

METRIC
--------

MIL-PRF-27415A  
11 December 1997  
SUPERSEDING  
MIL-P-27415  
2 August 1976

## PERFORMANCE SPECIFICATION

### PROPELLANT PRESSURIZING AGENT, ARGON

This specification is approved for use by all Departments and Agencies of the Department of Defense.

#### 1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers the requirements for two grades and two types of argon.

1.2 Classification. The argon will be of the following types and grades as specified (6.2):

1.2.1 Types. The types of argon are as follows:

Type I - Gaseous

Type II - Liquid

1.2.2 Grades. The grades of argon are as follows:

Grade A - 99.998 percent purity

Grade B - 99.985 percent purity

#### 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to SA-ALC/SFSP, 1014 Billy Mitchell Blvd/STE 1, Kelly AFB TX 78241-5603, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.
--

AMSC N/A

FSC 9135

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

## MIL-PRF-27415A

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

## SPECIFICATIONS

## DEPARTMENT OF DEFENSE

## MIL-S-27626 - Sampler, Cryogenic Liquid

(Unless otherwise indicated, copies of the above specifications, and standards are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia PA 19111-5094).

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM E 29 - Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications (DoD adopted)
- ASTM F 307 - Practice for Sampling Pressurized Gas for Gas Analysis (DoD adopted)
- ASTM F 310 - Practice for Sampling Cryogenic Aerospace Fluids (DoD adopted)

(Application for copies should be addressed to the American Society for Testing and Materials, 100 Bar Harbor Drive, West Conshohocken 19428-2959.)

## NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST) (Formerly National Bureau of Standards)

- Technical Publication No NSRDS-NBS 27 - Thermodynamic Properties of Argon from the Triple Point to 300K at Pressures to 1000 Atmospheres

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington DC 20402)

## COMPRESSED GAS ASSOCIATION (CGA)

- CGA G-11.1 - Commodity Specification for Argon
- CGA P-15 - Filling of Industrial and Medical Nonflammable Compressed Gas Cylinders

## MIL-PRF-27415A

(Application for copies should be addressed to the Compressed Gas Association, Inc, 1725 Jefferson Davis Highway, Arlington VA 22202-4100.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

## 3. REQUIREMENTS

3.1 Composition. The composition of the argon shall conform to the limits in Table I when tested in accordance with the applicable test methods (4.4). Other limits and tests may be specified by the procuring activity (see 6.2).

TABLE I. Composition

COMPOSITION	GRADES		TEST PARAGRAPH
	A	B	
Assay (purity)), Argon (Ar) percent by volume, min	99.998	99.985	4.4.1
Water, ppm by volume, max	3.5	23	4.4.2
Dewpoint, °C(°F)	-68(-90)	-54(-65)	4.4.2
Oxygen, ppm by volume, max	5	50	4.4.2
Hydrogen, ppm by volume, max	2	50	4.4.2
Nitrogen, ppm by volume, max	15	50	4.4.2
Total hydrocarbons (as methane), ppm by volume, max	1	Not Specified	4.4.2
Carbon dioxide, ppm by volume, max	1	Not Specified	4.4.2

3.2 Limiting values. The following applies to all specified limits in this specification: For purposes of determining conformance with these requirements, an observed value or a calculated value shall be rounded off "to the nearest unit" in the last right-hand digit used in expressing the specification limit according to the rounding-off method of ASTM Practice E 29 for using Significant Digits in Test Data to Determine Conformance with Specifications.

3.3 Filter. A filter with no more than a 10-micrometer nominal and 40-micrometer absolute rating shall be installed between the manufacturer's plant system and the manifold used to fill the gas or liquid containers for delivery.

3.4 Filled containers (Type I only).

## MIL-PRF-27415A

3.4.1 Pressure. Cylinders shall be within 99 to 100 percent of rated service pressure when tested as specified in 4.5.1. Pressure-Temperature Filling Charts in CGA P-15 or Table III may be used.

3.4.2 Leakage. Cylinders shall not leak when tested according to 4.5.2.

#### 4. VERIFICATION

##### 4.1 Points of inspection (6.2).

4.1.1 Containers. Unless otherwise specified, acceptance tests shall be conducted at the site of filling prior to shipment or departure.

4.2 Conformance inspection. Quality conformance tests shall consist of the following:

a. Individual tests (Type I only) . . . . 4.2.1

b. Sampling tests . . . . . 4.2.2

4.2.1 Individual tests (Type I only). Each container (cylinder or tube) shall be subjected to the following tests as described under 4.5:

a. Filling pressure . . . . 4.5.1

b. Leakage . . . . . 4.5.2

4.2.2 Sampling test. The number of argon containers shall be selected in accordance with Table II and subjected to the tests required by Table I.

TABLE II. Sampling for test

Number of containers in lot	Number of containers to be sampled
1	1
2 - 40	2
41 - 70	3
71 - over	4

##### 4.2.3 Lot definitions.

4.2.3.1. Grade A - Each filled container shall constitute a lot.

4.2.3.2. Grade B - For bulk transports, each filled container shall constitute a lot.

4.2.3.3. Grade B - For cylinders, each lot shall consist of one of the following:

a. The argon produced in not more than 24 consecutive hours from a continuous process which is used to fill shipping containers directly from the process output. A continuous process shall be the production of product by

## MIL-PRF-27415A

continuous input of raw materials and output of finished product by one manufacturer in one plant with no change in manufacturing conditions or materials.

b. The argon from individual runs of a batch process which is used to fill shipping containers directly from the process output. A batch process shall be the production of product by runs from single additions of raw materials which are reacted and purified forming the product.

c. The argon from either of both the continuous and batch processes which is held in a single storage tank and subsequently withdrawn to fill shipping containers. The product shall be homogeneous at the time of withdrawal and shall not be added to while being withdrawn. After each addition to the storage tank, the contents shall constitute a separate lot.

4.2.4 Sample. Each sample shall be of sufficient size to conduct all the quality conformance tests as specified herein. Unless otherwise specified, the quality conformance tests shall be made of each required sample (6.2). When required, an equivalent sample shall be forwarded to a laboratory designated by the procuring activity for subjection to the quality conformance tests specified herein.

4.2.4.1 Samplers. The sampler for Type I (gaseous) argon shall be a small compressed gas cylinder. The sampler for Type II (liquid) argon shall be in accordance with MIL-S-27626 or functionally equivalent thereto. The liquid samplers convert the entrapped liquid to gas. The aliquots taken for analysis are representative samples.

4.2.4.2 Sampling methods. Unless otherwise specified (6.2), Type I (gaseous) argon shall be sampled in accordance with ASTM F 307 and Type II (liquid) argon shall be sampled in accordance with ASTM F 310 except for the following changes: Replace paragraph 5.1 with "5.1 Ensure that the outlet of the sampling port is clean." Replace paragraph 6.1 with "6.1 Ensure that the outlet of the sampling port is clean."

4.2.5 Cylinders. The number of cylinders (pressure and Dewar types) filled with Type I (gaseous) or Type II (liquid) argon selected for sampling from each lot shall be in accordance with Table II. The first and last cylinders to be filled within a given lot shall be sampled. Other samples may be selected at random. The argon from each cylinder sampled shall constitute a separate sample. For the purpose of selecting sample cylinders only, any one cylinder may be selected from a group of cylinders filled simultaneously from a single manifold.

4.2.6 Bulk transports. A sample shall be taken from each portable tank, cargo tank, or tank car filled with Type I (gaseous) or Type II (liquid) argon.

4.3 Rejection. When any sample tested in accordance with 4.4 fails to conform to the requirements specified herein, the entire lot represented by the sample shall be rejected. Unless otherwise specified, disposition of rejected product shall be specified by the procuring activity (6.2).

4.4 Analytical procedures. Unless otherwise specified, samples shall be analyzed according to the procedures described below (6.2). Calibration gas standards may be required to calibrate (zero and span) analytical instruments

## MIL-PRF-27415A

used to determine the purity and impurity contents of the argon. The accuracy of the calibration gas standards is to be traceable to the National Institute of Standards and Technology.

4.4.1 Argon content. The argon content in percent shall be found by determining the aggregate impurities by the methods described below. The percent argon is the value obtained when this amount, expressed as volume percent is subtracted from 100.

4.4.2 Gaseous contaminants. Methods shall be selected from those of CGA G-11.1.

4.5 Gas cylinder tests.

4.5.1 Filling pressure. Samples shall be tested for proper filling pressure by attaching a calibrated Bourdon tube or equivalent gauge outlet and by attaching either a thermocouple or thermometer to the cylinder wall. The gauge shall have scale divisions not greater than 100 kPa (15 psi) for service pressures of less than or equal to 25 MPa gauge (3626 psig). For service pressures greater than 25 MPa gauge (3626 psig), a maximum of 700 kPa (102 psi) per scale division is acceptable. If a thermometer is used, tape or putty shall be applied to the bulb to protect it from alien temperatures. Putty shall not be applied between the bulb and the cylinder wall. The thermometer shall not have scale divisions greater than 2°F or 1°C. The containers shall be stabilized to ambient temperature. Then the valve shall be opened and the internal pressure observed on the gauge.

4.5.2. Leakage. Each Type I argon container shall be tested for leaks at the neck threads, stem packing, and safety device of the valve with leak detection fluid. Valve seat leakage shall be tested after filling has been completed. This shall be done by applying the leak-detection fluid sparingly across the outlet of the valve. Only leak-detection fluid that leaves no residue shall be used on the outlet.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful but is not mandatory.)

6.1 Intended use. The argon is used as a welding, purging, pressurizing, atmospheric inerting agent, or missile checkout gas in various systems.

## MIL-PRF-27415A

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of the specification.
- b. Type and grade of argon required (see 1.2).
- c. Issue of DoDISS to be cited in the solicitation, and, if required, the specific issue of individual documents referenced (see 2.2.1 and 2.3).
- d. When other limits or tests are required (see 3.1).
- e. When a variation in the points of inspection is required (see 4.1).
- f. When a variation of the quality conformance tests to be performed on a sample is required (see 4.2.4).
- g. When a variation to the sampling method is required (see 4.2.4.2).
- h. When a variation to the disposition of rejected product is required (4.3).
- i. When a variation of the analytical procedures is required (see 4.4).
- j. Packaging requirements (see 5.1 and 6.3).

6.3 Packaging requirements. Guidance for cylinders may be found in the following documents:

- a. MIL-DTL-2/11 - Valve, Cylinder, Gas, Argon, Helium, Nitrogen, Neon and Xenon, (Inert-Oil Free), Outlet 580
- b. MIL-DTL-2/51 - Argon, Helium, Nitrogen, Neon, Xenon, and Krypton Inert-Oil Free, Outlet 677
- c. MIL-STD-101 - Color Code for Pipelines and for Compressed Gas Cylinders
- d. MIL-STD-1411 - Inspection and Maintenance of Compressed Gas Cylinders
- e. 49 CFR 171 - 199 - Code of Federal Regulations

6.4 Field use limits. The requirements established by this specification are applicable for procurement purposes only and are valid solely as utilized by vendor and the procuring activity. They are not intended for each application.

6.5 Particulate contamination. Long term storage of filled argon containers may allow particulate contaminants to accumulate. For this reason, the installation of in-line filters between the containers and system if applicable, is recommended prior to use. Filters with a five micrometer nominal and 25 micrometer absolute rating for Type I (gaseous) and with a 10 micrometer nominal and 40 micrometer absolute rating for Type II (liquid) are suggested.

## MIL-PRF-27415A

TABLE III. Pressure Temperature Conversion Chart \*  
Container Service Pressure - 6000 psig

TEMP °F	PSIG	TEMP °F	PSIG	TEMP °F	PSIG
0	4567	44	5469	88	6366
2	4608	46	5510	90	6407
4	4649	48	5551	92	6448
6	4690	50	5592	94	6488
8	4731	52	5633	96	6529
10	4772	54	5674	98	6570
12	4813	56	5714	100	6610
14	4854	58	5755	102	6651
16	4895	60	5796	104	6691
18	4936	62	5837	106	6732
20	4978	64	5878	108	6772
22	5019	66	5918	110	6813
24	5060	68	5959	112	6853
26	5101	70	6000	114	6894
28	5142	72	6041	116	6935
30	5183	74	6081	118	6975
32	5224	76	6122	120	7016
34	5265	78	6163	122	7056
36	5305	80	6204	124	7096
38	5346	82	6244	126	7137
40	5387	84	6285	128	7177
42	5428	86	6326	130	7218

\* Calculated from the equation of state for argon of A. L. Gosman, et al. See NBS Technical Publication NSRDS-NBS 27.

6.6 Part or identifying number (PIN). The PINs to be used for argon acquired to this specification are created as follows:

M 27415 - X X      Example of PIN: M27415-2B

Grade (see 1.2.2).  
 Type (see 1.2.1). Use 1 for Type I; 2 for Type II.  
 Specification number.  
 Prefix for military specification.



MIL-PRF-27415A

6.7 Subject term (key word listing).

Aerospace  
Cylinders  
Argon  
Propellant  
Missile checkout  
Welding gas  
Inerting agent

6.8 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Custodians

Army - MI

Navy - AS

Air Force - 68

Review Activities

Air Force - 19

Preparing Activity

Air Force - 68

Civil Agency Interest

NASA

(Project 9135-0147)

# 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(s) or to amend contractual requirements.

### I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER  
MIL-PRF-27415A

2. DOCUMENT DATE (YYMMDD)  
97/12/11

3. DOCUMENT TITLE PROPELLANT PRESSURIZING AGENT, ARGON

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)*  
(1) Commercial  
(2) AUTOVON  
*(if applicable)*

7. DATE SUBMITTED  
(YYMMDD)

### 8. PREPARING ACTIVITY

a. NAME SA-ALC/SFSP

b. TELEPHONE *Include Area Code)*  
(1) Commercial  
(210)925-7847

(2) AUTOVON  
945-7847

c. ADDRESS *(Include Zip Code)*  
1014 Billy Mitchell Blvd, STE 1  
Kelly AFB, TX 78241-5603

**IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:**  
DEFENSE QUALITY AND STANDARDIZATION OFFICE  
5203 Leesburg Pike, Suite 1403, Falls Church, VA 22401-3466  
Telephone (703) 756-2340 AUTOVON 289-2340