INTERNATIONAL STANDARD

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Space systems — Measurements of thermo-optical properties of thermal control materials

Systèmes spatiaux — Mesures des propriétés thermo-optiques des matériaux de thermorégulation

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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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).

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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 meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 14, *Space systems and operations*.

Introduction

Throughout this International Standard, the minimum essential criteria are identified by the use of the imperative or the keyword “shall”. Recommended criteria are identified by the use of the keyword “should” and, while not mandatory, are considered to be of primary importance in providing serviceable, economical, and practical designs. Deviations from the recommended criteria can be made only after careful consideration, extensive testing, and thorough service evaluation have shown an alternative method to be satisfactory.

Solar absorptance and infrared emittance are the key parameters of materials for both active and passive thermal design of space systems.

This International Standard describes the methodology, instruments, equipment, and samples used to calculate the key parameters of thermal-control materials, i.e. solar absorptance [α_s or α_p] and the infrared emittance [ε_h or ε_n].

Attention is drawn to the possibility that some of the elements of this document can be the subject of patent rights other than those identified. ISO shall not be held responsible for identifying any or all such patent rights.

Space systems — Measurements of thermo-optical properties of thermal control materials

1 Scope

This International Standard specifies the multiple measurement methods, instruments, equipment, and samples used to calculate the thermo-optical properties of thermal control materials. This International Standard compares their features, indicates their limitations and biases, and guides the applications. These measurements will be performed at ground test facilities with the purpose of obtaining material properties. The measured properties will be used for material selection, thermal design of spacecraft, process control, quality control, etc. Also, on-orbit temperature data in the beginning of life can be assessed using the data obtained by ground measurement. Requirements for calibration and reference materials to ensure data quality are also defined.

The following test methods are detailed in the Annexes of this International Standard including the configuration of samples and calculations.

a) Solar absorptance using a spectrophotometer: (α_s) — Annex A

b) Solar absorptance using the comparative test method: (α_p) — Annex B

c) Hemispherical infrared emittance using the thermal test method: ($\varepsilon_{h\text{-}t}$) — Annex C

d) Normal infrared emittance using an IR spectrometer: ($\varepsilon_{n\text{-}s}$) — Annex D

e) Normal infrared emittance using ellipsoid collector optics ($\varepsilon_{n\text{-}e}$) — Annex E

f) Normal infrared emittance using two rotating cavities: ($\varepsilon_{n\text{-}c}$) — Annex F

2 Normative references

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

ISO 9288:1989, *Thermal insulation — Heat transfer by radiation — Physical quantities and definitions*

ISO 21348:2007, *Space environment (natural and artificial) — Process for determining solar irradiances*

ASTM E490-00a:2006, *Standard Solar Constant and Zero Air Mass Solar Spectral Irradiance Tables*

3 Terms and definitions

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

3.1
absorptance *(α)*
$\alpha = \Phi a/\Phi m$
where Φa is the absorbed radiant flux or the absorbed luminous flux and Φm is the radiant flux or luminous flux of the incident radiation

[SOURCE: ISO 80000-7]