to light. The magnitude of the change, if any, is influenced by the quantity and quality of the light to which the material is exposed, and by the nature and composition of the material itself. Two compositions, each consisting of identical components but in different proportions, may not have the same resistance to light. Also, two compositions each consisting of the same proportions of similar, but not identical, components may not have the same resistance to light.

When exposed to natural light, the conditions of the test vary continuously because of the large number of variables (for example intensity and spectral distribution of the light, temperature, relative humidity, and the amount and nature of atmospheric contaminants) and therefore results cannot be related to similar tests carried out on other occasions. Consequently, expressing the results as a function of time alone is not recommended.

These considerations form the basis for the comparison of light fastness of two different samples of a coloured pigment. Each sample is incorporated in the same proportion in otherwise identical compositions and these compositions, in a suitable form, are examined for any difference in their change of appearance after exposure to the same quantity and quality of light. In order to comply with these exposure conditions, it is necessary for the compositions to be exposed side by side at the same time to the same light source for the same period of time.

In addition, the light fastness of a pigment may be affected by the presence of other pigments such as titanium dioxide. This important aspect may be accommodated in document by allowing the agreed binder (medium) to consist of a dispersion of such a pigment. The test procedure is then followed as described.

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The extent, to which the change on exposure is allowed to proceed before the comparison is made, may be of importance. It is unrealistic to assess the exposures when the change is only equivalent to the first perceptible change, but it is also inadvisable to wait until the amount of change is large. Thus, it is recommended that comparisons of change of appearance be made when the amount of change of the pigment with known resistance to light (agreed reference pigment) is equal to fastness grade 4 and 3 of the grey scale in accordance with ISO 105-A02.

For any particular application, the method of test described in this document should be completed by the following supplementary information. This information should be derived, in part or totally, from a national or an international standard or other document related to the product under test or, if appropriate, should be agreed between the interested parties.

- a) Type and identification of the agreed reference pigment.
- b) The binder (medium) for dispersion of the test sample and the agreed reference pigment and details of the composition of the dispersion.
- c) The method of dispersion to be used.
- d) Whether the test is to be carried out under natural exposure (method A) or artificial light (method B).
- e) If method A is to be used, the exposure angle of the test specimens and glass cover.
- f) If method B is to be used, the details of the apparatus and of the light source.

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General methods of test for pigments and extenders —

Part 15:

Comparison of resistance to light of coloured pigments of similar types

1 Scope

This document describes a general method of test for comparing the resistance to light of samples of similar types of coloured pigments (agreed reference pigment and test sample).

Two methods of exposure are described in this document. In method A, the material is exposed under glass to natural light. In method B, the material is exposed to direct artificial light.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 105-A02, *Textiles — Tests for colour fastness — Part A02: Grey scale for assessing change in colour*

ISO 15528, *Paints, varnishes and raw materials for paints and varnishes — Sampling*

ISO 18451-1, *Pigments, dyestuffs and extenders — Terminology — Part 1: General terms*

CIE PUBLICATION NO 20 (TC-2.2), *Recommendations for the integrated irradiance and the spectral distribution of simulated solar radiation for testing purposes*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 18451-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

4 Principle

The test sample and the agreed reference pigment are each dispersed in the same agreed binder (medium). The dispersions are applied to a substrate and dried. They are then exposed to natural daylight with protection from rain (method A) or to artificial light (method B) under specified conditions.

The resistance to light is assessed by comparing the change in colour of the test sample to that of the agreed reference pigment.

5 Apparatus and materials

5.1 Substrate

- a) aluminium or rigid cardboard panels of suitable size for the applicator used, and with a white high gloss, light fast, coated and non-absorbent surface for the application of paint or
- b) paper used as substrate for mass tone prints.

5.2 Film applicator or other device, suitable for applying, side by side, two films of wet thickness 50 µm to 100 µm, or a **suitable apparatus** for preparing mass tone prints with a thickness of about 1,5 µm.

5.3 Cover sheet, of aluminium foil or other suitable opaque material.

5.4 Grey scale for assessing change in colour, complying with ISO 105-A02.

5.5 Agreed reference pigment, for comparison with the test sample. It shall be agreed between the parties and shall be similar in composition to that of the test sample.

5.6 Binder (medium), to be agreed between the interested parties. Its choice should be made with regard to the field of application of the pigments being tested.

5.7 Cabinet for exposure under glass to natural light (for method A).

The exposure cabinet shall have a glass cover and shall be of a sufficient size to carry out the expected number of tests.

The cabinet shall be constructed of metal, wood or other material capable of protecting the coated test substrates (specimens) from rain and similar climatic effects, and there shall be adequate ventilation to allow free flow of air over the test specimens.

The glass cover shall be a single piece of clear sheet glass, of thickness 2 mm to 3 mm, and free from bubbles or other imperfections. The transmittance of the glass shall be approximately 90 % at 360 nm and throughout the visible region of the spectrum, falling to a transmittance of less than 1 % at 300 nm and shorter wavelengths. To maintain these characteristics, it is usually necessary to clean the glass periodically and to replace the glass at intervals of not more than 2 years.

The cabinet shall be fitted with a means of support that allows the specimens to be placed not less than 50 mm below, and in a plane parallel to, the glass cover. The cabinet shall be placed so as to receive direct sunlight throughout the day without shadows of neighbouring objects falling upon it. If the cabinet is placed over ground, the distance between the bottom of the cabinet and the plane of the cleared area shall be great enough to avoid any undesirable effects of contact with grass or plant growth during the period of exposure. The glass cover and the test specimens shall slope toward the equator at an angle from the horizontal approximately equal to the latitude of the location at which the tests are being made. Other angles of exposure such as 45° may be used, but the angle shall be stated in the test report.

5.8 Apparatus for exposure to artificial light (for method B).

The apparatus may be a conventional artificial weathering machine, containing a suitable light source such as a xenon arc lamp and filter system, or a similar device (see also ISO 4892-2:2013, 4.1 which gives further details of the characteristics of xenon arc lamps.)

The apparatus shall operate under the following conditions:

- the simulated total irradiance incident on the specimens provided by the light source (lamp and filter system) shall be (550 ± 55) W/m² in the range 300 nm to 800 nm;
- the irradiance shall be (50 ± 15) W/m² in the range 300 nm to 400 nm;

- the irradiance at wavelengths shorter than 320 nm shall not exceed 0,5 W/m²;
- the spectral distribution of the total radiation at wavelengths above 360 nm corresponding to [Table 1](#) and [Figure 1](#) (taken from CIE Publication No. 20); an approximation within ±10 % of radiation data are sufficient;
- the air drawn into the test chamber shall be at normal ambient conditions of temperature and humidity, the degree of ventilation shall be such that the test specimens are maintained at a black panel temperature of (50 ± 5) °C;

NOTE ISO 4892-1 gives details regarding black panel thermometers.

- no water spray shall be used.

Xenon arc lamps are convenient to use and give a spectrum reasonably close to natural daylight. It is necessary to frequently monitor the output of each lamp because it characteristically decreases (especially within the actinic region) with use. Lamps should be replaced immediately when they fail to comply with the requirements specified in this clause. Typical commercially available lamps have a useful life of about 1 000 h. In some cases, the transmission characteristics of the associated filter system also alter in course of time and a regular replacement of filters is necessary.

Table 1 — Irradiance of the total radiation in spectral bands, in watts per square metre and in percentage of $E_T = 1\ 120\ \text{W/m}^2$

Range	Wavelength nm	Irradiance W/m ²		Percentage of total radiation ^a %	
0	<280	0		0	
1	281 to 320 ^b	5		0,5	
	321 to 360	27	68	2,4	6,1
	361 to 400	36		3,2	
2	401 to 440	56		5,0	
	441 to 480	73		6,5	
	481 to 520	71		6,3	
	521 to 560	65		5,8	
	561 to 600	60	580	5,4	51,8
	601 to 640	61		5,5	
	641 to 680	55		4,9	
	681 to 720	52		4,6	
	721 to 760	46		4,1	
761 to 800	41		3,7		
3	801 to 1 000	156		13,9	
	1 001 to 1 200	108	329	9,7	29,4
	1 201 to 1 400	65		5,8	

^a Total radiation, $E_T = 1\ 120\ \text{W/m}^2$.

^b Radiation below 300 nm does not reach the surface of the earth.

^c Radiation above 3 000 nm is negligible.