
**Space systems — Safety and
compatibility of materials —**

Part 7:

**Determination of permeability and
penetration of materials to aerospace
fluids**

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Systèmes spatiaux — Sécurité et compatibilité des matériaux —

*Partie 7: Détermination de la perméabilité et de la pénétration des
matériaux aux fluides aérospatiaux*

<https://standards.iteh.ai/catalog/standards/sist/b324dff7-0ff5-4204-a0db-2b6c87cb8c51/iso-14624-7-2006>



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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

ISO 14624-7 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 14, *Space systems and operations*.

ISO 14624 consists of the following parts, under the general title *Space systems — Safety and compatibility of materials*:

- Part 1: *Determination of upward flammability of materials*
- Part 2: *Determination of flammability of electrical-wire insulation and accessory materials*
- Part 3: *Determination of offgassed products from materials and assembled articles*
- Part 4: *Determination of upward flammability of materials in pressurized gaseous oxygen or oxygen-enriched environments*
- Part 5: *Determination of reactivity of system/component materials with aerospace propellants*
- Part 6: *Determination of reactivity of processing materials with aerospace fluids*
- Part 7: *Determination of permeability and penetration of materials to aerospace fluids*

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Introduction

The purpose of this part of ISO 14624 is to provide procedures to determine the permeability rate and penetration resistance of materials exposed to aerospace fluids.

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Space systems — Safety and compatibility of materials —

Part 7:

Determination of permeability and penetration of materials to aerospace fluids

1 Scope

This part of ISO 14624 specifies test equipment and techniques used to identify interactions resulting from exposure of a material to an aerospace fluid.

This part of ISO 14624 can be used to determine the reactivity of materials with aerospace fluids. It provides a means to determine the effects of minor amounts of aerospace fluids, such as in a splash or spill, on materials used in ground support processing operations, and in the selection of personal safety equipment.

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2 Normative references (standards.iteh.ai)

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.

ISO 4954, *Steels for cold heading and cold extruding*

ISO 6529, *Protective clothing — Protection against chemicals — Determination of resistance of protective clothing materials to permeation by liquids and gases*

ISO 6530, *Protective clothing — Protection against liquid chemicals — Test method for resistance of materials to penetration by liquids*

ISO 14951-3, *Space systems — Fluid characteristics — Part 3: Nitrogen*

3 Terms and definitions

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

3.1

aerospace fluid

fluid that is commonly used in the fabrication, development, processing of materials and production of aerospace and ground support equipment

EXAMPLES Cleaning agents, lubricants and solvents.

3.2

degradation

adverse physical or chemical change in a substance

**3.3
reaction**

chemical change in which a substance decomposes, combines with other substances, or interchanges constituents with other substances

4 Safety precautions

4.1 Laboratory facilities

Some aerospace fluids are considered to be toxic chemicals. These chemicals shall only be exposed to room atmosphere inside an approved laboratory hood. Separate, dedicated hoods shall be used for the oxidizers and fuels.

4.2 Protective clothing

Personal protective clothing shall be worn by personnel when performing these tests. The minimum protection required is fluid-compatible gloves, laboratory apron and face shield or goggles.

5 Test procedure

5.1 Inspection of sample on receipt

When received, the test material shall be accompanied by proper identification. The minimum information required is the manufacturer, trade name, composition, specification, generic name and batch/lot number (if known). A visual inspection shall be performed and any anomalies shall be noted. A suitable sample identification form is shown in Table A.1.

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5.2 Preparation of sample

5.2.1 General

The sample shall be tested in the intended use form (such as sheets or foams) and in the as-received thickness.

5.2.2 Sample cleaning

Samples shall be cleaned and dried to the end-use specifications. Contamination on the surfaces of solid, nonporous samples shall be removed by washing with deionized water and mild detergent, rinsing with deionized water, and drying with filtered, gaseous nitrogen. Particulates on the surfaces of solid, porous samples shall be removed with filtered, gaseous nitrogen meeting the requirements of ISO 14951-3.

5.2.3 Sample inspection

The sample shall be inspected to ensure it is at the specified worst-case thickness. Flaws and any residual contamination shall be noted. If the flaws result from sample preparation at the test facility, new samples shall be prepared. Samples with flaws that inordinately increase the surface area to bulk mass ratios shall not be tested. Samples shall be weighed and individually identified.

5.3 Penetration test

5.3.1 General

This test is used to determine the possible liquid penetration of materials when exposed to aerospace fluids or other chemicals of interest.

5.3.2 Test procedure

The test procedure shall be as follows.

- a) Place an appropriately sized sample of the test material (see Figure 1) over a beaker.
- b) Add the test fluid, approximately 1 ml of the specified test fluid, to the centre of the sample, taking care not to expose the edges of the sample to the fluid, and start the timer.
- c) Allow the test fluid to stand on the sample for the specified exposure time.
- d) Add test fluid as required to maintain a liquid film on the test sample during the specified exposure time.
- e) Carefully observe for the first fallen droplet at the bottom of the beaker, stop the timer, and note the time of occurrence.
- f) For materials used for protective garments, observe for initial wetness underneath the test sample and note the time of occurrence.

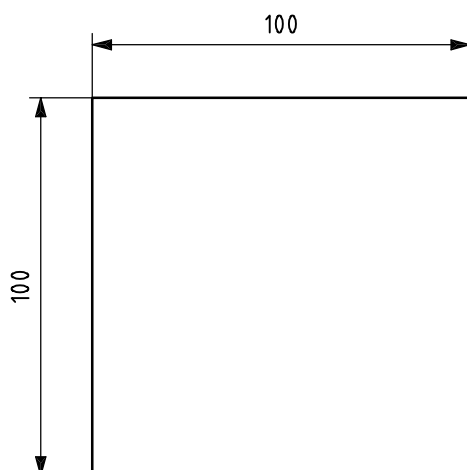
NOTE Atmospheric condensation could occasionally form underneath a sample during a test, giving a false indication of penetration. In such an event, verification can be made by applying a hypergol-compatible blotter that is known to discolour when in contact with a particular aerospace fluid.

- g) Carefully blot the liquid from the sample at the end of the specified exposure time.

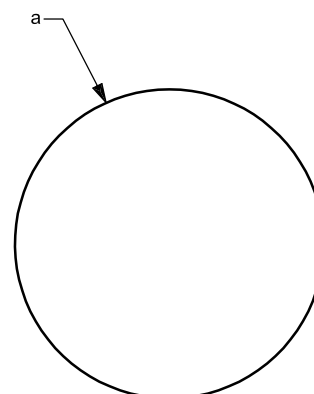
- h) Rinse the sample with running water for 60 s.

- i) Allow the test sample to air dry for 24 h prior to final evaluation.

Dimensions in millimetres



a) Penetration test specimen



a Radius as specified in ISO 6529 or ISO 6530.

b) Permeability test specimen

Figure 1 — Test specimens