भारतीय मानक

Indian Standard

IS 19065 (Part 5) : 2024
ISO 14952-5 : 2003

अंतरिक्ष प्रणालियाँ — द्रव तंत्र की सतह की सफाई

भाग 5 सुखाने की प्रक्रियाएँ

Space Systems — Surface Cleanliness of Fluid Systems

Part 5 Drying Processes

ICS 49.140

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Air and Space Vehicles Sectional Committee, TED 14

NATIONAL FOREWORD

This Indian Standard which is identical to ISO 14952-5 : 2003 'Space Systems — Surface Cleanliness of Fluid Systems — Part 5: Drying Processes' issued by International Organization for Standardization (ISO), was adopted by the Bureau of Indian Standards on the recommendations of Air and Space Vehicles Sectional Committee and approval of the Transport Engineering Division Council.

This standard is one of a series of standards on the 'Space systems — Surface cleanliness of fluid systems'. Other standard in this series are:

ISO 14952-1 : 2003	Space systems — Surface cleanliness of fluid systems — Part 1: Vocabulary
ISO 14952-2 : 2003	Space systems — Surface cleanliness of fluid systems — Part 2: Cleanliness levels
ISO 14952-3 : 2003	Space Systems — Surface cleanliness of fluid systems — Part 3: Analytical procedures for the determination of non-volatile residues and particulate contamination
ISO 14952-4 : 2003	Space systems — Surface cleanliness of fluid systems — Part 4: Rough-cleaning processes (*under preparation*)
ISO 14952-6 : 2003	Space systems — Surface cleanliness of fluid systems — Part 6: Precision-cleaning processes (*under preparation*)

The text of ISO standard has been proposed as suitable for publication as an Indian Standard without deviations. Certain terminologies and conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'; and

b) Comma (,) has been used as a decimal marker, while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to certain International Standard for which Indian Standard also exists. The corresponding Indian Standards, which is to be substituted in its respective place, is listed below along with its degree of equivalence for the edition indicated. For undated references, the latest editions of the referenced document applies, including any corrigenda and amendment:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 14952-1 : 2003 Space systems — Surface cleanliness of fluid systems — Part 1: Vocabulary	IS 19065-1 : 20 /ISO 14952-1 : 2003 Space systems — Surface cleanliness of fluid systems: Part 1 Vocabulary (*under preparation*)	Identical

The Committee has reviewed the provisions of the following International Standard referred in this adopted standard and has decided that it is acceptable for use in conjunction with this standard. For undated references, the latest edition of the referenced document applies, including any corrigenda and amendment.

International Standard	*Title*
ISO 14951-10 : 1999	Space systems — Fluids characteristics — Part 10: Water

(*Continued on third cover*)

Introduction

This part of ISO 14952 describes a method for vacuum drying intricate parts or components that are likely to retain entrapped moisture when dried by normal purging techniques. The purpose of this part of ISO 14952 is to provide processes that can be used to ensure the dryness of parts or components subjected to solvent-based or water-based cleaning processes.

Indian Standard

SPACE SYSTEMS — SURFACE CLEANLINESS OF FLUID SYSTEMS

PART 5 DRYING PROCESSES

1 Scope

This part of ISO 14952 provides guidance related to processes used to dry parts and components that have been subjected to solvent-based or water-based cleaning processes, and identifies drying processes that can be used for equipment that has been cleaned for use in ground support equipment, launch vehicles and spacecraft. Vacuum drying can be used to remove entrapped fluids from intricate parts when normal purging methods have been found to be ineffective.

2 Normative references

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 14951-3:1999, *Space systems — Fluid characteristics — Part 3: Nitrogen*

ISO 14952-1:2003, *Space systems — Surface cleanliness of fluid systems — Part 1: Vocabulary*

3 Terms and definitions

For the purposes of this part of this document, the terms and definitions given in ISO 14952-1 apply.

4 Drying and testing procedure

Components shall be thoroughly dried to remove residual cleaning, rinsing and/or verification media. Effluent gas shall not exhibit an increase in moisture content greater than 5 µl/l or a measurable increase in concentration of residual organic solvents. Items that do not lend themselves to this type of drying or testing procedure (i.e. special surface treatments or coatings) shall be dried in accordance with procedures agreed upon between the cleaning contractor and the customer.

5 Vacuum drying procedure

5.1 Apparatus and reagents

The following items are required to accomplish the vacuum drying processes specified by this part of ISO 14952.

5.1.1 **Vacuum oven**, with temperature control range from 45 °C to 125 °C.

5.1.2 Purge (test) gas, nitrogen in accordance with ISO 14951-3, Type A.

5.1.3 Thermocouple, for independent temperature monitoring of parts.

5.2 Heating of parts

Component parts shall be placed in the vacuum oven with the thermocouple attached to the largest part placed in the oven. The oven shall be closed and purged with inert test gas, then the oven shall be heated to the desired vacuum drying temperature. The temperature of the parts shall be governed by the following criteria:

a) minimum drying temperature for all parts shall be 45 °C;

b) maximum drying temperature for parts containing nonmetallics shall be 65 °C;

c) maximum temperature for drying metallic parts shall be 125 °C.

5.3 Thermal vacuum drying time

Once the thermocouple monitor indicates that the parts have reached the desired temperature, a vacuum should be drawn on the parts and maintained for the period specified in Table 1. Once the parts have been dehydrated, the heat should be discontinued and the oven slowly back-filled with the test gas.

Table 1 — Vacuum drying time

Values in hours

Vacuum oven pressure kPa	Temperature				
	45 °C	5 °C	6 °C	7 °C	8 °C
20,0	—	—	—	0,9	0,75
15,0	—	—	1,3	0,8	0,75
13,0	—	4,8	1,2	0,75	0,75
9,5	—	2,0	0,8	0,75	0,75
6,5	3,4	1,1	0,75	0,75	0,75
3,0	0,9	0,75	0,75	0,75	0,75
2,0	0,75	0,75	0,75	0,75	0,75

6 Gaseous purge-drying procedure

6.1 Materials

Gases used in purge-drying processes shall conform to the following requirements.

a) Nitrogen, filtered to remove particulates greater than 5 µm, shall be in accordance with Type A of ISO 14951-3:1999.

b) Air shall contain no particulate matter greater than 5 µm. The hydrocarbon content shall not exceed 10 µl/l except that a total value of 20 µl/l is acceptable when the portion of the total hydrocarbon content representing compounds containing 5 or more carbon atoms does not exceed 5 µl/l. The relative humidity shall not exceed 60 %.

6.2 Drying sample

6.2.1 Reliability sample

The quantitative analysis reliability sample shall consist of a minimum of 5 % of the items dried but not less than one sample from each group of items dried. The sample shall be selected in a manner that will provide maximum representation of the lot containing production items that have been cleaned, verified and dried. A lot does not necessarily mean identical parts but does include all hardware processed in one operation. The reliability sample and the segment of production that it represents shall be clearly identified, as specified by the customer.

6.2.2 Procedure reliability

Alternatively, the reliability of the drying procedure may be established for each hardware configuration and drying process. After qualification of the procedure and equipment for a specific hardware configuration, reliability sampling shall be left to the discretion of the customer. Samples for qualification of the drying process shall be selected as follows.

a) Select a minimum of five cleaned, verified and dried items from each of the hardware configuration to be qualified.

b) Evaluate samples in accordance with 6.3.

c) Upon qualification of the drying procedure for each hardware configuration, the established drying cycle requirements shall be implemented. Periodic spot tests shall be made to ensure that drying procedures continue to be effective.

6.3 Drying test

Unless otherwise approved by the customer, the reliability of the drying procedure for items subjected to liquids during cleaning or drying procedures shall be determined as follows.

a) Prefiltered drying gas shall be flowed through or over the affected surfaces of the item being tested.

b) For hardware processed with aqueous media, the dewpoint of the drying gas entering and leaving the affected item shall be monitored to determine the presence of moisture on cleaned and dried surfaces. An increase in the moisture content of the drying gas of 5 µl/l or greater shall necessitate additional drying prior to packaging or the application of protective coverings.

c) For hardware processed with halogenated solvents, the effluent drying gas shall be monitored with a halogen detector to determine if affected surfaces are free from residual solvent. If no measurable concentrations are indicated by the halogen detector, the affected surfaces shall be considered free from residual halogenated solvents. Any measurable concentration above ambient in the drying gas shall necessitate additional drying prior to packaging or application of protective coverings.

For hardware processed with alcohols or other hydrocarbons, the effluent drying gas shall be monitored with a hydrocarbon detector. Any measurable concentration above ambient in the drying gas shall necessitate additional drying prior to packaging or application of protective coverings.

(*Continued from second cover*)

Attention is drawn to the possibility that some of the elements of this standard may be the subject of patent rights. The Bureau of Indian Standards shall not be held responsible for identifying any or all such patent rights.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Bureau of Indian Standards

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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in.

This Indian Standard has been developed from Doc No.: TED 14 (22933).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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