KSC-SPEC-P-0024
February 26, 2001

REFRIGERANT, HCFC-124,

National Aeronautics and
Space Administration

John F. Kennedy Space Center

KSC-SPEC-P-0024
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REFRIGERANT, HCFC-124, 2-CHLORO-1,1,1,2-TETRAFLUOROETHANE, SPECIFICATION FOR

SPACEPORT ENGINEERING AND TECHNOLOGY DIRECTORATE

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REFRIGERANT, HCFC-124, 2-CHLORO-1,1,1,2-TETRAFLUOROETHANE, SPECIFICATION FOR

Approved:

Kenneth J. Payne
Acting Director of
Spaceport Engineering and Technology

JOHN F. KENNEDY SPACE CENTER, NASA

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REFRIGERANT, HCFC-124, 2-CHLORO-1,1,1,2-TETRAFLUOROETHANE, SPECIFICATION FOR

1. SCOPE

This specification establishes the requirements for hydrochlorofluorocarbon- (HCFC) -124, 2-chloro-1,1,1,2-tetrafluoroethane.

2. APPLICABLE DOCUMENTS

The following documents form a part of this document to the extent specified herein. When this document is used for procurement, including solicitations, or is added to an existing contract, the specific revision levels, amendments, and approval dates of said documents shall be specified in an attachment to the Solicitation/Statement of Work/Contract.

2.1 Governmental.

2.1.1 Specifications.

National Institute of Standards and Technology (NIST)

NIST Handbook 44	Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices

(Applications for copies should be addressed to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402-9325.)

U.S. Air Force

A-A-58060	Fluorocarbon and Other Refrigerants

(Applications for copies should be addressed to San Antonio ALC/SFPF, 1014 Billy Mitchell Blvd., Ste. 1, Kelly AFB TX 78241-5603.)

2.1.2 Standards.

Federal

RR-C-910	Cylinders, Compressed Gas

Military

MIL-STD-101	Color Code for Pipelines and for Compressed Gas Cylinders

2.1.3 Other Documents.

Code of Federal Regulations (CFR)

29 CFR 1910	U.S. Department of Labor (Occupational Safety and Health Standards)
49 CFR 173	U.S. Department of Transportation (Shippers, General Requirements for Shipments and Packagings)

(Application for copies of the Code of Federal Regulations should be addressed to the Superintendent of Documents, Government Printing Office, North Capitol and H Streets N.W., Washington, DC 20401.)

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specified procurement functions should be obtained from the procuring activity or as directed by the Contracting Officer.)

2.2 Non-Governmental.

Air Conditioning and Refrigeration Institute (ARI)

Standard 700	Specifications for Fluorocarbon and Refrigerants
Standard 700, Appendix C	Analytical Procedures for ARI Standard 700

(Applications for copies should be addressed to the Air Conditioning and Refrigeration Institute, 4301 North Fairfax Drive, Arlington, VA 22203.)

American Society for Quality Control (ASQC)

ASQC Z1.4	Sampling Procedures and Tables for Inspection by Attributes

(Applications for copies should be addressed to the American Society for Quality Control, 611 East Wisconsin Ave., Milwaukee, WI 53202-3005.)

American Society for Testing and Materials (ASTM)

ASTM D1120	Standard Test Method for Boiling Point of Engine Coolants
ASTM D2111	Standard Test Method for Specific Gravity of Halogenated Organic Solvents and Their Admixtures
ASTM D2887	Standard Test Method for Boiling Range Distribution of Petroleum Fractions by Gas Chromatography
ASTM D2988	Standard Test Method for Water-Soluble Halide Ion in Halogenated Organic Solvents and their Admixtures
ASTM D2989	Standard Test Method Acidity-Alkalinity of Halogenated Organic Solvents and Their Admixtures
ASTM D3401	Standard Test Methods for Water in Halogenated Organic Solvents and Their Admixtures
ASTM D3447	Standard Test Method for Purity of Halogenated Organic Solvents

(Applications for copies should be addressed to the American Society for Testing and Materials, 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959.)

3. REQUIREMENTS

3.1 Chemical and Physical Properties. - The refrigerant shall conform to the requirements of table 1 when tested as specified in section 4. Virgin HCFC-124 obtained directly from the manufacturer does not have to be tested by the manufacturer for boiling point and boiling range if the fluid meets or exceeds the remaining requirements listed in table 1.

3.2 Shelf Life. - Shelf life is considered to be indefinite at ambient conditions unless degradation or discoloration is detected. The fluid shall be tested prior to actual use on flight hardware or flight interface hardware.

3.3 Containers and Valves. - The material shall be contained in cylinders in accordance with the Federal Regulation for Transportation. FED-STD RR-C-910 and MIL-STD-101 can be used as guides for the cylinder requirements.

4. QUALITY ASSURANCE PROVISIONS

4.1 Qualification and Acceptance Tests. - Qualification and acceptance tests shall include all the tests required in this specification, with the exception noted in 3.1.

4.2 Certification. - A certified test report from the supplier shall accompany each lot of material comprising a shipment stating that the material meets all the requirements of this specification, with the exception noted in 3.1. This report shall include the actual test data (e.g., sample analysis report and actual laboratory results) for all requirements of this specification.

4.3 Responsibility for Inspection and Testing. - The supplier is responsible for the performance of all inspections and testing specified herein. Suppliers may, with the approval of the procuring agency, use their own facilities or those of a commercial laboratory. The procuring agency reserves the right to perform any of the inspections and testing set forth in this specification, where such are deemed necessary to ensure compliance with specification requirements.

4.3.1 Component and Material Inspection. - The supplier is responsible for ensuring that components and materials are manufactured, examined, and tested in accordance with referenced specifications and standards.

4.3.2 Material Inspection.

4.3.2.1 Inspection Lot. - Containers filled in a 24-hour period from the same source and with the same type of refrigerant shall be considered a lot.

4.3.2.2 Sampling. - Sampling for tests shall be performed in accordance with ASQC Z1.4.

4.3.2.3 Examination. - Samples selected in accordance with 4.3.2.2 shall be tested for conformance to the requirements listed in table 1 and 4.4. A result other than that specified shall constitute failure of the test.

4.4 Test Methods.

4.4.1 Water Content. - The refrigerant shall be tested for water content. The analysis may be conducted by infrared absorption, by an electrolytic moisture analyzer, or in accordance with ASTM D3401 or equivalent test method.

Table 1. Requirements and Test Methods

Chemical and Physical Property	Requirement	Test Method (Paragraph)
Water content, maximum ppm by weight	10	4.4.1
Air in vapor-phase, in filled container maximum percent by volume, liquid sample	1.5	4.4.2
Boiling point, (°C)	-10.83 ± 0.56	4.4.3
Boiling range, °C, 5 to 85 percent distilled	0.5	4.4.3
Chloride ion by test, maximum, ppm by weight	0.1	4.4.4
Acidity (equivalent HCl ppm, maximum)	0.1	4.4.5
Chemical purity, HCFC-124 and HCFC-124a (percent, minimum) HCFC-124a isomer, (percent)	99.7 <5	4.4.6
Particulate matter	Pass visual inspection	4.4.7

4.4.2 Air in the Vapor Phase. - The refrigerant shall be tested for air in the vapor phase in the original container in accordance with ARI 700 (Part 5) test method or equivalent test method. The refrigerant may be tested for the concentration of air in the vapor phase by gas chromatography. The test can be accomplished by the determination of gases not absorbable in perchloroethylene using water as a sealant. This test may also be completed by the determination of gases not absorbable in perchloro-ethylene using mercury as a sealant or by the determination of gases remaining when the refrigerant is frozen.

4.4.3 Boiling Point and Boiling Range. - The boiling point test shall be determined in accordance with ASTM D1120 or equivalent test method. The boiling range test shall be in accordance with ASTM D2887 or equivalent test method.

4.4.4 Chloride Ion Test. - An approved ASTM D2988, Method 3, or equivalent test methods may also be used for this test.

4.4.5 Acidity/Alkalinity. - The acidity/alkalinity of the material shall be determined in accordance with ASTM D2989 or equivalent test method.

4.4.6 Purity. - Purity shall be determined in accordance with ASTM D3447, gas chromatography or any equivalent test method. HCFC-124 consists of two isomers, HCFC-124 and HCFC-124a. The HCFC-124a amount shall not exceed 5 percent by weight. The sum of the two isomers shall meet the purity requirement.

4.4.7 Particulate Matter. - Particulate contamination of the refrigerant shall be determined by visual inspection. There should be no visible particle contamination.

4.5 Inspection of Packaging. - The packing of the containers of the refrigerant shall be examined to ensure there is no leakage, corrosion, or visible contaminants that could degrade the refrigerant or cause it to be inadvertently released from its container.

5. PREPARATION FOR DELIVERY

5.1 Packaging. - This refrigerant shall be furnished in reusable or disposable compressed gas cylinders conforming to 49 CFR 173 in accordance with the manufacturer's commercial practice and this specification. Packaging shall have integrity control seals installed on all outlets after filling.

5.2 Marking. - Each container of material shall include proper warning labels for personnel safety purposes and marking in accordance with 29 CFR 1910. Each container shall be legibly and permanently labeled with the following information:

MATERIAL: Refrigerant, HCFC-124
SPECIFICATION: KSC-SPEC-0024
MANUFACTURER'S NAME AND PRODUCT IDENTIFICATION:
DATE OF MANUFACTURE:
LOT NUMBER:
QUANTITY IN THIS CONTAINER:
PURCHASE ORDER NUMBER:

5.3 Container Inspection and Cleaning. - Containers shall be cleaned as required by the filling contractor to meet the requirements listed in table 1. All container interiors shall be clean and free of contaminants that could alter the properties of the fluid.

5.4 Filling Containers. - Unless otherwise specified, containers shall be filled to the rated capacity of the container. The weight of the refrigerant supplied shall be the difference between the filled (gross) weight and the unfilled (tare) weight of the container. The scale must be calibrated for commerce in accordance with NIST Handbook 44.

5.5 Leakage. - Containers and valves shall not leak after being filled and sealed.

5.6 Documentation. - The Material Safety Data Sheet (MSDS) shall be provided by the supplier and permanently retained by the user.

6. NOTES

6.1 Intended Use. - The material described in this specification is intended for use as a heat transfer medium for spaceflight hardware, related ground support equipment, and their interfaces, specifically the Space Shuttle Orbiter ground coolant loops and related support equipment.

6.2 Hazard Potential. - See the MSDS for complete hazard, health, and reactivity information. The National Fire Protection Association hazard ratings follow:

a. Fire 1

b. Health 0

c. Reactivity 1

6.3 Acquisition Requirements. - Acquisition documents must specify:

a. Title, number, and date of this specification

b. Method of shipment and the type and capacity of containers

c. Quantity by weight

d. When a different sampling plan is required (see 4.3.2.2)

e. Packaging requirements (see section 5)

Custodian:

NASA - John F. Kennedy Space Center
Kennedy Space Center, Florida 32899

Preparing Activity:

John F. Kennedy Space Center
Labs and Testbeds Division
Spaceport Engineering and
Technology Directorate

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER KSC-SPEC-P-0024	2. DOCUMENT DATE February 26, 2001

3. DOCUMENT TITLE
Refrigerant, HCFC-124, 2-Chloro-1,1,1,2-Tetrafluoroethane, Specification for

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME *(Last, First, Middle Initial)*	b. ORGANIZATION	
c. ADDRESS *(Include Zip Code)*	d. TELEPHONE *(Include Area Code)*	7. DATE SUBMITTED

8. PREPARING ACTIVITY

a. NAME Director of Spaceport Engineering and Technology	d. TELEPHONE *(Include Area Code)* (321) 867-7770

b. ADDRESS *(Include Zip Code)*

National Aeronautics and Space Administration, Mail Code: YA
Kennedy Space Center, FL 32899