2025-12-04

Plast – Bestemmelse af farveændringer og variationer i egenskaber efter eksponering for glasfiltreret solstråling, naturlig vejrpåvirkning eller strålekilder i laboratorier

Plastics – Determination of changes in colour and variations in properties after exposure to glass-filtered solar radiation, natural weathering or laboratory radiation sources

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DS/ISO 4582:2025

København
DS projekt: M398278
ICS: 83.080.01

Første del af denne publikations betegnelse er:
DS/ISO, hvilket betyder, at det er en international standard, der har status som dansk standard.
IDT med: ISO 4582:2025

DS-publikationen er på engelsk.

Denne publikation erstatter: DS/ISO 4582:2011

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ISO 4582

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Fifth edition
2025-09

Reference number
ISO 4582:2025(en)

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Published in Switzerland

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This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 6, *Ageing, chemical and environmental resistance*.

This fifth edition cancels and replaces the fourth edition (ISO 4582:2017), which has been technically revised.

The main changes are as follows:

— in 4.2.2.1 and 4.2.4.2, references to CIE tristimulus values and corresponding International Standard ISO/CIE 11664-3 and ASTM E1347 have been deleted;

— in Table 1, ISO 4628-4 for cracking and crazing has been added;

— in Table 2, ISO 4765 for chemical changes has been added;

— in 5.4, standard atmosphere 23/50 has been changed to class 2;

— in 6.2.2, reference to ISO 4628-1:2016, Table 3 has been added;

— a new Annex C (Measurements of changes in mechanical properties) has been added.

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.

A number of different exposure techniques can be used to provide information on the effects of environmental stresses such as simulated solar radiation, heat and water on plastics (see the ISO 877 series and the ISO 4892 series). Each exposure test has its own particular application and relevance. When determining changes in a particular property or attribute of a material subjected to different exposures, the same evaluation methods should be used after all exposures to ensure meaningful results.

Results for plastics subjected to exposure tests are strongly dependent on the type of exposure conditions used, the type of plastic being tested and the property being evaluated. A result obtained for one property might not be the same as that for a different property of the same material, even if the same exposure test is used. This document is not intended to establish a fixed procedure for conducting the exposure test, but is intended to provide a set of specific procedures used to express the results for change in a characteristic property of the material after it has been exposed. It is up to the user to determine which exposure conditions are most relevant to the specific material and the service conditions being used.

Test methods should be selected to determine changes in appearance and properties of the exposed material with its proposed application in mind. The exposure test used should be devised to discriminate among materials based on such changes. This document suggests typical properties that can be used to determine changes in plastics which have been subjected to exposure tests.

NOTE Because of large differences in the spectral distribution of the radiation sources used, there can be large differences in results for the same plastics exposed in the various devices described in the ISO 4892 series. Therefore, comparisons between plastics are intended to be made only based on results from exposures in the same type of device and under the same conditions. For optimum comparisons, plastics are expected to be exposed at the same time in the same device.

Plastics — Determination of changes in colour and variations in properties after exposure to glass-filtered solar radiation, natural weathering or laboratory radiation sources

1 Scope

This document specifies methods for determining changes in colour and other appearance properties, and variations in mechanical or other properties, of plastics that have been exposed to glass-filtered solar radiation, to natural weathering or to simulated solar radiation from a laboratory source.

The procedure used to analyse data depends on whether the test used to characterize the materials being exposed is destructive or non-destructive. The exposures are conducted under conditions specified in specific exposure standards (e.g. the ISO 877 series and the ISO 4892 series).

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-A01, *Textiles — Tests for colour fastness — Part A01: General principles of testing*

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

ISO 105-A03, *Textiles — Tests for colour fastness — Part A03: Grey scale for assessing staining*

ISO 291, *Plastics — Standard atmospheres for conditioning and testing*

ISO 2602, *Statistical interpretation of test results — Estimation of the mean — Confidence interval*

ISO 4628-1:2016, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 1: General introduction and designation system*

ISO/CIE 11664-1, *Colorimetry — Part 1: CIE standard colorimetric observers*

ISO/CIE 11664-2, *Colorimetry — Part 2: CIE standard illuminants*

ISO/CIE 11664-4, *Colorimetry — Part 4: CIE 1976 L*a*b* colour space*

CIE 015, *Colorimetry 4th ed*

3 Terms and definitions

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

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

<weathering testing> material which is of similar composition and construction to the test material and which is exposed at the same time for comparison with the test material

Note 1 to entry: An example of the use of a control material would be when a formulation different from one currently being used is being evaluated. In that case, the control material would be the plastic made with the original formulation.

Note 2 to entry: A control material is sometimes referred to as a “control."

3.2
file specimen
portion of the material to be tested which is stored under conditions in which it is stable, and is used for comparison between the exposed and the original state

3.3
test specimen
specific portion of the material upon which the testing is to be performed

3.4
replicate specimen
identical pieces of the test material being evaluated which are all exposed, conditioned and tested at the same time

[1] ISO 75 (all parts), *Plastics — Determination of temperature of deflection under load*

[2] ISO 178, *Plastics — Determination of flexural properties*

[3] ISO 179 (all parts), *Plastics — Determination of Charpy impact properties*

[4] ISO 180, *Plastics — Determination of Izod impact strength*

[5] ISO 294-2, *Plastics — Injection moulding of test specimens of thermoplastic materials — Part 2: Small tensile bars*

[6] ISO 306, *Plastics — Thermoplastic materials — Determination of Vicat softening temperature (VST)*

[7] ISO 527 (all parts), *Plastics — Determination of tensile properties*

[8] ISO 877 (all parts), *Plastics — Methods of exposure to solar radiation*

[9] ISO 2813, *Paints and varnishes — Determination of gloss value at 20°, 60° and 85°*

[10] ISO 2818, *Plastics — Preparation of test specimens by machining*

[11] ISO 4628-4, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 4: Assessment of degree of cracking*

[12] ISO 4628-6, *Paints and varnishes — Evaluation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 6: Assessment of degree of chalking by tape method*

[13] ISO 4765, *Chemically-induced ultra-weak photon emission (UPE) — Measurement as an analysis method of degradation of polymeric material*

[14] ISO 4892 (all parts), *Plastics — Methods of exposure to laboratory light sources*

[15] ISO 6603-1, *Plastics — Determination of puncture impact behaviour of rigid plastics — Part 1: Non-instrumented impact testing*

[16] ISO 6603-2, *Plastics — Determination of puncture impact behaviour of rigid plastics — Part 2: Instrumented impact testing*

[17] ISO 6721-1, *Plastics — Determination of dynamic mechanical properties — Part 1: General principles*

[18] ISO 6721-3, *Plastics — Determination of dynamic mechanical properties — Part 3: Flexural vibration — Resonance-curve method*

[19] ISO 6721-5, *Plastics — Determination of dynamic mechanical properties — Part 5: Flexural vibration — Non-resonance method*

[20] ISO 8256, *Plastics — Determination of tensile-impact strength*

[21] ISO 10350-1, *Plastics — Acquisition and presentation of comparable single-point data — Part 1: Moulding materials*

[22] ISO 10640, *Plastics — Methodology for assessing polymer photoageing by FTIR and UV/visible spectroscopy*

[23] ISO 11403-3, *Plastics — Acquisition and presentation of comparable multipoint data — Part 3: Environmental influences on properties*

[24] ISO 13468-1, *Plastics — Determination of the total luminous transmittance of transparent materials — Part 1: Single-beam instrument*

[26] ISO 18314-1, *Analytical colorimetry — Part 1: Practical colour measurement*

[27] ISO 20753, *Plastics — Test specimens*

ICS 83.080.01

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