INTERNATIONAL STANDARD

ISO 16691

First edition
2014-02-15

Space systems — Thermal control coatings for spacecraft — General requirements

Systèmes spatial — Revetements pour le contrôle thermique des satellites et vehicules spatiaux — Exigences générales

Reference number
ISO 16691:2014(E)

© ISO 2014



COPYRIGHT PROTECTED DOCUMENT

© ISO 2014

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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

Published in Switzerland

Contents

Page

Foreword ..... **iv**

Introduction ..... **v**

1 Scope **1**

2 Normative references **1**

3 Terms, definitions, and abbreviated terms **1**
3.1 Terms and definitions 1
3.2 Abbreviated terms 4

4 General **4**
4.1 Functionality 5
4.2 Basic components 6

5 Selection **6**

6 Test methods for TCC **8**
6.1 Visual inspection 8
6.2 Coating thickness 8
6.3 Adhesion 8
6.4 Thermo-optical properties 8
6.5 Resistance (electrical surface resistance and electrical volume resistivity) 10
6.6 Outgassing 10
6.7 UV-resistance 11
6.8 Radiation resistance 11
6.9 Atomic oxygen resistance 11
6.10 Gloss 11
6.11 Temperature cycling (influence of temperatures) 11
6.12 Mass of ejecta 11

7 Requirements for application **11**

8 Safety requirements for TCC application **12**

9 Identification **12**

10 Protectors **12**

11 Packing **13**

12 Production program of quality assurance **13**
12.1 General 13

13 Changes and revisions **13**
13.1 Permissive document 13
13.2 Necessary signatures for the confirmatory document 14
13.3 Record of changes 14

Annex A (informative) **General properties of TCC-I and TCC-II** **15**

Bibliography **17**

© ISO 2014 – All rights reserved

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 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*.

© ISO 2014 – All rights reserved

Introduction

This International Standard explains technical information for TCCs selection and application required to confirm their compliance with the requirements of the thermal control for spacecraft.

This International Standard classifies thermal control coatings in accordance with their usage in passive and/or active thermal control subsystems for reduction of external heat absorption or regulation of radiant heat exchange between on-board equipment on spacecraft, their general properties, and their special characteristics for space environment applications.

This International Standard also contains special recommendations for surface preparation, application of coating systems and curing, and establishes requirements for test methods on estimating properties of thermal control coatings according to their target use.

© ISO 2014 – All rights reserved

Space systems — Thermal control coatings for spacecraft — General requirements

1 Scope

This International Standard defines general requirements for thermal control coatings (TCC) that are applied on metallic and/or non-metallic surfaces of spacecraft and payloads in order to provide the following thermo-optical properties:

— α_S: solar absorptance;

— ε: emittance.

The function of TCC is to reduce external heat absorption and/or to regulate radiant heat exchange between on-board equipment on spacecraft.

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 9117-1:2009, *Paints and varnishes — Drying tests — Part 1: Determination of through-dry state and through-dry time*

ISO 14624-3, *Space systems — Safety and compatibility of materials — Part 3: Determination of offgassed products from materials and assembled articles*

3 Terms, definitions, and abbreviated terms

3.1 Terms and definitions

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

3.1.1
active thermal control system
system where the active thermal control method is used

Note 1 to entry: The active thermal control method is the procedure to control the temperature using mechanical mobile components or fluid, using electric energy from a heater, changing the component's thermo-physical property, or utilizing another technology to change/control the temperature.

[SOURCE: JERG-2–310:2009]

3.1.2
coating
continuous layer formed from a single or multiple application of a coating material to a substrate

[SOURCE: ISO 4618:2006]

© ISO 2014 – All rights reserved