METRIC

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PERFORMANCE SPECIFICATION

PROPELLANT PRESSURIZING AGENT, ARGON

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

Comments, suggestions, or questions on this document should be addressed to HQ-AFPET/AFTT, 2430 C Street, Bldg 70, Area B, Wright-Patterson AFB, OH, 45433-7632 or e-mailed to AFPET.AFTT@wpafb.af.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at http://assist.daps.dla.mil.

AMSC N/A FSC 9135

1. SCOPE

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 (see 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, 4, or 5 of this specification. This section does not include documents cited 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 of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Other Government documents, drawings, and publications. The following Government document forms a part of this document to the extent specified herein. Unless otherwise specified, the issue of this document is the one cited in the solicitation or contract (see 6.2).

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

Technical Publication NSRDS-NBS 27	Thermodynamic Properties of Argon from the Triple Point to 300K at Pressures to 1000 Atmospheres

(Copies of this document are available online at http://www.nist.gov or the National Institute of Standards and Technology (NIST), 100 Bureau Drive, Stop 1070, Gaithersburg, MD 20899-1070.)

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 these documents are those cited in the solicitation or contract.

ASTM INTERNATIONAL

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

(Copies of these documents are available online at http://www.astm.org or the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken PA 19428-2959)

COMPRESSED GAS ASSOCIATION (CGA)

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

(Copies of these documents are available online at http://www.cganet.com or the Compressed Gas Association, Inc., 4221 Walney Road, 5th floor, Chantilly, VA 20151-2923)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related specification sheets), 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 (see 4.4). Other limits and tests may be specified by the procuring activity (see 6.2).

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 E 29, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications.

3.3 Filter. A filter with a rating of at least 10-micrometer nominal and 40-micrometer absolute or better 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).

3.4.1 Pressure. The container filling pressure shall not differ from that required by the contract by more than 1% at 70°F when tested as specified in 4.5.1. In no case shall the filling pressure exceed the rated service pressure of the container. Gas cylinders shall be filled to within 99 to 100 percent of their rated service pressure when tested as specified in 4.5.1. Pressure-Temperature Filling Charts in CGA P-15 or the pressure-temperature table in Section 6 may be used.

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

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	2	50	4.4.2
Hydrogen, ppm by volume, max	2	50	4.4.2
Nitrogen, ppm by volume, max	10	50	4.4.2
Total hydrocarbons (as methane), ppm by volume, max	0.5	Not specified	4.4.2
Carbon dioxide, ppm by volume, max	0.5	Not specified	4.4.2

4. VERIFICATION

4.1 Points of inspection (see 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 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 Type I. A lot is defined as all of the argon supplied in one or more container(s) filled from a single manifold at the same time.

4.2.3.2 Type II. Each filled container shall constitute a lot.

4.2.3.3 Container Assemblies. A shipping conveyance consisting of multiple cylinders or tubes that are interconnected by a single manifold that equalizes the pressure across all cylinders/tubes to form a single unit is considered a single container.

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 performed on each required sample (see 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 Sampling methods. Each sample taken for analysis shall be representative of the entire contents of the container being sampled. All equipment used shall be made of suitable materials. Unless otherwise specified in the acquisition requirements (see 6.2), sampling shall be accomplished by one of the following methods.

a. Type I, gaseous argon may be sampled in accordance with ASTM F 307 and Type II, liquid argon may be sampled in accordance with ASTM F 310. It is critical that the sampling port be clean and free of contaminants.

b. Connect the shipping container being sampled directly to the analytical equipment using suitable pressure regulation as required to prevent over-pressurization of the equipment.

4.2.5 Non-Bulk Containers. The number of containers filled with Type I (gaseous) argon selected for sampling from each lot shall be in accordance with Table II. The first and last containers to be filled within a given lot are typically sampled. Other samples may be selected at random. Every container filled with Type II (liquid) argon shall constitute a lot and will be sampled.

4.2.6 Bulk transports. For bulk shipments, each container filled with Type I (gaseous) or Type II (liquid) argon constitute a lot and shall be sampled.

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.

4.4 Analytical procedures. Unless otherwise specified (see 6.2), samples shall be analyzed according to the procedures described in 4.4.2. Calibration gas standards may be required to calibrate (zero and span) analytical instruments 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 (NIST).

4.4.1 Argon content. The argon content in percent shall be found by determining the aggregate impurities by the methods described in 4.4.2. The aggregate impurities shall include all the impurities listed in Table I, regardless of Grade. The percent argon is the value obtained when the aggregate impurities, expressed as volume percent, are subtracted from 100 percent.

4.4.2 Impurities. The analytical procedures described in CGA G-11.1 shall be used to determine the concentrations of those impurities listed in Table I.

4.5 Filled container tests (Type I only).

4.5.1 Filling pressure. Containers shall be tested for proper filling pressure by attaching a calibrated Bourdon-tube or equivalent gauge to the valve outlet and by attaching either a thermocouple or thermometer to the container 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 (100 psi) per scale division is acceptable. If a thermometer is used, tape or putty shall be applied to the bulb to protect it from extraneous temperatures. Putty shall not be applied between the bulb and the container wall. The thermometer shall not have scale divisions greater than 1°C (2°F). 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 by connecting a hose to the valve outlet and placing the other end of the hose under the surface of a liquid.

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 or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. 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.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, and date of this specification.
b. Type and grade of argon required (see 1.2).

c. If required, the specific issue of individual documents referenced (see 2.2.1).
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 4.2.4.1).
h. When a variation of the analytical procedures is required (see 4.4).
i. Packaging requirements (see 5.1).

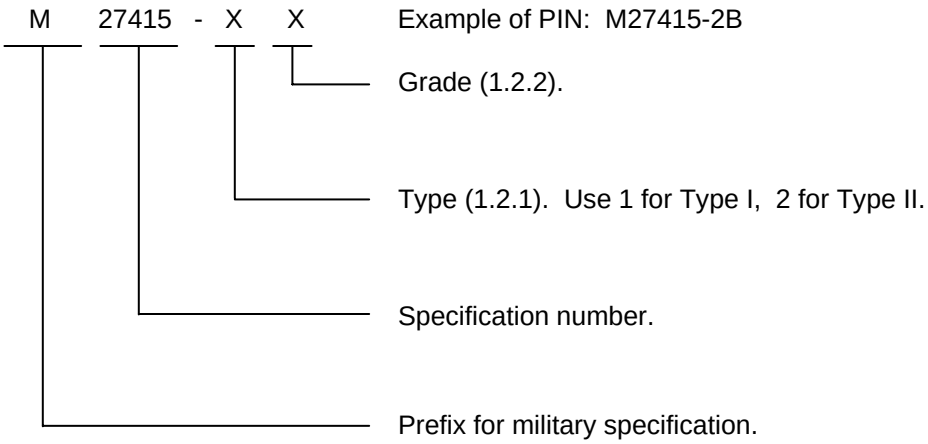
6.3 Packaging requirements. Guidance for cylinders may be found in the following documents:

a. MIL-DTL-2/11	Valve, Cylinder, Gas: Argon, Helium, Nitrogen, Neon, and Xenon, (Inert-Oil Free), Outlet 580
b. MIL-DTL-2/51	Valve, Cylinder, Gas: 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 rating of five micrometer nominal and 25 micrometer absolute rating or better for Type I (gaseous) and with a 10 micrometer nominal and 40 micrometer absolute rating or better for Type II (liquid) are suggested.

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



6.7 Subject term (key word) listing.

Aerospace
Cylinders
Argon
Propellant
Missile checkout
Welding gas
Inerting agent

6.8 International standardization agreement implementation. This specification serves as the implementing document for STANAG 7127 GGS. MIL-PRF-27415, Grade A, argon, meets the requirements of the argon specified in STANAG 7127. When the amendment, revision, or cancellation of this specification is proposed, the preparing activity must coordinate the action with the U.S. National Point of Contact for the international standardization agreement, as identified in the ASSIST database at http://assist.daps.dla.mil.

6.9 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.

TABLE III. Pressure temperature conversion chart container service pressure – 6000 psig. [1]

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

Note 1: Calculated from the equation of state for argon of A. L. Gosman, et al. See NBS Technical Publication NSDRS-NBS 27 (Available through NIST).

CONCLUDING MATERIAL

Custodians:
Army – MI
Navy – AS
Air Force – 68
DLA – PS

Review activities:
Air Force – 19

Preparing activity:
Air Force – 68
(Project 9135-2005-005)

Note: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information using the ASSIST Online database at http://assist.daps.dla.mil.