

METRIC
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BB-A-106D  
27 December 2010  
 SUPERSEDING  
 BB-A-106C  
 30 January 2001

## FEDERAL SPECIFICATION

### ACETYLENE, TECHNICAL, DISSOLVED

The General Services Administration has authorized the use of this federal specification by all federal agencies.

#### 1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers two technical grades of acetylene dissolved in acetone.

1.2 Classification. The acetylene shall be of the following grades, as specified (see 6.2):

Grade A - 99.6 percent acetylene

Grade B - 98.0 percent acetylene

#### 2. APPLICABLE DOCUMENTS

2.1 Government publications. The issues of the following documents, in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

##### Federal Standard

FED-STD-123	- Marking for Shipment (Civil Agencies)
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##### Commercial Item Description

A-A-59860	- Valves, Cylinder, Gas (for Compressed or Liquefied Gases)
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<p>Beneficial comments, recommendations, additions, deletions, clarifications, etc. and any data that may improve this document should be sent to: <a href="mailto:STDZNMGT@dla.mil">STDZNMGT@dla.mil</a> or Defense Logistics Agency Aviation VEB, 8000 Jefferson Davis Highway, Richmond, VA 23297-5616. Since contact information can change, you may want to verify the currency of this address information using the ASSIST database at <a href="https://assist.daps.dla.mil/">https://assist.daps.dla.mil/</a>.</p>
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## BB-A-106D

(Activities outside the federal government may obtain copies of federal standards and commercial item descriptions as specified in the General Information section of the Index of Federal Specifications, Standards and Commercial Item Descriptions. The index is for sale on a subscription basis from the General Services Administration, Federal Supply Service, Specification Section, East 470 L'Enfant Plaza SW, Suite 8100, Washington, DC 20407.)

(Single copies of this specification, and other federal specifications, standards, and commercial item descriptions required by activities outside the federal government for bidding purposes are available without charge from the General Services Administration, Federal Supply Service, Specification Section, East 470 L'Enfant Plaza SW, Suite 8100, Washington, DC 20407.)

(Federal government activities may obtain copies of federal standardization documents and the Index of Federal Specifications, Standards and Commercial Item Descriptions from established distribution points in their agencies. Electronic copies may be obtained from <https://assist.daps.dla.mil/>.)

## Military Specification

MIL-DTL-3701 - Cylinders, Compressed Gas: DOT-8 and DOT-8AL Acetylene, with Valves

## Military Standards

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

MIL-STD-129 - Military Marking for Shipment and Storage

MIL-STD-1411 - Inspection and Maintenance of Compressed Gas Cylinders

(Copies of military specifications and standards required by contractors in connection with specific procurement functions are available from the Standardization Document Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094. Electronic copies may be obtained from <https://assist.daps.dla.mil/>.)

## Federal Regulations

49 CFR 171-185 - Hazardous Materials Regulations

(The Code of Federal Regulations (CFR) is for sale on a subscription basis from the Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954. When indicated, reprints of certain regulations may be obtained from the federal agency responsible for issuing them. Electronic copies may be obtained from <http://www.gpoaccess.gov/ecfr/>.)

## BB-A-106D

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on the date of invitation for bids or request for proposal shall apply.

## American Society for Quality

- |          |   |
|----------|---|
| ASQ Z1.4 | - Sampling Procedures and Tables for Inspection by Attributes |
|----------|---|

(Application for copies should be addressed to the American Society for Quality, 600 North Plankinton Avenue, Milwaukee, WI 53023. Electronic copies may be obtained from [http://www.asq.org/.](http://www.asq.org/))

## ASTM International

- |           |                                      |
|-----------|--------------------------------------|
| ASTM D329 | - Standard Specification for Acetone |
|-----------|--------------------------------------|

(Application for copies should be addressed to ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. Electronic copies may be obtained from [http://www.astm.org/.](http://www.astm.org/))

## Compressed Gas Association (CGA)

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|-----------|--|
| CGA C-13  | - Guidelines for Periodic Visual Inspection and Requalification of Acetylene Cylinders         |
| CGA G-1   | - Acetylene  |
| CGA G-1.1 | - Commodity Specification for Acetylene  |
| CGA G-1.9 | - Recommended Practices for Maintaining the Proper Solvent Level in Acetylene Cylinders        |
| CGA TB-17 | - Test Methods for Evaluating Paints and Coatings on Refillable Steel Compressed Gas Cylinders |
| CGA V-9   | - Compressed Gas Association Standard for Compressed Gas Cylinder Valves                       |

(Application for copies should be addressed to the Compressed Gas Association, 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923. Electronic copies may be obtained from [http://www.cganet.com/.](http://www.cganet.com/))

### 3. REQUIREMENTS

3.1 Material. The acetylene shall conform to the requirements of gaseous acetylene as specified in CGA G-1.1 and shown in table I.

## BB-A-106D

TABLE I. Properties of acetylene.

Limiting characteristics <sup>1</sup>	Grade A (Percent by volume) <sup>2</sup>	Grade B (Percent by volume) <sup>2</sup>
CGA G-1.1 Quality Verification Level	QVL H	QVL C
Acetylene (C <sub>2</sub> H <sub>2</sub> )	99.6 minimum	98.0 minimum
Phosphine (PH <sub>3</sub> ) and arsine (AsH <sub>3</sub> ) <sup>3</sup>	0.0025 maximum	0.05 maximum
Hydrogen sulfide (H <sub>2</sub> S) <sup>3</sup>	0.0025 maximum	0.05 maximum

<sup>1</sup> Additional information on the properties and handling of acetylene may be found in CGA G-1.

<sup>2</sup> Acetone-free basis.

<sup>3</sup> Carbide process acetylene only (see 6.3).

3.2 Cylinders and valves. The acetylene shall be contained in government-owned and furnished cylinders conforming to MIL-DTL-3701 equipped with valves meeting all requirements of A-A-59860. When specified (see 6.2), new cylinders meeting the same requirements shall be purchased and furnished with the gas product. When specified (see 6.2), the acetylene shall be contained in supplier-owned DOT-approved cylinders meeting the requirements of 49 CFR 171-185 equipped with valves qualified to either CGA V-9 or A-A-59860.

3.3 Cylinder maintenance. Government-owned and furnished cylinders shall be inspected, maintained, and when necessary, reconditioned in accordance with MIL-STD-1411 to meet all serviceability requirements of 49 CFR 171-185. Supplier-owned cylinders shall be processed using CGA C-13, CGA G-1.9, and the supplier's own approved procedures to meet all serviceability requirements of 49 CFR 171-185.

3.3.1 Painting. Government-owned and furnished cylinders requiring repainting shall be color-coded and stenciled in accordance with MIL-STD-101. The paint and the painting process shall be by any method or system that will provide a finish that meets the requirements of CGA TB-17.

3.3.2 Valves. Unless otherwise specified (see 6.2), replacement valves for any defective valves found in the government-owned and furnished cylinders shall be furnished by the supplier and shall be qualified to meet all requirements of A-A-59860. Valves in supplier-owned cylinders shall be qualified to meet all requirements of either A-A-59860 or CGA V-9.

3.3.3 Acetone. Acetone for the replenishment of government-owned and furnished cylinders shall conform to ASTM D329.

3.4 Capacity. Cylinders shall be filled to volume capacity on the basis of weight (see 6.6). Cylinders shall be filled in compliance with 49 CFR 173.303; the pressure in the filled cylinder shall not exceed 1723 kPa (gauge) at 21.1 °C (250 pounds per square inch gauge (psig) at 70 °F).

3.5 Leakage. Cylinders and valves shall not leak after being filled.

## BB-A-106D

## 4. QUALITY ASSURANCE PROVISIONS

4.1 Inspection responsibility. The supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own or any other inspection facilities and services acceptable to the government. The government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.1.1 Component and material inspection. The supplier is responsible for insuring that components and materials used are manufactured, examined, and tested in accordance with referenced specifications and standards. The supplier shall verify that the production facility will produce acetylene that complies with the percent by volume (v/v) acetylene purity requirements of 3.1 for the grade supplied. Current analytical records of acetylene production by the facility may be used to perform the verification. The analytical records shall be considered current if taken within 180 days preceding the date of contract or purchase order. When current analytical records are not available, or in case of process upset or equipment malfunction which affects the product purity, not less than one acetylene sample from the production facility shall be tested as specified in 4.4.2.1 prior to starting or continuing production.

4.2 Quality conformance inspection.

4.2.1 Examination. Each filled cylinder shall be examined as specified in 4.3.1. Presence of one or more defects shall be cause for rejection of the cylinder.

4.2.2 Tests.

4.2.2.1 Individual cylinder. Each filled cylinder shall be tested for leakage as specified in 4.3.2.3. Failure of the test shall be cause for rejection of the cylinder.

4.2.2.2 Samples (carbide process acetylene only). Samples selected from each lot of carbide process acetylene shall be tested for phosphine/arsine and hydrogen sulfide as specified in 4.3.2.2. Sampling shall be from filled cylinders and shall be conducted in accordance with ASQ Z1.4. A lot shall be considered to be all cylinders filled from the same source during a consecutive 24-hour period. The acceptance quality limit (AQL) shall be as specified in the contract (see 6.2).

4.3 Inspection procedure.

4.3.1 Examination. The filled acetylene cylinders shall be examined for the following defects:

- a. Cylinder or valve not as specified in 3.2.
- b. Cylinder maintenance not as specified in 3.3.
- c. Capacity not as specified in 3.4.

## BB-A-106D

4.3.2 Tests.

4.3.2.1 Acetylene purity. (This test is required only for verification of the production facility as outlined in 4.1.1.) Compliance with the acetylene purity requirement of 3.1 shall be determined by gas chromatography or other appropriate instrumental method. Prior to the test, a few cubic feet of gas shall be discharged to purge the sampling lines. The minimum acetylene content shall be 99.6 percent (v/v) for grade A and 98.0 percent (v/v) for grade B. Otherwise, compliance with the minimum requirements has not been met and shall constitute failure of this test.

4.3.2.2 Phosphine/arsine and hydrogen sulfide (carbide process acetylene only). Compliance of carbide process acetylene with the phosphine/arsine and hydrogen sulfide requirements of 3.1 shall be determined qualitatively as specified in 4.3.2.2.1. In case of dispute, the acetylene shall be quantitatively analyzed as specified in 4.3.2.2.2. Prior to each test, a few cubic feet of gas shall be discharged to purge the sampling lines.

4.3.2.2.1 Qualitative determination. The qualitative determination for both grade A and grade B acetylene may be made with color detector tubes for phosphine/arsine and for hydrogen sulfide (see 6.7). If the indicated percentage of phosphine/arsine or of hydrogen sulfide is greater than that specified in 3.1, the acetylene shall have failed the test.

4.3.2.2.2 Quantitative analysis. The quantitative determination of phosphine/arsine and of hydrogen sulfide shall be by gas chromatography or other appropriate instrumental method. The maximum allowance for phosphine/arsine is 0.0025 percent (v/v) for grade A and 0.05 percent (v/v) for grade B. The maximum allowance for hydrogen sulfide is 0.0025 percent (v/v) for grade A and 0.05 percent (v/v) for grade B. Quantities in excess of these respective amounts shall constitute failure of this test. Analysis by gas chromatography may be performed in lieu of the method specified in 4.3.2.2.1, if gas chromatography is the supplier's preferred method of testing.

4.3.2.3 Leakage. After filling, each cylinder shall be tested for leakage by applying a soap solution to all portions of the valve, the junction of the valve and cylinder, and the safety device on the cylinder. Care shall be taken to ensure that the solution does not contaminate the valve outlet. Any evidence of gas leakage as indicated by bubbling of the soap solution shall constitute failure of this test.

4.4 Inspection of preparation for delivery. All cylinders shall be examined to determine if any markings are missing, illegible, incorrect, or incomplete. Any one defect shall be cause for rejection.

## 5. PACKAGING

5.1 Packing. Shipment of the cylinders of acetylene shall conform to 49 CFR 171-185.

5.1.1 Palletization. When specified (see 6.2), the cylinders of a single grade of acetylene shall be palletized together in the vertical, valve-up position, on hardwood pallets in accordance with the requirements of the procuring agency or activity.

## BB-A-106D

5.2 Marking. The cylinders shall be marked in accordance with 49 CFR 171-185. Each cylinder shall be stenciled or tagged grade A or grade B as applicable.

5.2.1 Civil agencies. In addition to the marking specified in 5.2, the cylinders shall be marked in accordance with FED-STD-123.

5.2.2 Military agencies. In addition to the markings specified in 5.2, the cylinders shall be marked in accordance with MIL-STD-129.

## 6. NOTES

INFORMATION FOR GUIDANCE ONLY. (This section contains information of a general or explanatory nature that is helpful, but is not mandatory.)

6.1 Intended use. The grade A acetylene covered by this specification is used as an illumination gas for navigational lights. The grade B acetylene covered by this specification is for use in cutting and welding.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Grade of acetylene required (see 1.2).
- c. When supplier is to furnish cylinders (see 3.2).
- d. When acetylene is to be contained in supplier-owned cylinders (see 3.2).
- e. When government-furnished replacement valves are to be utilized (see 3.3.2).
- f. AQL (see 4.2.2.2).
- g. When cylinders are to be palletized (see 5.1.1).
- h. Packaging requirements (see 5.1 through 5.2.2).

6.3 Processes. Acetylene is commercially produced by either of two types of processes:

a. Carbide process. Acetylene is produced by reaction of calcium carbide and water. The calcium carbide has varying amounts of phosphorus and sulfur contaminants, which result in phosphine, arsine, and hydrogen sulfide impurities in product acetylene.

b. Petrochemical processes. Acetylene is produced by the thermal or arc cracking of hydrocarbons, such as the Wulff process or the BASF process; or by the partial combustion of methane with oxygen, such as the Montecatini process. Acetylene so produced is sometimes referred to as petrochemical or by-product acetylene. There is no phosphine, arsine, or hydrogen sulfide contamination in acetylene produced by petrochemical processes.

6.3.1 Grades. Acetylene produced by either type of process is considered to meet commercial cutting and welding requirements, which is the intended use of grade B, 98 percent (v/v) acetylene. Further purification produces grade A, 99.6 percent (v/v) acetylene, which is often described as purified grade. Generally, only carbide process acetylene is further purified.

6.4 Government-furnished cylinders. The contracting officer should arrange to furnish the cylinders specified in 3.2.

## BB-A-106D

6.5 Maintenance of government-furnished cylinders. Purchasers should specify the extent to which the gas supplier should process government-furnished cylinders that require maintenance.

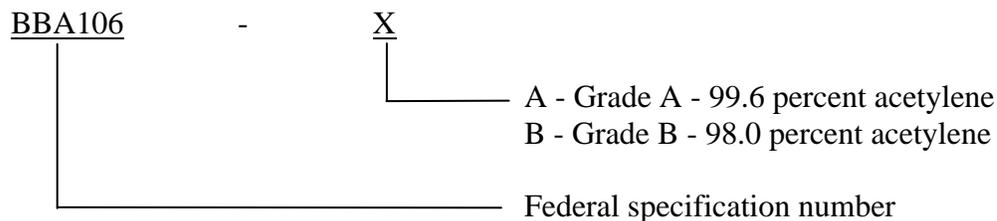
6.5.1 Service practices. The gas supplier should furnish at no additional cost all services that are required at each and every filling of a cylinder to comply with applicable regulations and normal good practice. Such services would include, but not be limited to all inspection, testing, evacuation, and handling services required for the gas supplied.

6.5.2 Service fees. A schedule of allowable fees should be specified by the purchaser for the gas supplier's performance of services such as the replacement of valves, valve parts, cylinder caps, periodic inspection, cleaning, painting, color-coding, marking, and handling of unserviceable cylinders as required. The gas supplier should furnish all materials and components for these services.

6.6 Basis of purchase. The basis of purchase should be the cubic foot. A conversion factor of 917.7 liters per kilogram (14.7 cubic feet per pound) weight of acetylene should be used. The weight of acetylene supplied in each cylinder is the difference between the filled weight and the tare (unfilled) weight of the cylinder. Acetylene is available in several cylinder sizes ranging from 283 through 11,893 liters (10 through 420 ft<sup>3</sup>) rated capacity. In general, the amount of acetylene in a filled cylinder may vary slightly (up to 3 percent) from the rated volume capacity of the cylinder.

6.7 Color detector tubes. The color detector tubes specified in 4.3.2.2.1 are tubes containing granules impregnated with indicating chemicals. Two color detector tubes would be used for the specified tests, one for phosphine/arsine and one for hydrogen sulfide. A detector tube that does not have cross-sensitivity to hydrogen sulfide must be used when detecting for phosphine/arsine. A detector tube that does not have cross-sensitivity to arsine and phosphine must be used when detecting hydrogen sulfide. Phosphine/arsine color detector tubes cannot differentiate between phosphine and arsine content. The length of color change in a tube, when a measured volume of acetylene is passed through it, is directly proportional to the concentration of the impurity. The tubes and associated apparatus are available from several manufacturers and in several ranges.

6.8 Part or identification number (PIN). The following PIN procedure is for government purposes and does not constitute a requirement for the contractor.



BB-A-106D

6.9 Subject term (key word) listing.

Acetone  
Arsine  
BASF process  
Carbide process  
Cylinder  
Gas chromatography  
Hydrogen sulfide  
Montecatini process  
Petrochemical process  
Phosphine  
Valve  
Wulff process

6.10 Changes from previous issue. Asterisks (or vertical lines) are not used in this revision to identify changes with respect to the previous issue due to the extensive changes.

MILITARY INTERESTS:

Custodians:  
Air Force - 68  
DLA - GS

CIVIL AGENCY  
COORDINATING ACTIVITY:

GSA - FAS

Preparing Activity:  
DLA - GS3

(Project 6830-2010-002)

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 above using the ASSIST database at <https://assist.daps.dla.mil/>.